

**SOCIAL INTERACTION AND WELL-BEING IN ARCHITECTURAL
ENVIRONMENTS.**

The Design of a Multi-Use-Facility.

By

David Michael Sharkey

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Supervisor: Juan Ignacio Solis-Arias

Staff Number: 33192

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DECLARATION

I hereby declare that this document is my own unaided work under the supervision of Mr Juan Ignacio Solis-Arias. All citations, references and borrowed ideas have been duly acknowledged. It is for submission to the School of Community Development and the Built Environment, University of KwaZulu-Natal, Durban, South Africa in partial fulfilment of the requirements for the degree of Master of Architecture. It has not been submitted before, for any degree or examination, at any other educational institution.

.....

David Michael Sharkey

.....day of.....year.....

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DEDICATION

To my Dad, for always encouraging and being there to motivate me to pursue my dreams, and to always believe in and uplift me through some challenging times. Without your constant support I would not be where I am today, and I thank you immensely for all you have done.

ABSTRACT

The urban architectural environment in modern day life places a variety of additional unnecessary stresses upon people which affects social interaction and well-being. This dissertation is aimed at developing an understanding of what social interaction and well-being is in architecture and how important it is to design architectural environments that enhance these two principles.

The research investigates the benefits and design tools of a more appropriate approach to the built environment through the exploration of the theories of Biophilia, Image Of The City and New Urbanism. The theories seek to provide architects and the designers of the built environment with tools that can be used to create architectural environments that enhance social interaction and the well-being of building users.

It further endeavours to highlight the destructive qualities that affect well-being and social interaction in the architectural environment on both a macro (city context) and a micro level (the building) to create an awareness in those responsible for the design of these environments and the impact they have on society.

The designers of the built environment should consider the social and well-being needs of the people as this will convert architectural environments into spaces that have physical and physiological benefits to its users.

TABLE OF CONTENTS

DECLARATION	i
ACKNOWLEDGEMENTS	ii
DEDICATION	iii
ABSTRACT	iv
TABLE OF CONTENTS	v

PART ONE

BACKGROUND RESEARCH ON ISSUES

No. of Pages

CHAPTER ONE	1
1.1 INTRODUCTION.....	1
1.1.1 Background Statement.....	1
1.1.2 Justification of the Study	2
1.2 EXPLORING AND DEFINING THE PROBLEM, AIMS AND OBJECTIVES.....	2
1.2.1 Defining the Research Problem	2
1.2.2 The Aims of the Study	3
1.2.3 The Objectives of the Study	3
1.3 SETTING OUT THE SCOPE OF THE CHOSEN STUDY	3
1.3.1 Delineating the Research Problem	3
1.3.2 Definition of Key Terms.....	4
1.3.3 Stating the Assumptions	6
1.3.4 The Working Hypothesis	6
1.3.5 Key Questions	7
1.4 CONCEPTS AND THEORIES	7
1.4.1 Biophilia.....	7
1.4.2 Kevin Lynch's Theory: Image of the City.....	8
1.4.3 New Urbanism	9
1.5 RESEARCH METHODS AND MATERIALS.....	10
1.5.1 Research Methods	10
1.5.2 Research Materials.....	11
1.5.2.1 Primary Research.....	11
1.5.2.2 Secondary Research.....	11

1.6 CONTRIBUTION TO KNOWLEDGE.	12
1.7 CONCLUSION.	13
CHAPTER TWO	15
UNDERSTANDING HUMAN WELL-BEING AND ITS EFFECTS	15
2.1 INTRODUCTION.	15
2.2 WELL BEING DEFINED	16
2.3 STRESS AND ITS EFFECTS.	17
2.2 CONCLUSION.	18
CHAPTER THREE	19
THE IMPACT OF THE MACRO CONTEXT ON SOCIAL INTERACTION AND WELL- BEING.	19
3.0 INTRODUCTION.	20
3.1 IMPACT OF CITY STRUCTURE AND IMAGE.	21
3.1.1 Urban Sprawl and its Effects	21
3.1.2 Commuting and its Impact	23
3.1.3 Image of the City: Identification and Orientation	25
3.2 COMBATTING URBAN SPRAWL.	30
3.2.1 New Urbanism.	30
3.2.2 Principles of New Urbanism.	32
3.3 STREET AND THE PLAZZA IN THE URBAN ENVIRONMENT	34
3.3.1 The Street.	34
3.3.2 The Plaza	39
3.4 BIOPHILIA AND THE URBAN ENVIRONMENT	41
3.4.1 The Importance and Access to Green Spaces	41
3.5 CONCLUSION.	44
CHAPTER FOUR	46
THE IMPACT OF THE MICRO CONTEXT ON SOCIAL INTERACTION AND WELL- BEING	46

4.0 INTRODUCTION.	46
4.1 SICK BUILDING SYNDROME.	50
4.1.1 Sick Building Syndrome Defined	50
4.1.2 Symptoms of Sick Building Syndrome	50
4.1.3 Causes of Sick Building Syndrome.	51
4.1.3.1 Thermal Comfort and Ventilation Systems	51
4.1.3.2 Causes and Effects of Volatile Organic Compounds (VOC'S) .	52
4.1.3.3 The Effects of Lighting	53
4.1.3.4 The Impact of Technological Induced Design	53
4.2 BIOPHILIA IN ARCHITECTURAL DESIGN.	64
4.2.1 DYNAMIC NATURAL LIGHT.	64
4.2.1.1 Architecture as a Tool for Day Lighting Strategies	66
4.2.1.2 Solar Shading	69
4.2.2 NATURAL VENTILATION	70
4.2.3 WATER	74
4.2.3.1 Water and Its Impact on Well-being	74
4.2.4 PLANTS.	75
4.2.4.1 Plants as an Architectural Tool for Well-being	78
4.2.4.2 Green Roofs	78
4.2.4.3 Vertical Gardens	79
4.3 FREQUENT OPPURTUNITIES FOR SPONTANEOUS INTERACTION WITH NATURE.	80
4.4 BUILDING MATERIALS AND FINISHES FOR WELL-BEING.	81
4.4.1 Importance of Building Materials	81
4.4.2 Materials and their relationship to Well-being	83
4.4.3 Building Finishes: Impact of Colour on Well-being	85
4.4.3.1 Application of Colour and its Effects.	85
4.4.3.2 Analysis of the Dominant Hues.	87
4.4.3.3 The impact of Colour in the Interior Environment.	89

4.5	ARCHITECTURE AS A TOOL FOR SOCIAL INTERACTION	90
4.5.1	Sociopetal and Sociofugal Layouts	90
4.5.2	Opportunities for Social Interaction	90
4.5.2.1	Balconies, Patios and Roof Gardens	91
4.5.2.2	Atriums and Courtyards.	93
4.5.2.3	Staircases.	93
4.6	CONCLUSION.	94
CHAPTER FIVE		98
KEY PRECEDENT STUDY		98
5.1	INTRODUCTION.	98
5.2	MICRO CONTEXT: GENZYME CENTER IN CAMBRIDGE.	98
5.2.1	Location and Purpose.	98
5.2.2	Concept and General Layout	99
5.2.3	Biophilic Elements	100
5.2.3.1	Natural Lighting	101
5.2.3.2	Ventilation	103
5.2.3.3	Planting	104
5.2.3.4	Water and Water features.	105
5.2.4	Building Materials.	105
5.2.5	Spaces for Social Interaction	105
5.3	CONCLUSION.	107
CHAPTER SIX		108
CASE STUDIES		108
6.1	INTRODUCTION.	108
6.2	MACRO CONTEXT: MELROSE ARCH (JOHANNESBURG, GAUTENG)	109
6.2.1	Justification.	109
6.2.2	Location and Concept	109
6.2.3	Analysis and Discussion	110
6.2.4	Principles of New Urbanism	111
6.2.5	Social Interaction: The Street and Public Spaces.	112
6.2.6	Biophilic Elements	114
6.2.6.1	Water and Water Features	114
6.2.6.2	Landscaping and Planting	115
6.2.7	Image of the Environment: Identification and Orientation.	117

6.3 MICRO CONTEXT: MUNICH REINSURANCE CENTRE (GAUTENG)	118
6.3.1 Justification	118
6.3.2 Location and Concept	118
6.3.3 General Layout	119
6.3.4 Biophilic Elements	119
6.3.4.1 Dynamic Natural Light	120
6.3.4.2 Natural Ventilation	121
6.3.4.3 Water	121
6.3.4.4 Planting	122
6.3.5 Materials and Colours	123
6.3.6 Spaces for Social Interaction	125
6.4 CONCLUSION	127
 CHAPTER SEVEN	128
ANALYSIS AND DISCUSSION	128
7.1 INTRODUCTION	128
7.2 ANALYSIS OF RESULTS	128
7.2.1 Social Interaction	128
7.2.1.1 Macro Context Analysis	128
7.2.2 Well-being	131
7.2.2.1 Macro Context Analysis	131
7.2.2.2 Micro Context Analysis	131
7.2.2.3 Architects Response and Analysis	135
7.3 CONCLUSION	138
 CHAPTER EIGHT	141
RECOMMENDATIONS AND FINAL CONCLUSION	141
REFERENCES	157
LIST OF FIGURES	165
LIST OF TABLES	172
 APPENDIX 1: PRECEDENT STUDY: ELPHICK PROO`ME ARCHITECTS STUDIO	173
 APPENDIX 2: PROFFESIONAL SURVEY / QUESTIONAIRRE	179

APPENDIX 3: ARCHITECTURAL TOOLS FOR WELL-BEING.	184
3.1 DAY LIGHTING TOOLS FOR ARCHITECTURE.	184
3.1.1 Side Lighting	184
3.1.2 Single, Bilateral and Multilateral Lighting	184
3.1.3 Clerestory Lighting	184
3.1.4 Light Shelves.	184
3.1.5 Top Lighting.	185
3.1.6 Skylight System.	185
3.1.7 Courtyards.	186
3.1.8 Light Wells.	186
3.1.9 Atriums.	186
3.2 SHADING DEVICES: HORIZONTAL AND VERTICAL LOUVRES	186
3.3 VENTILATION TOOLS FOR ARCHITECTURE.	187
3.3.1 Wind Variation-Induced Single-Sided Ventilation.	187
3.3.2 Wind Driven Cross Ventilation.	188
3.3.3 Buoyancy Pressure – Driven Stack Ventilation.	189
3.3.4 Wind Scoops.	190
3.3.5 Double Facades.	190
3.3.6 Chimneys.	191
3.3.7 Wind Towers	191
3.3.8 Atriums	191
3.3.9 Ventilation Openings in the Facade.	192

PART ONE

CHAPTER ONE

1.1 INTRODUCTION

1.1.1 Background Statement

Present day life is filled with a variety of stresses such as; environmental stresses (traffic, air pollution, crowding, noise etc), family pressures (relationship complications, financial problems, children and family demands etc), internal stress (perfectionism, unrealistic expectations etc), work stress (meeting deadlines, demands of job, uncomfortable workplace environments etc). All these stresses create a demanding lifestyle, although stress is not always bad. In small amounts it can help you perform under pressure and motivate you to do your best. However when you are constantly running in emergency mode, your mind, body, health and overall well-being pay the price. Eventually stress can take the better part of you, both mentally and physically and start affecting your health as chronic stress disrupts every system in your body (www.helpguide.org).

Currently the internet and social media encourage more and more digital and virtual interactions. Can the role of an architectural building have an alternative place in contributing to or detracting from the way humans interact with each other? In the discipline of architecture this is a very interesting topic, especially when looking back at the history of different civilizations and the role architecture had in creating opportunities for social interaction to take place. A specific example of this is the effect the Agora as an ancient Greek gathering place had on the dynamics of how people interacted with one another. Just like the internet and the social media such as Facebook make people more present in the minds of so many more people than ever before. The researcher thinks that architecture can create more opportunities for social interaction amongst people to enliven social bonds, create a sense of a community and dramatically improve the spirit of the place and the experience in architectural environments.

Urban environments and buildings need to be designed to encourage a certain level of social connectivity, through social interaction and engagement. By doing so it creates and builds social relationships and reduces the stress levels allowing individuals to relax and socialise, taking a break from their fast paced lifestyles (Reynolds and Kaplan 1990, p. 101-110).

The design of a single space as a whole (the relationship between the building and the built environment) has the ability to change life, reasoning ability, state of mind of its users and it is therefore important to implicate design methods which produce positive architectural environments which will in turn encourage social interaction and well-being.

1.1.2 Justification of the Study

There is a need for architectural environments to be created that enhance the well-being of people and give them the opportunity to interact with one another. The amount of additional stress the architectural environment places on one is not necessary and can be avoided to create a far more healthy, enjoyable environment that promotes happiness, productivity, self-esteem, mobility and well-being.

1.2 EXPLORING AND DEFINING THE PROBLEM, AIMS AND OBJECTIVES

1.2.1 Defining the Research Problem

A poorly designed built environment affects the well-being of people and places a considerable amount of stress upon the users. According to Day (2002, p. 7), “*Stress breeds illness*”, the environment therefore has the ability to create stress in a number of ways just as well as it has the potential to reduce it. The spirit of a particular place is fed by the attitudes and the many actions of the people responsible for the built environment (Day 2002, p. 7).

This dissertation will explore both the positive and negative impacts that the macro and the micro context has on the well-being and social interaction of the individuals in the architectural environment. Emphasis will be placed on how architects, designers and urban designers can create architectural environments that enhance well-being and social interaction through design. It will further discuss the benefits that these architectural environments can have on the individuals that use them.

“Nourishing or ugly surroundings affect us. Nature-formed places may be harsh, inhospitable, frightening. But never dishonest, aggressively ugly or humanity-devaluing. It’s what we have done to them that brings these qualities” (Day 2002, p. 119).

1.2.2 The Aims of the Study

This study aims at: Investigating the benefits of a more appropriate approach to the architectural environment that views architecture as a leader in social interaction, as well as creating architectural environments through design, that enhances well-being regardless of the various cultures and their backgrounds.

1.2.3 The Objectives of the Study

The intended **objectives** of the research are as follows:

- To establish the definition of well-being and what are the effects of stress from a macro to a micro level and how can one combat this to produce architectural environments that promote well-being and social interaction.
- To study the appropriate theories, concepts and existing architectural projects which will reflect how social interaction and well-being has been applied, achieved and expressed in the built environment.
- To acquire such knowledge to enable appropriate guidelines to be established for designing architectural environments that enhance well-being and give people the opportunity to interact with one another.
- To create awareness to architects and designers of the architectural environment and the impact they have in design on the well-being and social interaction needs of their users.

1.3 SETTING OUT THE SCOPE OF THE CHOSEN STUDY

1.3.1 Delineating the Research Problem

This dissertation primarily deals with the stressors in the urban environment such as urban sprawl, lack of public spaces, green areas, quality of the street, vehicle dominated contexts and lack of pedestrian friendly environments in the macro context. In the micro context the increase in Sick Building Syndrome and artificial environments as well as the inadequate design of buildings and spaces, choices of colours and materials and how the individuals

well-being and opportunities to socially interact are affected by these stressors. It will not focus on removing all stress from one's life but rather removing the possible stress brought about from poorly designed built environments through architectural interventions with the aim of producing healthy environments that enhance well-being and social interaction.

Well-being will be discussed in much greater detail than social interaction. Primarily because social interaction does not successfully occur if the well-being needs are compromised. Therefore creating an understanding of the well-being needs in an architectural environment is of utmost importance when considering the design for opportunities for social interaction.

Further the dissertation endeavours to highlight the destructive qualities that affect well-being and social interaction on both a macro and micro context in the architectural environment. It emphasizes the importance of creating architectural environments that enhance social interaction and well-being. The research will investigate the benefits and design tools of a more appropriate approach to the architectural environment that enhances social interaction and the well-being of building occupants through good architectural design.

1.3.2 Definition of Key Terms

Terms used within this dissertation are defined below:

- **Architectural Environments** - *Everything that exists both natural and man-made in a particular area that surrounds and influences the built form.*
- **Built Environment** - *This refers to the human made surroundings that provide the setting for human activity, experience and use. Usually refers to buildings that are designed for a purpose by an architect and its surroundings (www.wikipedia.com).*
- **Genius Loci or sense of place** - *Creating a place that has distinct character in the micro and macro context, the atmosphere of a place (Schulz 1979, p.5).*
- **LEED** - *The Leadership in Energy and Environmental Design (LEED) Green Building Rating System is an independent certification program that provides voluntary guidelines for developing high performance, sustainable buildings. Created*

by the U.S. Green Building Council (USGBC), the program awards varying levels of certification to buildings that meet LEED rating standards in five major categories: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. A LEED rating of Certified (45 points), Silver (60 points), Gold (75 points), or Platinum (90 points), is based on the number of points; a building accumulates in the 136 point system (<http://www.ecomii.com/ecopedia/leed>).

- **Macro Context** - A large scope of a specific area which includes many buildings and their surrounding environment (Dictionary.com).
- **Micro Context** - Is a smaller scale of focus, relating to the building's exterior and interior details. (Dictionary.com)
- **Multi-Use-Facility** – Is a building that has a variety of functions. In this case the Multi-Use-Facility will incorporate retail, business and residential as its primary functions.
- **Sick Building Syndrome** - An illness affecting workers in buildings characterized by eye and nose irritation, runny or stuffy nose, fatigue, headache, nausea, sore throat, general respiratory problems and thought to be caused by indoor pollutants, microorganisms, or inadequate ventilation (London Hazards Centre, 1990:1-90).
- **Social Interaction** - When one human being encounters another and engages in a conversation.
- **Stress** - refers to the process that is not only specific, but also central to the relationship between people and their surroundings. It is the process by which environmental events or forces, called stressors, threaten an organism's existence and well-being and by which the organism responds to this threat. (Evans,1982)
- **Stressor** - an event, experience, etc, that causes stress e.g. a poorly designed building (www.dictionary.com).

- **Well-being** - *A good or satisfactory condition of existence; a state characterized by health, happiness, and prosperity; welfare (www.dictionary.com).*
- **Designers** – *In the context of this dissertation designers are referred to those other than architects who are also responsible for the built environment. Such designers might be technicians, draughtsman as well as the clients who have an input in the outcome of the final product.*

1.3.3 Stating the Assumptions

The primary assumption to be made is that the architectural environment influences people. Its effects are physical, emotional and spiritual and are experienced by all building users. It is also assumed that many cities and buildings are not contributing to the well-being of their inhabitants and are not creating enough opportunities for people to interact with one another due to poor design.

1.3.4 The Working Hypothesis

Those responsible for the built environment need to understand the impact that they have on the users of the architectural environment to enable them to successfully create spaces that enhance social interaction and well-being.

Humans are constantly placed under huge demands and an abundance of stresses in the urban environment. It is important for the healthy functioning and well-being of the physical body that humans are at peace mentally. Approaching the built environment with a focus on creating environments that have a positive impact on human well-being and creating opportunities for people to interact with one another will convert architectural environments into spaces that have physical and psychological benefits for the users. These benefits can promote well-being, a sense of place within the user, encourage productivity and provide a meaningful journey and experience through architectural environments in both a macro and a micro context regardless of culture and age.

1.3.5 Key Questions

- How can the well-being of an individual and social interaction be achieved through architectural and urban design in the built environment from both a macro and a micro perspective?
- What is the well-being of individuals and is the current urban environment ensuring this?
- In the existing urban environment does the architecture benefit the inhabitants?
- Is there a way of reversing the negative effects caused by environmental stressors through good architectural design and how?
- What impact does the architectural environment have on social interaction as well as the well-being of the user?
- What are the physical and psychological benefits of using architecture as a tool for social interaction and human well-being?

1.4 CONCEPTS AND THEORIES

Numerous concepts and theories have been identified as foundational to this research topic. They will provide the framework for the literature review as well as the research plan. The concepts and theories mentioned below will help create architectural environments that enhance well-being and social interaction through architectural design.

1.4.1 Biophilia

Biophilia considers the relationship between humans and their natural and built environments and is the theory that forms the basis of Biophilic design. Such an approach in design can create built environments that restore and maintain human health, well-being, reduce stress, increase concentration, productivity and enhance learning. By introducing Biophilia within architecture one can allow people opportunities to interact with nature, whether it is being outdoors in a natural setting, or just having a view from the interior of a building. People with access to natural environments are far healthier than those that do not have access to natural environments (Sjoquist 2003, p.11-12). Biophilic design is a relevant concept to explore in light of the research topic.

The concept of Biophilia can complement architecture, the term given to this process is Biophilic design. Pollack defines Biophilic design as: “*Biophilic design recognizes the inherent human need for nature together with sustainable and universal design strategies to create environments that truly enhance life*” (Pollack 2006, p. 38).

Utilizing certain design strategies called Biophilic design attributes the process of well-being will be enhanced. The importance of Biophilia on the well-being of people as well as the role it can play in producing spaces that encourage social interaction has a great impact on architecture. Architects and designers need to create environments that connect the building and the occupants that use it to nature and its many benefits in a variety of ways (Pollack 2006, p. 38).

1.4.2 Kevin Lynch’s Theory: Image of the City

Schulz (1980) in his book “*Towards a Phenomenology of Architecture*”, makes the reader aware of being able to orientate oneself around a place and through space as well as being able to identify with it. Space and place cannot be experienced as meaningful if one cannot orientate and identify it. Lynch's theory discusses the importance of the environmental image to identify and orientate oneself within a particular environment. It further introduces 5 key elements that create guidelines for architects and urban designers in creating environments that are easy to identify and orientate oneself within. These five elements are paths, edges, districts, nodes and landmarks (Lynch 1960, p. 47-48).

Lynch (1960) expresses that the image of the environment is always experienced in relation to its surrounding context and the sequences of events that lead up to this perceptual image, as well as the images of past experiences within a particular environment (Lynch 1960, p. 1-2).

These 5 design elements are fundamental in creating an environmental image that is legible. By combining these elements together they can reinforce one another and enhance a journey through the city. This theory provides architects and urban designers with design guidelines in creating environments that humans can recognize and orientate themselves within any given urban environment, as well as enhancing the journey through the city and celebrating spaces in the form of nodes which encourages social interaction.

A good environmental image gives the viewer an important sense of emotional security and also heightens the potential depth of human experience. A lack of legibility in an environment such as in the city gives rise to disorientation and can bring about fear and stress to the viewer (Lynch 1960, p. 2-6). It is therefore important to create environments that allow for individuals to experience the city in a meaningful way, thereby creating legible environments that one can identify and orientate within by making use of Lynch's five elements. Architectural environments that are legible, conducive to orientation and identification positively impact on the well-being of individuals experiencing it. This further allows individuals to enjoy the experience within the architectural environment which in turn encourages social interaction.

1.4.3 New Urbanism

New Urbanism began in the 1980's as a revolt against urban sprawl and the modernist planning methods and building approach. New Urbanism has a charter which consists of 27 principles which create guidelines for constructing environments that follow these principles.

“The automobile was, and remains, the agent of chaos, the breaker of the city” (Katz 1994, p. 222).

New Urbanistic environments create a higher quality of life, ideal places to live, work and play. Less traffic congestion and driving creates a healthier lifestyle with more walking and less stress with the availability of and proximity to everyday working opportunities, retail and services. Most importantly New Urbanism strives to create communities by creating pedestrian friendly environments; this gives people more opportunities to get to know others that can result in meaningful relationships with more people creating a friendlier environment. This has a positive impact on human well-being. New Urbanism can revitalize city centres that are sick and can bring life back to the heart of the city creating a sense of place worth living for. Currently many cities all over the world are confronting the problems of sprawl, traffic jams, environmental degradation and sheer ugliness. These environments are dangerous, cause stress and place the well-being of individuals at risk. Through architecture and urban design as demonstrated by New Urbanism one can revitalise these environments and transform them into places that marvel with beauty and bring life back to

the city, creating an experience for the user that is healthy and creates opportunities for social interaction.

“The sum of human happiness increases because of New Urbanism” (Duany 2003).

1.5 RESEARCH METHODS AND MATERIALS

This dissertation will explore two forms of study, empirical and non-empirical study. The empirical study will explore the use of primary data in the form of case studies, surveys, questionnaires and text data. The non-empirical approach will deal with secondary data in the review of literature. This section deals with the research methods and materials that the researcher will use to require the knowledge to inform this dissertation and make it possible.

1.5.1 Research Methods:

For the purpose of this dissertation a combination of both primary and secondary sources are required to obtain the relevant information.

Primary data collection allows the researcher to test the validity of the hypothesis. This testing therefore involves the comparison and the evaluation of data obtained from both primary and secondary sources to obtain a final analysis of the data collected.

Secondary research methods help the researcher obtain important knowledge on the topic. This knowledge helps establish a general understanding around the key research questions and provides information that can determine the outcome of the hypothesis.

Once the researcher has completed the collection of information through secondary sources, he has to decide the kind of data collection method to use. This could possibly be done by numerous ways such as an observation, questionnaire, interview, survey, scales or journals. The type of data collection method depends on what type of data is required for a particular research problem. In addition, the answers that are being sought will decide what type of analysis is needed. Due to the nature of the topic the research is to be qualitative rather than quantitative. However, the methods employed must have neutrality: the researcher does not set out to prove a particular viewpoint or manipulate data to get an outcome. The key is to ask

relevant questions to meet the aims and objectives of the dissertation (Neale 2009, p. 121-136).

1.5.2 Research Materials:

1.5.2.1 Primary Research

The primary research methods include:

- **Case Studies:** The Case Studies are selected as they are real life examples of what the concepts and theories mentioned in this document are capable of producing. They further reflect the positive impact both architects and urban designers can have on the people that use these spaces, as well as enhancing both social interaction and well-being in architectural environments. These studies involve visiting the site or building, photographing and critically assessing buildings or spaces relevant to this study through the methods explained below. Drawings are to be obtained and analysed with conclusions being supported by personally produced graphic and photographic data.
- **Questionnaires:** Questionnaires are the formal method employed to carry out surveys. Questions may vary from specific to a broader context. The questionnaires will be distributed to various trained professionals through email. The contents and findings of this questionnaire will be discussed in detail in chapter 7 under analysis and discussion and to aid in creating a final conclusion to the dissertation.
- **Still Photography:** This will be used to capture single events and events over time for the purposes of supporting or dispelling assumptions / theories.
- **Observation:** To critically analyse the selected case studies at their respective sites.

1.5.2.2 Secondary Research

Secondary information forms the foundation for the research on social interaction and well-being in architecture. This information is found through research obtained from a literature review of the existing body of knowledge, in the form of:

- **Books:** These provide historical and theoretical information used to make sense of the recent data in journals and books.
- **Journals:** These provide recent data, knowledge and discussion relating to the topic.
- **Newspapers:** These provide recent data, knowledge and discussion relating to the topic.
- **Electronic resources** (e-books, e-journals, articles): The internet provides access to current papers from around the world otherwise unattainable in the traditional library.

A critical analysis of this literature provides the framework and criteria by which case studies and precedent studies are to be analysed. Precedent studies fall under secondary research. For the purpose of this dissertation a number of both international and local architectural environments and buildings are identified as relevant to the subject matter and are analysed through photographs, architectural drawings as well as text media. The studies of the various precedents is to provide the researcher with practical insight into the existing theories on social interaction and human well-being as an architectural design tool as they can be seen in the built environment.

The primary (empirical) data and the secondary (non-empirical) data will be obtained from this research document. These data sources are combined together to come up with valuable conclusions and analysis with the intension of informing the design of a Multi-Use-Facility for Durban.

1.6 CONTRIBUTION TO KNOWLEDGE

The purpose of this dissertation is to contribute towards the body of literature regarding social interaction and well-being in architectural environments as well as using architecture to create environments that enhance both social interaction and well-being. A contribution is to be made regarding the benefits of architectural environments that enhance well-being and social interaction. A further contribution is also made to how designers can address social isolation and the many architectural stressors that negatively impact on the user's well-being through comprehensive, responsible and sustainable architectural design.

The study is to further contribute towards an understanding of how the architectural environment has an impact on the well-being of a user as well as social interaction. A new approach to the design of architectural environments from both a macro and micro perspective is to be explored. This will show how the well-being of users and creating places for social interaction can be implemented into the design process to enhance the overall experience of architectural environments.

1.7 CONCLUSION

Architecture is the art and science of building. It exists all over the world, to all different cultures with its primary purpose to shelter people from different extremes of weather. It is the built up environment that one experiences every day. It defines space as well as confining it. Architecture creates interesting as well as incompetent spaces. It is these spaces that are created for the sole purpose of the building user. Architecture is one of the first professions. A life without architecture would be no life at all. It is architecture that contributes to human existence. However, architecture can have both negative and positive effects on the user. Architecture should be meaningful and strive to capture the spirit of the place where people live. It should create interesting spaces where people can interact. It should enhance the everyday experience of the user's life and should, most importantly, be designed for the people who are using the building. The buildings' very functioning is critical.

However, the majority of the modern built environment is inadequately designed and managed and constant exposure to poorly designed spaces produces stress and illness which are the symptoms of the Sick Building Syndrome (Pearson 1991, p. 68-69). The built environment also affects peoples' lives, moods, productivity, happiness, self-esteem, mobility, well-being, safety, thermal comfort and many other diverse aspects.

Designers today have the responsibility to move forward and re-establish the leadership and purpose of architecture in society. It is the architect's task to produce places that enhance the user's lifestyle. As discussed within this chapter the architectural environment places many stressors on the individual which impact on their well-being. It is important that an awareness to those responsible for the built environment is created.

According to the World Health Organization report in 1984, up to 30% of new and remodelled buildings worldwide may be linked to symptoms of Sick Building Syndrome (<http://www.epa.gov>). Further artificial environments are not encouraging user well-being. The poor selection of materials that give off harmful gases and the selection of colour all have the ability to negatively impact upon the building occupant. It is the architects and the designers of the built environment who have the responsibility of ensuring that they take all these matters into account in the design process. Failure to do so produces buildings that negatively impact on the user's well-being. Architecture needs to support the well-being needs of its users and not detract from it. The power of architecture has the opportunity to uplift its occupants and this should not be missed. Architecture should never be the source of illness or misery, but rather it should enhance the well-being of those who use it and create healthy environments for people. It is therefore important that the researcher utilizes the theories mentioned in this chapter to form the basis of a source of knowledge that can contribute to the creation of architectural environments that enhance social interaction and well-being.

Through this introductory chapter the researcher has created a clear understanding of what this dissertation is to be about. As mentioned previously, background information was given to the research topic and the related issues were discussed. The study has been contextualized and motivation has been given for its value. The research problem is defined and the aims and objectives of the study have been clearly stated. The key assumptions of the research have been stated and the limitations of the proposal described. The key terms have been defined as well as the key questions to which the remaining chapters will answer. The hypothesis has been formulated which will guide the literature in the following chapters. The theoretical framework has been outlined as well as the qualitative research approach that will guide this dissertation.

The research presented here is grounded on the fundamental concepts and theories discussed and strives to draw closer to answering the key questions posed. In doing so it is anticipated that one will gain insight into an approach to the architectural environment that views architecture as a tool for social interaction and well-being. Furthermore, it is expected that the following literature will reveal how this approach can benefit the design of human spaces by enhancing their experience of space and the ability to interact and create architectural environments that enhance the well-being of the user.

2.0 CHAPTER TWO: HUMAN WELL-BEING AND ITS EFFECTS

2.1 INTRODUCTION

Central to an architectural environments success on both a macro and a micro level is its impact on people, individually or collectively. At the individual level, a highly effective architectural environment is one that has positive impacts on well-being. On a macro level architecture has an impact and affects the well-being of individuals at the level of urban design and the immediate built environment. At the micro level this includes the individual building in its entirety, both internally and externally and this is where the architects have the responsibility of taking into account the well-being of the user.

In order for one to understand the impact that architecture has on the individual experiencing the architectural environment, consideration of the various characteristics that describe well-being will be explored. It is also important to understand the term stress, as it is directly related to, and has an adverse impact on human well-being. This section aims to give the reader a greater understanding of well-being, stress and its effects in order to understand how distressing the architectural environment can be, and how it can impact on well-being. This creates an awareness and attention to the designers that they create environments that essentially shape the attitudes, behaviour and contentment of the individuals experiencing it.

“The best of architecture unites us – with family, with community, with our natural environment and with that which lies beyond our mundane experience” (Day 2002, p. Preface).

2.2 WELL BEING DEFINED?

Well-being is a broad concept that encompasses all aspects of a person's life, including physical and emotional health, spiritual, finances, lifestyle, habits and job satisfaction, social relationships, experience of stress and enjoyment on a daily basis, and access to fundamentals such as healthy food, healthcare, and a safe place to live. Well-being basically means to be happy in all aspects of your life.

“A dynamic state in which the individual is able to develop their potential, work productively and creatively, build strong and positive relationships with others, and contribute to their community” (www.marshalls.co.uk).

Biologist Stephen Boyden (1971), describes two needs that define the biological foundations of well-being. These needs are survival needs and well-being needs. Survival needs deal with the aspects of the environment that directly affects and threaten human health. Examples of these needs are clean air and water, reduced amount of pathogens in the environment as well as the opportunity for people to be able to rest and sleep. However, well-being needs are more indirect in their position of impact. These needs are different and affect the overall health of a person through their relationship to fulfilment, quality of life, and psychological health.

Both the needs mentioned above have different effects on the well-being of an individual. When survival needs are not met this can have serious health implications and can lead to illness and even death in worst case scenarios. Whereas failure to meet the well-being needs affects an individual by creating stress and related illnesses.

The definitions of well-being stated above helps one to understand the term well-being in context of the built environment.

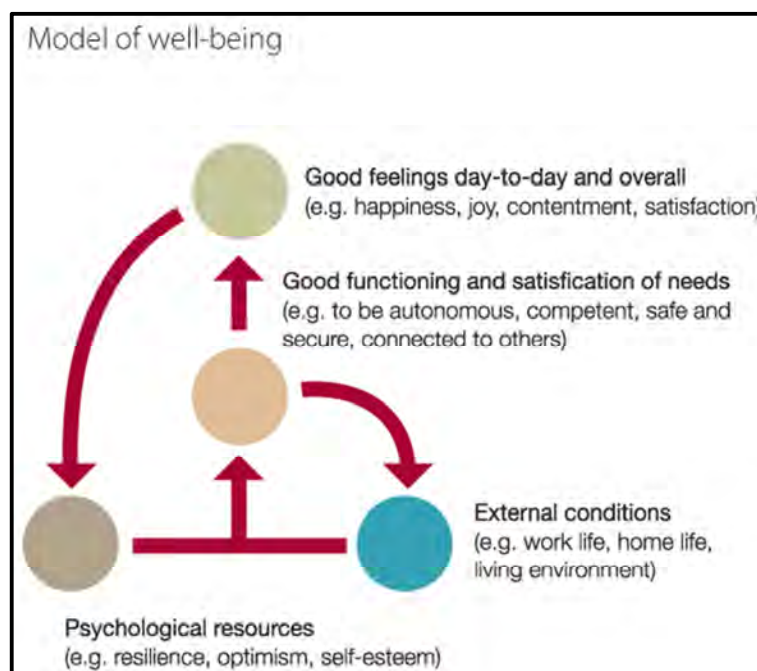


Figure 1: Model of well-being. Well-being is the dynamic interplay between all four circles.
(www.marshalls.co.uk).

2.1.2 STRESS AND ITS EFFECTS:

Stress is directly related to an individual's well-being. The architectural environment on both a macro and a micro scale has an abundant of factors that cause stress. Therefore an understanding of stress is necessary as it directly impacts upon the well-being of an individual.

“Stress has been likened to the tension on the strings of a violin. You need enough to make good music - too much and the strings will snap, too little and there will be no music” (Bryce 2001, p.3).

It is important to define stressors as they are directly linked to the definition of stress. Stress is the feeling one has when under pressure whereas stressors are the things in the environment that one responds to.

Butler (1993, p.1) describes stress as a dynamic process reflecting both internal and external factors, which are characteristic of an individual and their circumstances, as well as the interactions between them. This definition of stress involves a greater understanding of the part played by cognitive factors in psychological well-being such as thoughts, beliefs and attitudes. Lazarus and Folkmans (1984) definition of stress reflects this type of thinking. They both say that stress is *"a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being"*.

Stress plays a huge role in the well-being of the individual; it can have severe impact on the human body and can even cause death. Some of the most common disorders that are said to be stress related are high blood pressure, strokes, heart attacks, diabetes, menstrual problems, increased vulnerability and cancer, depression and anxiety (Bryce 2001, p.2).

It is evident that there is a multitude of potential stressors that exist in the environment. Each stressor has a different affect on an individual depending on how that person perceives the stressor. *“All of this is important because our lives are unquestionably shaped by towns and cities we inhabit and by the beauty or ugliness of our surroundings”* (Day 2002, p. Preface).

2.2 CONCLUSION:

Well-being and stress have been clearly defined. The relationship between well-being and stress has been shown. Currently architectural environments all around the world are a potent source of stress for many people and do impact on their well-being.

In context of this research, the stressors that have been created by environmental and architectural design will be explored, together with the stressors that exist in the architectural environment. From a macro context, urban sprawl, traffic congestion, vehicle dominated contexts, lack of social spaces, parks, green spaces, plazas and the general street quality all have the ability to create un-necessary stressors on the users. From a micro context the stressors created from insufficient ventilation and excessive or lack of natural day lighting will become evident. Further the harmful selection of materials and choice of colour all have the potential to create stress on the building user. Thermal comfort, lack of solar shading, glare, pollution in the air, artificial environments are all elements which contribute to stress in the architectural environment and may negatively affect ones well-being.

It is therefore important that architects and designers design environments that do not contribute to these stressors, but rather they create environments that enhance and encourage well-being and social interaction.

The impact these stressors have on building occupants will become evident in the chapters to follow, as well as the tools architects and urban designers may use to combat these stressors and create healthy environments that enhance both social interaction and well-being.

As this research document continues the impact that these stressors have on the users in the macro and micro architectural environments will become evident. More importantly, social interaction and well-being in architectural environments will become more apparent. Further, the tools that architects and urban designers can use to combat these stressors will become evident.

3.0 CHAPTER THREE:

THE IMPACT OF THE MACRO CONTEXT ON SOCIAL INTERACTION AND WELL-BEING:

3.0 INTRODUCTION:

The following chapter considers the architectural environment on a macro context and its effects on social interaction and well-being. It is important that architects have a general understanding of the effects built environments have on a macro scale. Although architects specialize in the design of buildings, it is fundamental that they work hand in hand with a variety of other professionals to ensure that the built environment has positive effects on the well-being of its inhabitants (Deasy 1974).

"...for whatever he builds he controls or guides human behaviour. When enlightened as to the effects of the physical environment upon behaviour, he designs by intent; but when ignorant of these effects, he designs by default" (Deasy 1974, p.12).

Many people from all over the world choose to live in cities as they can offer high levels of accessibility and convenience. However the urban environment in many cities is not a pleasant place for people to live due to increased crime, slums, squatter settlements, traffic, congestion, high levels of heat, noise pollution and a poor provision of social amenities such as green and public spaces. In some instances green spaces are provided but they are not used due to the increase in crime and the fear of safety and on the other hand green spaces are lacking in the built environment and this negatively impacts on the city inhabitant for numerous reasons. The negative aspects that many urban environments encounter give people no choice but to leave the city and seek a better quality of life in the suburbs. This results in urban sprawl. Research from Hartig (1993) suggests that this move to the suburbs can be as the direct result of people seeking contact with natural environments, rather than the harshness created by the concrete jungle of the city.

Both the street and the plaza play an important part in achieving well-being and social interaction in the urban context. However in many cities around the world the importance of these spaces for public life has been neglected. Both these spaces are important for social interaction to occur and the way in which they are designed need to consider the well-being

needs of its users. Plazas represent outdoor living rooms in the city and form an important part for social interaction to occur. Plazas are fundamental in city design as they create places where people can partake in activities and take a break from the harsh, fast paced lifestyle of the city. An urban space has the ability to create and offer exciting spaces to society, to bring people from different races, socio economic groups and cultures together and give them the opportunity to interact in a common space.

The street also plays a pivotal role in well-being by allowing people to interact. However the emphasis of pedestrian movement, experience and interaction has been increasingly overlooked. Especially, when many buildings have become skyscrapers and vehicular access has become prominent. This has resulted in pedestrian spaces that have become smaller and pushed to one side, with little emphasis on the experience of the street for pedestrians. Many streets lack good quality design, trees, seating, resting areas, urban furniture and opportunities for interaction to occur. Vehicles and buildings have become the main focus. This emphasis on economic growth and the consequence of high rises has encouraged fragmentation, loss of meaning and has impacted negatively on the people using the streets in many cities.

As the environment deteriorates due to urban sprawl and lack of identification and orientation so does the physical and mental health of an individual deteriorate. This directly affects their well-being (Jackson and Kochtitzky 2010, p. Preface). Professionals must be alert to the health benefits, including improved physical and mental health and less stress that can result in environments that are accessible, safe, well designed and focus on the importance of the well-being of the individual.

The following section discusses Urban sprawl, its characteristics and its impact on well-being and the social interaction of its inhabitants. A brief discussion on the image of the environment follows and illustrates how important identification and orientation are in the built environment in maintaining human well-being. It further endeavours to explore the theory of New Urbanism in creating environments that combat the many issues mentioned above with particular reference to combating urban sprawl. However, the main emphasis of the following section is to create awareness to both architects and urban designers on how destructive the urban environment can be on its inhabitants and how important it is to consider and design for social interaction and well-being in the built environment.

3.1 IMPACT OF CITY STRUCTURE AND IMAGE:

3.1.1 Urban sprawl and its effects:

Urban Sprawl is characterized by a number of factors such as separation of land uses, low densities, leapfrog development, strip retail development, motorcar dependant development, as well as the development on the periphery of an urban area which detracts from the city centre (Johnson 2001, p.717). Most definitions highlight sprawl as being defined by scattered, unplanned growth, commercial strip developments, increase in commuting time and distances travelled, contributing to the urban heat island affect and air pollution. It is also characterized by an increase in low density development in suburban areas (Bray, Elliott, Vaki, 2005, p. 7).

There are many cities around the world such as Las Vegas, Melbourne, Boston, Mexico City, Beijing (China) and local cities such as Johannesburg and Durban which are typical examples of urban sprawl.

Sprawl leads to people becoming reliant upon their motor cars to get to places. An increase in driving leads to vehicle emissions that contribute to air pollution and a lack of physical activity is evident (Bray, Elliott, Vaki, 2005, p. 8). Sprawl further degrades the environment and bites into natural spaces that have been left void, further contributing to a concrete jungle of roads and buildings. Due to the nature of sprawl developing on the peripheral areas of the city, a large expensive amount of infrastructure and services are needed to serve a low population which lives in these small density areas in comparison to the population which lives in the city (Torrens 2006, p. 249).

“Urban sprawl, roller-painted across the countryside, is often without form, grace, or a sense of community. Planning philosophies aimed to strike down this amorphous creature should only gladden our hearts” (Lessinger's 1962, p. 169).



Figure 2 (left): Image shows how urban sprawl is spreading in Johannesburg, South Africa. Low density development is slowly destroying the natural environments that are present (<http://amazingdata.com>).

Figure 3 (right): Shows the extent of sprawl in Southern California. The freeway networks are predominant and the lack of green space is evident. Vehicle dominated contexts and lack of public space and green space has diverse impacts on the well-being and social interaction levels of a cities inhabitants (<http://www.lasmogtown.com>).



Figure 4: Image showing the land use zoning of Durban, South Africa's CBD area. Blue represents commercial / business zoned, green represents parks and green spaces, orange representing residential and red being municipal buildings (Adapted by author from www.googleearth.com).

The way in which Durban city is zoned and designed contributes to urban sprawl. One can see the lack of social and green spaces (green). Secondly most of the city is zoned as a commercial / business zone (blue) which means that after work hours the city becomes dead. The few residential places that are left (orange) only allow for a small percentage of the population to live in these areas. One can deduce that the city of Durban does not contribute in its entirety to the well-being and social needs of its inhabitants and has caused sprawl.

3.1.2 Commuting and its impact:

"The automobile was, and remains, the agent of chaos, the breaker of the city" (Katz 1994, p. 222).

Urban sprawl contributes to the dependence of the automobile which has further implications and effects on human well-being (Bray, Elliott, Vaki, 2005, p. 8). Many built environments do not give their inhabitants opportunities for physical activity. Commuting encourages obesity, due to the many hours spent in the car daily, and the lack of physical exercise which is the direct result of this (Bray, Elliott, Vaki, 2005, p. 24). The increase in commuting can increase diabetes which can further increase the risk of blindness, heart disease and kidney failure. Research has proven that physical activity is more effective in controlling these diseases than medication itself (Jackson & Kochtitzky, 2010, p. Preface). Jackson & Kochtitzky (2010, p. 8) mention that people who partake in regular physical activity gain tremendous health benefits, which enhances their well-being.

"It is dishonest to tell our citizens to walk, jog, or bicycle when there is no safe or welcoming place to pursue these "life-saving" activities" (Jackson and Kochtitzky 2010, p. Preface).

Commuting has further consequences on human well-being. It causes many deaths and injuries on the roads due to the increased annual travel distance per person. Traffic jams, exhaust fumes, stress, and anxiety that occur while commuting affect the well-being of individuals which can contribute to an increase in blood pressure as well as road rage and



Figure 5 (left): Image depicting Johannesburg traffic in the afternoon. Many hours are spent in the motor car commuting form home to work on an everyday basis (www.cnbc.com).
Figure 6 (middle): Stress caused on a daily basis from commuting (www.247funworld.com).
Figure 7 (right): Congestion and delays can raise blood pressure and physical tension which may manifest itself as road rage. (<http://surp.tumblr.com>).

headaches (Curbow 1999). Commuting on a daily basis involves much more than covering the distance between work and home. Commuting not only takes time, but also generates financial costs, causes stress, frustration and anger and it intervenes in the relationships with people at both work and home (Frumkin 2002, p. 201-217). Daily commuting has been stated to have the most negative effects on people. Worst of all most car commuters are alone in each car, adding to congestion (Kahneman, Krueger, Schkade, Schwarz and Stone, 2004, p. 341).

“Societies that thrived in the past were integrative, emphasizing centrality, continuity and easy access. The physical and social construct of the sprawl environment is the antithesis of what has just been described, and promotes isolation” (Bray, Elliott, Vaki, 2005, p. 34).

Many people have moved away from the cities as it is not contributing to their well-being and social needs. However the move away from the cities has further contributed to the effects that urban sprawl causes. Those responsible for the architectural environment in cities together with architects and urban designers should reverse this trend and create environments that bring life back to the city.

3.1.3 Image of the City: Identification and Orientation:

Schulz (1980) in his book *“Towards a Phenomenology of Architecture”*, makes the reader aware of being able to orientate oneself around a place and through space as well as being able to identify with it. Space and place cannot be experienced as meaningful if one cannot orientate and identify it. Lynch's theory will discuss the importance of the environmental image to identify and orientate oneself within a particular environment. It further introduces 5 key elements that create guidelines for architects and urban planners in creating environments that are easily identifiable and easy to orientate one within.

Nasar (1998) affirms that the environment arises from a constant interaction between the environment and man. Cities and their parts have an ambience, a sensory essence that people can feel. People become responsive to what they can see. They seek meanings in places that they attempt to visualize. The visual quality is effective as it induces an experience and appreciation in the surroundings (Nasar 1998, p. 1).

Lynch (1960) states that the image of the environment is always experienced in relation to its surrounding context and the sequences of events that lead up to this perceptual image, as well as the images of past experiences within a particular environment. Lynch uses the word legibility when talking about the visual quality of an environmental image (Lynch 1960, p. 1-2).

Legibility plays an important part in the viewer's image of the environment. This basically means how easily the viewer is able to observe and recognize the different parts which make up a city and organize them into a clear pattern. Legibility is discussed as being crucial in the city setting. A good environmental image gives the viewer an important sense of emotional security and also heightens the potential depth of human experience. A lack of legibility in an environment such as in the city gives rise to disorientation and can bring about fear, stress and potential disaster to the viewer (Lynch 1960, p. 2-6).

According to Lynch (1960) an environmental image is constructed out of three components: identity (the recognition of urban elements as separate entities), structure (the relation of urban elements to other objects and to the observer), and meaning (its practical and emotional value to the observer) (Lynch 1960, p. 8-9).

Evans (1982 94) shares a similar view point to Lynch (1960) and says that the legibility of architectural environments is a fundamental design issue that has a direct influence on how easily people are able to orientate themselves. Evans (1982) further explains that the illegibility of an environment may induce stress by producing confusion, fear and a feeling of incompetence.

Lynch (1960) tested this theory on three different United States cities. He emphasized the importance of understanding the public's input, and conducted a series of interviews and asked questions of numerous people within the United States cities. From the experiments conducted Lynch (1960) was able to understand how people subconsciously understand the environment as well as finding out what is useful when navigating through the environment.

Lynch was able to identify with five elements that acted as visual and physical markers in the environment as a result of the experiments conducted. These five elements allow for structure by relating them to the overall environment and result in an increase in legibility of the overall environmental image, allowing the users to navigate and orientate themselves around the city environment. The five elements; paths, edges, districts, nodes and landmarks are explored in detail below:

- **Paths** are the routes along which an observer occasionally or potentially moves. These paths can be streets, walkways, transit lines, canals or railroads. They are identifiable and continuous and have a directional quality. Paths that had well know destinations had stronger identities and made the observer feel more safe and orientated along them. (Lynch 1960, p. 49-62).

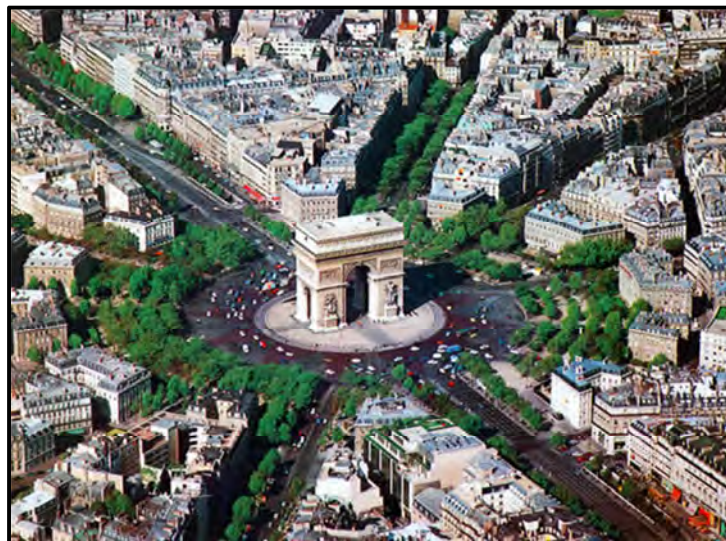


Figure 8: Paths in the form of streets and walkways converge at a node where the Arc De Triumph (Landmark) is located in Paris ([http://decortoadore.blogspot .com](http://decortoadore.blogspot.com)).

- **Edges** are boundaries or breaks in continuity, they are linear elements that are not used or considered as paths. They are the boundaries between two phases; such edges may be barriers which close one region off from another. They have directional quality and seem strongest when they are visually prominent and continuous in form (Lynch 1960, p. 62-66).



Figure 9: The Thames River in London is a prominent example of Lynch's term edge. One can clearly see the edge which separates the built environment from the water giving this edge continuity and directional quality (<http://www.bbc.co.uk>).

- **Districts** are relatively large sections of the city distinguished by some identity or character that make them different to the other districts in the city. Such examples of character or identity are: texture, space, form, detail, building type, use, activity, topography ect (Lynch 1960, p. 66-72).



Figure 10: The image clearly shows the different districts within Durban. The CBD district is characterised by tall compact buildings. The harbour district is characterised by more industrial, human scaled buildings with harbour related facilities. The beach front is considered to be another district defined by tall hotel buildings overlooking the Indian Ocean (<http://www.statssa.gov.za>).

- **Nodes** are the strategic spots in a city which an observer can enter. They are the focal points to and from where he or she is moving. A node is a centre of activity. Such examples are at intersections, places of break in transport, a crossing or convergence of paths or may be simply concentrations, which gain their importance from being the condensation of some use or physical character as a square (Lynch 1960, p. 72-78).



Figure 11: A great example of a node is the square in front of St Peters Basilica in Rome. The node acts as an important gathering point before the cathedral. With all paths leading to it (<http://www.digitalapoptosis.com/category/top10/page/3/>).

- **Landmarks** are reference points, the singling out of one element from a variety of possibilities. Landmarks can only ever be visible from the exterior; they are never identified as being internal elements in relation to the image of the environment. People do not enter inside them, they are external features. They are usually a simply defined physical object such as a sign, tower or mountain. They can be seen from a distance and at many angles. Trees, doorknobs and signs can also be seen as landmarks. They are always used for clues of identity and increasingly relied upon by the observer so that the journey becomes familiar. Landmarks are more successful when they have clear form and contrast their background. They can be very successful when placed at junctions involving path decisions. Landmarks are an important element of urban form and the environmental image because they help orient people in the city and help to identify an area (Lynch 1960, p. 78-83).



Figure 12: The Eiffel Tower in Paris is an excellent example of a landmark. It is visual references that people are able to identify with and orientate themselves through the city of Paris (<http://www.reuters.com>).

The 5 design elements mentioned above are fundamental in creating an environmental image that is legible. By combining these elements together they can reinforce one another and enhance a journey through the city. Most importantly these elements allow the user to be able to identify with the environment and be able to easily orientate oneself within the environment. The most important part of this theory is that it provides architects and urban designers with design guidelines in creating environments that humans can recognize and orientate themselves with in any given urban environment. In relation to the research topic this theory provides fundamental guidelines in creating environments that promote well-being and social interaction. When people are familiar with their surroundings and are able to orientate themselves, they are happy and are able to enjoy the experience within the environment with no added stress.

3.2 COMBATTING URBAN SPRAWL

3.2.1 New Urbanism:

New Urbanism is a revolt against the modernist planning methods encouraging sprawl and building approach. According to Jacobs and Appleyard (1987, p. 112-120) as well as many other authors and critics, they view New Urbanism as a step forward in comparison to the arrangement of buildings, streets and public spaces that Modernism produced. Hale (1994, p. 136) states *"The architects who created Modernism had continued to produce one masterpiece after another, but Modernism had not been able to produce an average street that came alive"*. However in opposition to Modernism the New Urbanists acknowledge that there is a place for the great, free standing architectural masterpiece. These are buildings of civic importance such as museums, community centres, libraries, theatres, art galleries etc but what is important is the way in which the environment is planned. New Urbanist planners produce environments that enhance the public realm in their designs regardless of the architecture of a specific building (Cliff 2002, p. 274).

New Urbanism aims at creating friendly walk able, compact, vibrant, mixed use communities that address the physical health and social well-being of its users. The principles that guide the theory of New Urbanism can help create environments that enhance the well-being of the users as well as creating more opportunities for people to interact, to enliven social bonds and create a community. New Urbanism has a strong emphasis on community and maintains this with the creation of parks, open spaces, and community gathering spaces like a square which are crucial to the well-being of the users in the urban environment (<http://www.newurbanism.org/>). Talen (1999, p. 1361-1379) states that there is one critical aspect of a community and that is giving people the opportunity to interact with one another. New Urbanism succeeds in accomplishing this (Cliff 2002, p. 278). Kelbaugh (2000, p.148) states that New Urbanism aims at creating a high level of physical quality of buildings, streets, plazas and parks that encourage social interaction among both friends and strangers, rich and poor, black and white, old and young .

"The sum of human happiness increases because of New Urbanism" (Duany, p. 2003).

Solomon (1992, p.46), further defines New Urbanism as not focusing specifically on architectural style but rather on the spatial structure of beautiful cities and towns.

Solomon (1992, p. 46) emphasizes this point as the biggest and most important, most thoroughly lost and forgotten lesson about town building in that *“buildings alone don’t matter; it is only the ensemble of streets, lots, and buildings, and the way they fit together that comprise the basis of town making”*.



Figure 13 (left): The image depicts a car orientated shopping centre in Shelly Beach, Kwa-Zulu-Natal. Access is achieved by driving as there are no residential links. The shopping centre is surrounded by a sea of parking with poor public transport (<http://www.iolproperty.co.za>).

Figure 14 (right): The image depicts a pedestrian based shopping strip in Boulder, Colorado, USA. Access is made possible by walking and driving. Public transport is well organised and accessible. There is an active main street shopping strip with the big box supermarkets allocated behind the active street (<http://hococonnect.blogspot.com>).

Figures 13 and 14 show how urban forms can contrast and the affect they can have on the public that access them. Figure 13 promotes no opportunities for social interaction and isolates the inhabitants. People making use of such a facility come there for one reason only and that is to shop. Figure 14 is a contrast as the main street forms a shopping strip that encourages the public to walk and shop along the street and this enhancing the opportunities for people to socially interact with one another. The experience is more meaningful and enjoyable as opposed to the experience one would gain in figure 13. The key element to be learned here is that architectural environments significantly affect the experience of space. It is important that buildings and the environments that they surround contribute to an enjoyable experience.

3.2.2 New Urbanism Principles:

1. Walk ability: Creating environments where walking is encouraged and mixed use facilities are close by to avoid the use of cars and to encourage physical activity which is important for the health of the users. Creating environments that are pedestrian friendly rather than vehicle dominated contexts that cause un-necessary stress in the urban environment. This further allows the users to interact and form social bonds.

"Streets are not the dividing lines within the city. They are to be the communal rooms and passages" (Katz 1994, p. xxii).



Figure 15 (left): Gallions Reach Shopping Park, Beckton, London. The figure depicts a big box shopping centre surrounded by car parking, not encouraging social interaction or a sense of a community (<http://lds.localdataimages.com>).

Figure 16 (right): The figure depicts Melrose Arch, Johannesburg, South Africa retail and restaurant environment on a street where provisions are made for both vehicles and the pedestrian. The environment is open air, vibrant and attractive with active streets. This type of atmosphere belongs to the community and encourages social interaction (www.gautengcc.co.za).

2. Connectivity: High quality pedestrian network and public realm that encourages walking and makes it a pleasurable experience. A simple interconnected grid system which disperses traffic by providing a variety of pedestrian and vehicular routes to any destination.

3. Mixed-Use & Diversity: Creating architecture that encourages a mixed use of functions such as shops, offices, apartments and public facilities that encourage a diversity of people, of ages, income levels, cultures, and races. Mixed use environments encourage a more vibrant environment that enhances interaction and creates safer environments for the user as the buildings are occupied on a twenty four hour basis with eyes on the street.

4. Mixed Housing: A range of types, sizes and prices in closer proximity that allow for a diversity of users as well as different socio economic classes to be able to live in the same environment.

5. Quality Architecture & Urban Design: Beautiful architectural style to be human scaled, to encourage human comfort and create a sense of place. The strategic placement of public facilities and public spaces to allow for ease of accessibility to the wider community. Architectural environments that are of human scale, vibrant and pedestrian friendly nourish the human spirit which is importance for the well-being of the individuals.

6. Traditional Neighbourhood Structure: Creating environments that have a definite public space at the centre with dissemble edges. This central space is usually a square or a park. The buildings are to contain a variety of uses and densities and are to be in close walking distance to the rest of the community.

7. Increased Density: Buildings, places of residence, shops and offices to be close together to create a more efficient use of services and resources as well as for ease of walking. Increased densities of buildings and functions allow for a more convenient, enjoyable place to live as everything is easily accessible and available to the users and occupants.

8. Smart Transportation: The streets created are relatively narrow and are shaded by rows of trees. This slows traffic down and creates an environment that is far more conducive for pedestrians and bicycles. In some instances parkings are made available parallel to the streets to create a buffer for the pedestrians from the cars. A pedestrian friendly environment is created to encourage a greater amount of people to use walking as a form of transport which has positive impacts on peoples overall health. It also allows for social interaction to occur and for one to experience the spirit of the place in which they work and live.

9. Sustainability: Sustainability is taken seriously; new developments are to have minimal impact on the environment and a respect for nature. Materials and resources that are energy efficient and are less harmful to the environment. Creating environments that encourage people to walk more and drive less.

10. Quality of Life: The preceding principles that New Urbanism adheres to when combined together create a synergy that produces architectural environments that offer a high quality of life, well worth living for, and create environments that enrich, uplift and inspire the human

spirit. All these elements are important in the well-being of an individual (<http://www.newurbanism.org/>).

3.3 STREET AND THE PLAZZA IN THE URBAN ENVIRONMENT

3.3.1 The Street

Many streets that exist in built environments all over the world are not contributing to the well-being and social interaction needs of their inhabitants. An example of these streets exist in Chicago, Illinois I (figure 17) and in Durban, South Africa (figure 18, 19).



Figure 17 (left): Chicago's Dan Ryan Expressway looking north. Freeways split neighbourhoods and make walking for pleasure difficult; the street for pedestrian movement has not been considered (www.ens-newswire.com).

Figure 18 (top right): A typical image portraying one of Durban, South Africa's poor street experiences with vehicle dominated contexts, lack of trees, urban furniture and activity create a harsh environment for the person experiencing the street (Author 2012).

Figure 19 (bottom right): A typical image showing an example of the poor street frontage that exists within the average streets of Durban, South Africa. Roller shutter doors create an unpleasant experience and do not encourage street life vibrancy (Author 2012).

Many cities around the world sprawl into forests and farmlands with widening of roadways, but no sidewalks or bicycle routes. With many areas dedicated to tarmac parking areas and

treeless streets. These cities encourage the motor car while impacting the well-being of the pedestrian experiencing the street. Poorly designed neighbourhoods, buildings, roads and sidewalks (figure 19) do not foster well-being or social interaction (www.ens-newswire.com).

“The simple social intercourse created when people rub shoulders in public is one of the most essential kinds of social “glue” in society” (Alexander 1977, p. 489).

The street as described by Mumford (1961, p. 74) is an urban phenomenon which is open and serves as a means of articulated pedestrian circulation. Kelbaugh (2008, p. 187) argues that this articulation is achieved by sidewalks, trees, architectural codes that determine the building frontage whereby the space of the street is perceived as a “figural public space or outdoor room” (Kelbaugh *et al*, 2008, p. 187). Gehl (1987, p. 59) refers to the street as “life between buildings”, the setting for formal and informal economic activity and social interaction on many levels. Both urban and architectural forms can have a direct impact on the psychological and social well-being of humans. Woodcock (1988, p. viii) refers to the street as an urban living room that is bounded by buildings.



Figure 20: Times Square New York is a busy vibrant street that accommodates spaces for rest and social interaction for the people that use it. Movable chairs and places to break from the busy street life enhance ones well-being and allows people to interact and take a break from their fast paced lifestyles (<http://www.streetsblog.org>).

The way in which these buildings present themselves to the street in terms of scale, size, choice of materials, setbacks, and so on plays a huge role in the impact that they have on

people experiencing the street. Buildings can either impact negatively on one's well-being and feel very imposing, heavy and uninviting, or conversely buildings can also create positive impacts on well-being. They can relate to the street and enhance it by creating human scale, creating a setback which gives the street interest and spaces for social interaction to occur. It is fundamental that architects consider the important role that their buildings have on the street and how through architecture they can enhance the experience of the street and encourage social interaction to occur. The urban environment is perceived as the stage of public life and architecture is seen as the backstage of public life. It is the street that connects these two realms together with the people that use them. According to Gehl (1987, p. 65) people only experience the ground floor of buildings, the pavement and what is happening in the street itself, therefore it is important that particular attention is given in the design of the ground floor and the spaces it creates.

Architectural forms have an impact on spatial relations and therefore they have an impact on the way people relate themselves to and experience their surroundings. Whether far apart or closely packed, buildings define urban space and the street and they are therefore the walls of the urban living room (Woodcock 1988, p. viii).

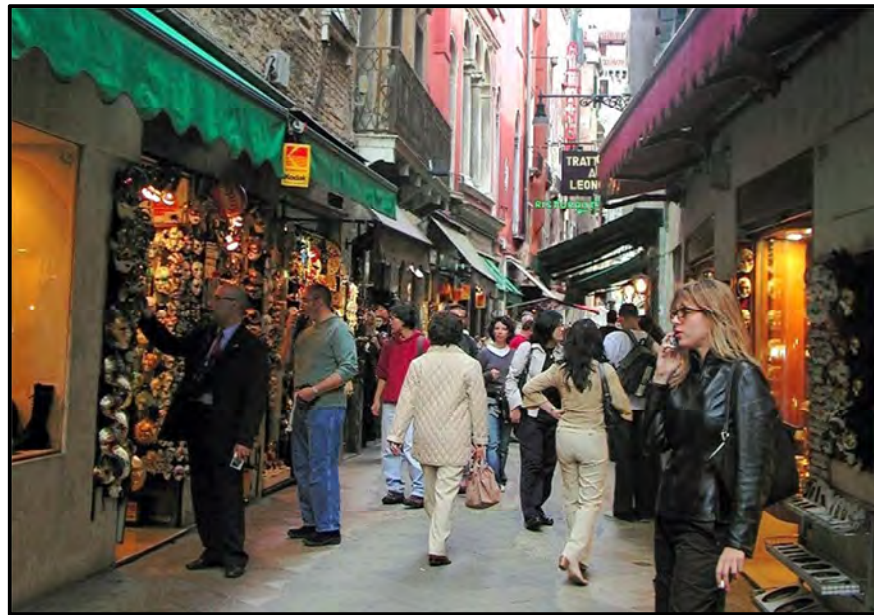


Figure 21: A typical street in Venice, Italy as a tight corridor, articulated by exterior of buildings creates a contrast in experience to that in figure 21(www.sights-and-culture.com).



Figure 22: The Street as an open corridor, articulated by exterior of buildings, landscaping, seating areas and roads for vehicles. The Champs Elysees, Paris is a great example of how it is possible to accommodate the pedestrian and create an environment that enhances well-being. The pedestrian streets are wide to encourage movement. Resting areas such as stalls and seating areas that encourage social interaction, relaxation and breaks which enhance ones well-being are numerous. This famous street successfully co exists with the use of cars and is lined with trees to create human scale and provide shade for the users on hot days. One can see that the height of the buildings is limited to create a dynamic, vibrant, safe and socially interactive environment (<http://hugeasscity.com>).

As an example imagine a building in the city centre, which has a blank wall facing a lively street (refer to figure 24). The blank wall forms a physical, visual and psychological barrier from the inside to the outside. This has a negative impact on any social interaction and environmental connection between those inside and outside the building. Further the wall separates one from their environment and its significant form is suggestive of a “*declaration of distrust of the city and its streets and the undesirables who might be on them*” (Whyte 1988, p. 222). Psychology of space is an important factor in the success of social interaction on the street as well as for the well-being of its users, as in this case it serves to break the continuity that is so vital for the rest of the street (Whyte 1988, p. 226).



Figure 23 (left): The museum of fine arts in Houston Texas has a massive blank wall that faces onto the street. This clearly indicates the lost opportunity of the space and where there could be life there is void. The trees are also planted away from the pavement not serving any purpose. This space has a huge affect on the ability for people to interact as well as impacting upon their well-being. (<http://www.neohouston.com/2011/02/liner-buildings/>).

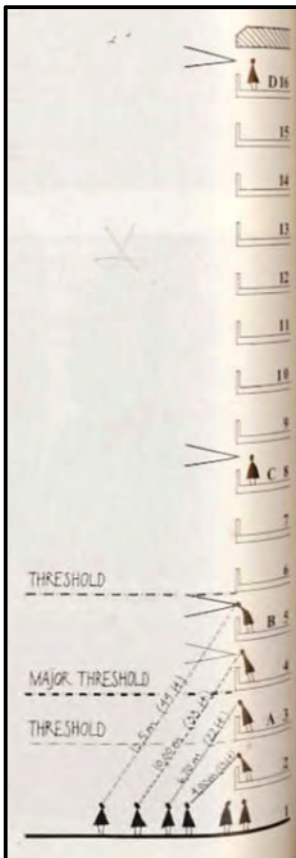


Figure 24 (right): The AT&T Long Lines Building in Manhattan, New York has a 550 feet sheer wall which encourages no pedestrian interaction on ground level and has severe physiological impacts on both the people walking past the building and within it. (<http://www.flickr.com/photos/>).

As mentioned earlier buildings should create human scale so that people using the street can relate and feel comfortable. Both Alexander and Gehl note that any building up to five storeys high has a significant positive impact on the life of the street at ground level, as it allows for surveillance and interaction between building and street. Their studies show that the fifth floor is the threshold floor. Thereafter levels leave people out of touch with ground events (Gehl 1987, p. 100).

Figure 25: Isolation and human scale threshold (Gehl 1987, p. 25).

3.3.2 THE PLAZA AND PUBLIC SPACES

Public spaces should be extensions of the community. They are the front porches of public buildings, museums, libraries, art galleries, community centres, theatres etc.

Outdoor spaces are streets, parks and plazas in front of public buildings. These spaces are significant and symbolic features in a city. They reflect the cultural, social, political and historical aspects and attributes of a city. They are a meeting place in the city where various cultures can come together. All people with access to that particular outdoor public space are free to gather and relax in that space, to build and strengthen social bonds and experience diversity and create a community within a public realm. Outdoor public spaces encourage a sense of connection and belonging with a wider community.

When these places work well they are valued as places that bring the public together, of all ages, races and socio economic groups. Cities and neighbourhoods with thriving urban spaces benefit from a strong sense of community; conversely, when such places are lacking, people may feel less connected to each other and to the place where they live.

In some instances public outdoor spaces are often sterile, cold and lifeless environments which fail as public spaces and lead to many other problems such as high maintenance, crime and public indifference.

The expression of the public domain should be brought out into the space surrounding the building. The entrance to the building serves as an important means of communicating with the public as to who is eligible to enter, however, creating space in front of and surrounding the building is of primary importance as it sends out the message of welcome and invitation prior to even approaching a building. Open public domain provided in conjunction with the built forms of architecture for the public aid in enhancing the feeling of unity and connection to others by means of shared space.

A space becomes a place when it successfully provides the framework for the creation of human memories. According to Gehl, *“a summary of observations and investigations shows that people and human activity are the greatest object of attention and interest”* (Gehl 1987, p. 31). These human activities can be anything from impromptu street performances,

construction workers on a site, or a parade down a main street. Essentially, there is always a positive association between activity and place.

Just as physical structure and form define space, so human activity and memory define place. Therefore in order to make a successful outdoor space in terms of pedestrian usefulness, “*optimal conditions for seeing what is going on in the space*” needs to be created (Gehl 1987, p. 165).



Seeing is the most direct way people take in the nature of their surroundings. Striking and unique objects, or landmarks, serve to orientate us and give us a sense of place. In Rotterdam, the “*progression through space was powerfully modulated by the dimension of colour*” (Bacon 1967, p. 230). This was not met through painted walls or designer paving, but by the use of flowers. This seemingly simple gesture is extremely powerful as an urban design tool, in that it serves both a pragmatic function delineating pathways and visual cues.

FIGURE 26: Rotterdam experience of colour (Bacon 1967, p. 231).

Dewar (1992, p. 18) speaks about creating qualitatively fine public spatial environments. He observes that the quality of urban environments is not informed primarily by the quality of individual buildings, but rather related to the quality of the public spatial environment. Dewar (1992, p. 18) believes that when the public spaces are rich social places, the entire environment is positive, regardless of the quality of individual buildings. Conversely, when the public spaces are uninformed and poorly scaled the entire environment is sterile, again regardless of how well individual buildings are designed or made.

In Tranicks opinion, this outcome may be due to the lack of consideration for the three dimensional relationship between buildings and spaces and without a real understanding of human behavior. Tranick suggests that the exterior space should define the borders of the architecture “*establishing the walls of the outdoor room*” (Tranick 1986, p. 18).

The creation of public plazas in the city environment is crucial as they can encourage social interaction and contribute to the sense of place of the city. Interaction of people plays a pivotal role in creating a successful community. A public plaza should contain places for people to sit, have trees to provide shade, and have certain activities that give life to this place. This gives people the opportunity to sit on a bench or walk past one another creating a meeting place for social interaction to occur.

Public plazas should be designed to create a space that is comfortable and inviting. Careful consideration should be taken in their design as plazas that are either too big or small could evoke feelings of alienation or claustrophobia. Plazas can have a positive impact on well-being as they allow people to use a public space, sit around it on a bench in the open environment and enjoy the peace and fresh air. People can take time out to just sit and relax and this can relieve them from the many urban stressors that they experience on a daily basis.

3.4 BIOPHILIA AND THE URBAN ENVIRONMENT

3.4.1 The Importance and Access to Green Spaces

Having access to parks, green spaces and planting and vegetation within the urban environment is very important in creating opportunities for people to socially interact as well as maintaining and enhancing their well-being. Green spaces such as parks play a crucial part in many people's daily lives. Research has found that outdoor activity in green spaces provides both refreshment and relaxation and gives people the opportunity to take a break from the various stressors encountered on a daily basis (Morris 2003, p. 5). Places where exercise can take place are important as people require physical exercise to enhance their well-being.

Not only do green spaces within the city improve the well-being of the cities inhabitants but these spaces have many environmental benefits such as filtering the air from pollutants, stabilising ground surfaces, absorbing rainwater and reducing flooding, the creation of visual and sound barriers, encourages the sustainability of wildlife habitats and decreases the urban heat island affect (Morris 2003, p. 8).

Ulrich (2002) uses a vast range of empirical evidence to support the argument that the benefits of viewing green areas within the urban environment goes beyond aesthetic

enjoyment and enhances peoples emotional well-being, reduces stress and improves health. Outdoor green spaces provide urban inhabitants with an increased quality of life and heightens both social interaction and well-being. Meeting people or going out in groups thus helps to enhance community spirit and encourage a more socially inclusive environment.

Green spaces within cities are attractive and help promote the image of the city, creating an atmosphere that defines its character and identity making these places more attractive to live and work in. Being in contact or having a visual of nature gives a person a sense of being away from their daily routines, demands and stresses. It also offers aesthetically pleasing stimuli which takes peoples mind of their stressors and this helps people to concentrate, relax and enjoy their surroundings (Klaplan 1995, p. 169-182).

The following images portray a city that makes use of green spaces (figure 25) and a city that contrasts this (figure 26). Just by observing the difference between the two one is able to understand the possible advantages and disadvantages of each with regards to both social interaction and well-being within the urban environment.



Figure 27 (left): The city of Brisbane, Australia has a great open space network with a good balance of green spaces. The green open space network allows for people to enjoy nature and take a break from their demanding lifestyles. Brisbane offers its inhabitants a variety of activities such as shopping and dining in the parklands, gardens and the port. Opportunities for recreation and exercise within in the parks as well as cycling and running tracks and many activities make Brisbane an attractive place to live (<http://www.charterworld.com>).

Figure 28 (right): This image portrays Mexico City with an inferior open space network that lacks green spaces and is monotonous. Very little space exists between buildings and its inhabitants rely on the motorcar for transport (<http://www.mustangevolution.com>).

Biophilia, the “*inherent need of humans to interact and affiliate with nature to achieve and maintain optimum health and well-being*” (Pollack 2006, p. 37). The importance of green spaces especially within the city context plays a vital part in achieving well-being and social interaction. Green spaces offer many opportunities to enhance ones well-being and also offer many opportunities for social interaction to occur.



Figure 29 (left): New York’s Central Park is one of the world’s best known urban parks which has a tremendous positive affect on the inhabitants well-being, allowing them to get physical exercise and take a break from the fast paced lifestyle of the city environment. An environment is created that connects the inhabitants to nature (<http://franciseng.blogspot.com>).

Figure 30 (right): Central Park, New York offers an abundance of social activities such as 30 tennis courts, 26 ball fields, 21 playgrounds with over 26 000 trees, 9000 benches and 36 bridges, which create the perfect environment for social interaction to take place. The central location of the park makes it easily accessible to the inhabitants of New York, thereby creating a common place whereby people can meet and interact (<http://www.centralparknyc.info>).

3.5 CONCLUSION

Many cities around the world are confronting the problems of sprawl, traffic jams, deteriorating downtowns, environmental degradation and sheer ugliness. These environments are dangerous, cause stress and place the well-being of individuals at risk. These poorly planned cities are not contributing to their inhabitant's well-being and social needs and this is causing their decay. Lack of convenient public transport causes many people to rely on their own transport which creates highly congested vehicular dominated environments. Zoning laws reduce the amount of people who can live and work in the city. A lack of green (parks), public space (plazas) and poor street quality are not fulfilling the needs of many inhabitants. Architectural environments that contain these characteristics are what cause urban sprawl to occur. Urban sprawl continues to create a greater impact on one's life as cities sprawl into the peripheral areas with ever widening roadways, but no sidewalks or bicycle routes. With their vast amount of tarmac parking areas and treeless streets, these environments encourage the motor car and make it an important need to move around.

By having a broader understanding of many current architectural environments around the world architects and urban designers have the ability to change these negative environments and rejuvenate them, bringing life back to city centres. New Urbanism has the potential to achieve this. Through the principles and characteristics of New Urbanism both architects and urban designers can apply these principles to current architectural environments. The application of these principles in current architectural environments will certainly bring life back to sterile environments and enhance individual lifestyles.

New Urbanism aims at the well-being of the collective society. Most of the New Urbanism principles portray this focus (Talen, 2002, 181). The need for public transport and decreasing vehicle dominated contexts increases opportunities for people to interact and it creates healthier environments that enhance the well-being of users.

"Buildings are instruments for constructing time and place, not items to be consumed and discarded" (Katz 1994, p. xxiii).

New Urbanistic environments create a higher quality of life, ideal places to live, work and play. Less traffic congestion and driving creates a healthier lifestyle with more walking and less stress. It also promotes availability of and proximity to everyday retail and services. Most

importantly New Urbanism strives to create communities by creating pedestrian friendly environments. This gives people more opportunities to get to know others and that can result in meaningful relationships with more people creating a friendlier environment which has a positive impact on human well-being.

Architects and Urban designers should consider the use of plazas and the street in their designs. The importance of providing safe, accessible, public and green spaces within the city is also important for the inhabitants. If these social spaces are designed correctly they can have the benefit of positively impacting on the architectural environment and the people that use them. These spaces are for the city users and should in every possible way be designed to enhance interaction and well-being as this can effectively reduce stress levels, provide restoration from the effects of mental fatigue and stressors from the urban environment.

The contents of this chapter has both highlighted the destructive qualities that the built environment can have on both social interaction and well-being, with regards to deteriorating downtowns, urban sprawl, lack of public and green spaces, poor quality streets and lack of plazas. The importance of both identification and orientation within the architectural environment has also been highlighted. It is therefore important for both urban designers and architects to consider the importance of these elements in their designs on a macro scale. To make a difference architects need to have an understanding of not only the micro environment but also the impact that the macro environment can have on its users and how they can positively impact on the environment at this scale. The use of New Urbanism principles together with Kevin Lynch's elements (paths, edges, nodes, districts and landmarks) and the careful and strategic design of public and green spaces, the plaza and the quality of the street can significantly enhance the experience of an architectural environment. The careful consideration and design of all the above mentioned concepts, theories and ideas will enhance the users well-being and create spaces that allow for social interaction to occur.

The macro context has been discussed and the impact that it has on social interaction and well-being. It is imperative that one understands the impacts on a macro scale as well as all the impacts the micro context has. This will be explored in the following chapter.

CHAPTER FOUR: THE IMPACT OF THE MICRO CONTEXT ON SOCIAL INTERACTION AND WELL-BEING

4.0 INTRODUCTION

The following chapter considers the architectural environment on a micro context and its effects on social interaction and well-being. It is important that architects have a general understanding of the effects the architectural environment has on a micro scale as this is their area of expertise. It is imperative that architects ensure that the built environment which they create has positive effects on the well-being of its inhabitants (Deasy, p. 1974).

Greenfield (1987) mentions that up to 90 percent of people spend their lives within buildings. Therefore buildings that have characteristics of Sick Building Syndrome can have a huge impact on the well-being of building occupants. Tate (1994, p. ix) mentions that according to the World Health Organization report in 1984 an estimated 30 percent of new and remodelled buildings maybe affected by Sick Building Syndrome. The following section will create an understanding of what Sick Building Syndrome (SBS) is, discussing its characteristics, consequences and impact on human well-being. It is important that architects are aware of the impacts that many poorly designed buildings have on their occupants and users and create an awareness of what not to do in building design.

The theory of Biophilia and its natural attributes is seen as a way to counteract the impact of Sick Building Syndrome and poorly designed architectural environments.

Biophilia considers the relationship between humans and their natural and built environments and is the theory that forms the basis of Biophilic design. Such an approach in design can create built environments that restore and maintain human health, well-being, reduce stress, increase concentration, productivity and enhance learning. By combining Biophilia with architecture one can allow people opportunities to interact with nature, whether it is being outdoors in a natural setting, or just having a view from the interior of a building. People with access to natural environments are far healthier than those who do not have access to these environments (Sjoquist 2003, p. 11-12).

Biophilic design involves using native plants and trees in the landscape, letting light and wind flow through the interior spaces. Essentially bringing the outdoors to the indoors, to connect building users with the site and the landscape (Sjoquist 2003, p. 12-14).

By using Biophilic design techniques in architecture, one can ultimately create architectural environments that encourage well-being and the experiential quality of space that can provide opportunities for social interaction. By mimicking nature as part of the design of built environments, one can create healthier building environments that are beneficial to human experience. Biophilic design encourages a symbiotic relationship between humans and their natural environment.

Wilson introduced the concept of Biophilia to the world in 1984. He defines Biophilia as: *"the inherent need of humans to interact and affiliate with nature to achieve and maintain optimum health and well-being"* (Pollack 2006, p. 37). It is shocking to see how far humans have moved from this definition.

Studies have shown that humans naturally need nature. Suggestions from these studies have been made that the natural world is a defining part of the human psyche. It is also a major source of our sense of identity, physical, emotional, and cognitive development, as well as being an important foundation for the development of our aesthetic and spiritual experiences (Pollack 2006, p. 37-38).

The concept of Biophilia can be used in architecture. The term given to this process is Biophilic design. Pollack defines Biophilic design as: *"Biophilic design recognizes the inherent human need for nature together with sustainable and universal design strategies to create environments that truly enhance life"* (Pollack 2006, p. 38).

The importance of Biophilia on the well-being of people and the role it can play in producing spaces that encourage social interaction has a positive impact on architecture. Architects need to create environments that connect the building and the occupants that use it to nature and its many benefits in a variety of ways (Pollack 2006, p. 38).

Biophilic design attributes are elements and qualities of the physical natural environment that connect humans to the physical, psychological and cognitive benefits derived from direct experiences with nature. Natural attributes are preferred over other design strategies to enhance the process of well-being. Natural attributes bring buildings to life physically through the use of design strategies and materials. Biophilic design attributes include;

dynamic natural light, natural ventilation, access to open or moving water, planting and opportunities for spontaneous interaction with nature and sensory connections to it (Pollack 2006, p. 38).

By understanding the impact that the natural environment has on well-being and social interaction, architects can use Biophilic design elements in their designs to truly enhance the well-being of building occupants.

Natural day lighting is an important Biophilic attribute that architects should consider when designing for well-being. Day lighting is a major concern in modern society. From the macro perspective of global warming, climate change, burning of fossil fuels, right down to the micro level, with concerns and issues of glare, thermal comfort and both health and well-being (Bouberki 2008, p. 47). The lack of windows and connection to the outside world, glare and uncomfortable internal temperatures has tremendous physiological effects on building users and can contribute to stress (Bouberki 2008, p. 77). On a more positive note natural light has the ability to truly enhance the building occupant's well-being, productivity, sick people will heal faster, students will perform better and it reduces stress levels (Bouberki 2008, p. 109). Day lighting strategies will be discussed later on in this chapter to create a set of tools that architects can use to capture day lighting as well as the solar shading devices that are necessary to reduce visual and thermal discomfort.

Another Biophilic attribute that will be discussed is natural ventilation. Fresh air, like fresh water, is a fundamental human need. People are healthier, work more effectively, and are more engaged when their places of work or habitation are naturally ventilated. The need for architects to make use of natural ventilation methods and elements plays a prominent role in the well-being of building occupants as it has the ability to create the desired thermal environment as well as eliminating undesired contaminants within the air.

Water, another Biophilic attribute will be discussed as well in terms of how it can create environments that enhance well-being. Water is one of the most dominant elements covering 70% of the earth's surface (Heerwagen, Kellert, Mador 2008). It should afford more attention in people's daily lives as well as in architectural design. Water has for many generations been associated with life and so architects must consider it as being an important natural element and integrate it into architectural environments for the benefit of society. Water has symbolic, visual and acoustical qualities, with many benefits to building occupants, which will be discussed.

The last Biophilic attribute that will be discussed is the use of planting in architecture and how effective it is in enhancing well-being. Papers (2008, p. 3) emphasises that the use of plants and vegetation in the interiors of buildings can improve the climate inside, air quality and can reduce noise. Plants play a valuable role in the built environment. The positive impact that plants have on people can enhance comfort, well-being and satisfaction as well as performance (Heerwagen, Kellert, Mador, 2008:7). The important benefits that plants have on human well-being and the process through which they purify the air and maintain a balanced micro climate will be explored.

It is not only the ventilation, day lighting and orientation strategies used in architectural design that can affect or enhance the well-being of building occupants. It must be noted that it is also the careful selection of building materials and finishes that characterise the building. They affect the indoor air quality can have an important influence on the moods and emotions of building users. Materials containing harmful Volatile Organic Compounds (VOCs) which are toxic and pollute the indoor air quality can lead to a Sick Building Syndrome. This brings to attention the importance of selecting materials and finishes that have the least impact and consequence on the well-being of building occupants and users.

Social interaction within the building environment is very important to consider. People do not do well with long periods of isolation and thus the need for interaction is essential. Architects need to consider spaces within buildings and create opportunities for people to interact. It is essential that building users or occupants have such spaces so they can escape from the stresses of the work or home environment to seek mental and physical relaxation. The importance of creating these spaces and ways in which architects can achieve such spaces in architectural design is further discussed.

The following chapter discusses Sick Building Syndrome, its characteristics and its impact on the well-being of building occupants and users. Biophilic design and its attributes namely dynamic natural light, natural ventilation, water and planting are then discussed in view of their importance in creating architectural environments that enhance well-being. The above mentioned attributes will further contribute to a set of Biophilic tools that architects can use in their designs to encourage well-being in the built environment on a micro scale. Further, this chapter endeavours to explore the selection of building finishes, selection of materials and colour in creating healthy environments.

The following chapter seeks to create awareness for architects of how destructive the architectural environment can be on its occupants and users on a micro level by emphasizing how important it is to consider and design for social interaction and well-being in the built environment. The main emphasis is to develop a set of tools through architecture that one can use to create environments that enhance both social interaction and well-being.

4.1 SICK BUILDING SYNDROME (SBS)

"Building in recent times has had almost as equally damaging effects on people as on ecosystems. The increased use of synthetic materials, mechanical control of ventilation, coupled with poor consideration of the relationships between material choice, climate, site and their combined effect on people, has led to the creation of unhealthy indoor environments... many common materials contain substances that are toxic and which can lead to serious health impacts.... leading to a decrease in productivity.... off-gassing materials, bacteria or viruses, lack of fresh air... formaldehyde and xylene are commonly susceptible to off-gassing... a significant influence on asthma sufferers" Graham (2003, p. 85).

4.1.1 Sick Building Syndrome Defined:

According to Boubarki (2008, p. 1) the term Sick Building Syndrome describes situations when building occupants experience discomfort, a sense of being unwell, and health problems associated with the time they spend in buildings. In some cases no specific illness or cause can be identified. Sick Building Syndrome is commonly related with issues such as indoor air quality, air pollution, the lack of daylight, poor acoustics and inadequate ventilation. Lack of sunlight combined with a humid environment can cause mold to form in interior environments which can cause respiratory diseases. Many Sick Building Syndrome symptoms are only temporarily and can be treated although some are long term, chronic ailments (Boubarki 2008, p. 1).

4.1.2 Symptoms of Sick Building Syndrome:

According to the World Health Organization the following mentioned symptoms are the impact that Sick Building Syndrome has on building occupants well-being - nausea, dizziness, headaches, erythema, eye, nose and throat irritation, sensation of dry mucous membranes and skin, airway infections and coughs, wheezing and itching and mental fatigue

(Balsdon 1990, p. 19). The above mentioned effects of Sick Building Syndrome according to Balsdon (1990, p. 20) are more likely to occur in buildings that are air-conditioned rather than naturally ventilated buildings (Finnegan et al 1984, Burge et al 1987). Sick Building Syndrome is also considered to cause stress as the interior environment does not necessarily satisfy human comfort (Balsdon 1990, p. 20).

4.1.3 Causes of Sick Building Syndrome:

There are six main building elements according to Balsdon (1990, p. 40) that give rise to Sick Building Syndrome. The six elements are an airtight shell, lack of occupant control over their environments, application of energy conservation methods, mechanical heating, ventilation and air-conditioning systems, use of materials and equipment that give off harmful toxins and pollutants and artificial lighting. The Institute for Occupational Safety and Health (NIOSH) carried out research to determine what caused Sick Building Syndrome and what affect this had on the well-being of building occupants. They came to a conclusion that inadequate ventilation was 48 percent of the problem (Balsdon 1990, p. 40). From the six elements one can simplify them into three elements that contribute to Sick Building Syndrome. They are thermal comfort and ventilation systems, the causes and effects of Volatile Organic Compounds (VOC's) and lastly the effects of lighting.

4.1.3.1 Thermal Comfort and Ventilation Systems:

Balsdon (1990, p. 5) mentions that due to the energy crisis in 1970 there was a need for architectural designs that were energy efficient as huge amounts of money was spent on heating and cooling buildings. In response to this need the building industry developed regulations that would produce airtight buildings that could retain and maintain temperatures. Godfish (1995) states that this resulted in buildings that could not breathe as they trapped toxic materials and natural ventilation was eliminated which all contribute to Sick Building Syndrome.

Mikrine (1996, p. 66) explains that the primary purpose of ventilation systems are to provide outdoor air circulation and distribution within the building to dilute air pollution and maintain human comfort. However, Mikrine (1996, p. 66) mentions that many heating ventilation and air conditioning (HVAC) systems are inadequately designed or maintained and this contributes to poor indoor air quality which impacts on the building occupants health and comfort. The HVAC systems are most often the source of both biological and chemical

contaminants (Mikrine 1996, p. 66). An important part of allowing fresh air into the building in these systems happens in the mixing chamber. This is where fresh air is mixed with the return air within the building. However only ten to twenty percent of this air is fresh and in some cases the fresh air dampers are closed so there is no fresh air but rather the same old, polluted stale air that is just re-circulated throughout the building (Balsdon 1990, p. 51). Secondly, most HVAC systems also contain air filters which are supposed to remove dust and any other impurities that are present in the air. These filters are often insufficient and poorly maintained (Balsdon 1990, p. 51). The disadvantages of these systems are numerous.

With regards to thermal comfort levels HVAC systems do not allow building occupants to have control over their environments, windows cannot be opened and heating and cooling cannot be locally controlled. This causes problems as different people feel comfortable under different conditions (Balsdon 1990, p. 55). Therefore some people will be too warm and others might be too cold which affects their well-being within the building environment and has further consequences. It is crucial that not only the indoor temperature is comfortable but that the humidity level is also controlled. When the humidity is too high people become uncomfortable and hot and when the humidity is too low people may develop headaches, sinus troubles and sore eyes (Balsdon 1990, p. 57-58).

4.1.3.2 Causes and effects of Volatile Organic Compounds (VOC's):

Volatile Organic Compound is a class of chemical components that contain more than one carbon atom and are volatile at room temperature. In indoor air VOC's are produced from sources such as building products, materials, furnishings, cosmetics, cleaning products, electric equipment and smoking (Gobbell 1994, p. 70). Mikrine (1996,18) emphasizes that VOC's found in building environments are toxic and pollute the indoor air which impacts negatively on the human well-being of building occupants. Many VOC's are emitted from building materials such as adhesives, sealants, paint, carpets, vinyl tiles, wall coverings etc. However, Gobeell (1994, p. 33-34) suggests that materials should be carefully selected and where materials cannot be avoided one should allow the building to breathe and outgas before occupation. Microorganisms such as bacteria, fungi and mold produce a variety of VOC's. Exposure to these organisms has been proven to contribute to Sick Building Syndrome (Godish 1995, p. 195). As mentioned there are a variety of VOC's that exist in the building environment all of which have negative impacts on building occupants health and well-being.

One needs to take the harmful impact that VOC's can have on people into account (Mikrine: 1996, p. 69). VOC's are not the only pollutants that can be found in the interior environment. Other common pollutants are radon, moulds, carbon monoxide, legionella, carbon dioxide and ozone (Van Wyk: 2009, p. 179).

4.1.3.3 The Effects of Lighting:

Lighting is another cause of Sick Building Syndrome. Both artificial and natural light have impacts on building occupants when poorly designed. Balsdon (1990, p. 60) states that in the work place, areas that are not suitably lit cause visual disturbance, and glare from both natural and artificial lighting causes dry, gritty eyes and headaches as well as a distraction from work. The use of white florescent artificial lighting further contributes to Sick Building Syndrome and the many symptoms that result from it (Balsdon 1990, p. 60).

4.1.3.4 The Impact of Technological induced design:

The importance of creating environments that enhance well-being are crucial to this dissertation. A healthy building environment is important for the health of an individual working in a building (Darier 1998, p. 65). The health of individuals is conditioned by the internal environment, the built environment has the ability to create negative impacts on its users and this causes stress which further creates both physical and psychological health problems (Darier 1998, p. 76). It is believed that the applications of technology such as mechanical ventilation systems are not considered to be a risk free operation. However as discussed in Sick Building Syndrome they are one of the causes of this syndrome which negatively affect the well-being of the building users.

Pearson (1991, p. 68-69) states *“the majority of urban built environments are poorly designed and managed, and the constant exposure to them produces stress and illness....the symptoms of “sick building syndrome” being part of a far wider malaise”*. Guy and Shove (1994) mention that technology has allowed buildings to form a barrier to the hostile natural world. Guy and Shove (1994) further mention that due to technology and the increase of mechanically ventilated buildings a new image of buildings has been created. These environments are potentially dangerous and place the occupants of the buildings at daily risk from a variety of health hazards (Guy and Shove 1994).

Levin (2003, p. 1) mentions that modern buildings have a negative environmental impact and that they threaten global environmental health. Levin (2003, p. 1) blames the use of current building technology for the adverse impact on the building users well-being. He further creates an awareness that our buildings account for up to forty percent of the total environmental burdens of modern societies. *“In spite of their enormous impacts on the environment, modern buildings generally fail to provide all their occupants with the safety, health and comfort that are expected. A significant fraction of building occupants are uncomfortable, dissatisfied, or even ill from the effects of modern buildings”* (Levin: 2003, p. 2). Levin (2003, p. 2) remarks that estimated averages of 30 percent of office workers have reported experiencing repeatedly one or more symptoms of the Sick Building Syndrome (Levin: 2003, p. 2).

Levin (2003, p. 2) believes that when people are not in control of their building environments they are generally less satisfied with them. However when people have individual control over their interior environments they are most likely to be happy with them. Levin (2003, p. 2) questions the practices *“that are resulting in energy intensive, unsatisfying and in many cases uncomfortable, unhealthy, and unproductive building environments”*. His view point is far more satisfying to building occupants giving them the opportunity to control their own environments as well as lessening the buildings impact on the environment.

According to Levin (2003, p. 2-3) historically architects were not just concerned with the building's appearance, they were concerned and addressed all aspects of a building's performance without the need to use *“prevalent forms of environmental control technology”*. Rapoport (1969) mentions that the form of the building and the materials used were strongly linked to thermal comfort, day lighting and ventilation design. Over the past two centuries some architects have abandoned their historical responsibility for providing thermal comfort, ventilation and illumination by the design of the basic structure itself. Many of the buildings erected now days do not focus on the environmental conditions (Levin 2003, p. 2). This meant that buildings were far less naturally comfortable to their users and it became necessary for mechanical engineers to take over the job of designing for the building services (Banham, p. 1984).

Levin (2003, p. 3) states *“As a result, in recent years there has been a proliferation of specialties resulting in an almost unmanageable coordination problem, and so, architects have become managers of the process rather than the true building designers”*. However designers still have a choice to create buildings that are either mechanically ventilated or naturally ventilated, the latter having less impact on the environment with less energy demands and is far healthier for the building occupants. Levin and Banham (2003, p. 2-3 & 1984) mention that currently there is a trend towards sealing the exterior building envelope (figure 31) and using mechanical ventilation (figure 32) methods for maintaining thermal comfort levels within the building and electric illumination dominates the provision of light over natural day lighting.



Figure 31 (left): An office tower in the Canary Wharf business district in London. The image portrays a typical example of a building where the exterior building is sealed to allow for mechanical ventilation to be the means of thermal comfort (www.explow.com).

Figure 32 (right): An interior view of the office tower in the Canary Wharf business district in London. A typical example of a building that relies on mechanical ventilation and electric illumination. This type of building does not allow the building user to control his or her own thermal or visual comfort levels and there is no element of nature within the interior environment. No natural ventilation occurs so the chances of indoor contaminants are high. Buildings of this nature place the well-being of individuals at risk and can cause considerable decrease in work productivity (www.explow.com).

Guy and Farmer (2001, p. 145) state that our health has been threatened by the technologies that were created to protect it. People supporting this point of view believe that this is the

problem that is affecting building user's health and well-being. Large modern buildings that incorporate advanced technologies are separating the building occupants from nature and allowing them no individual control over their immediate surroundings (Guy and Farmer, 2001, p. 145). Many people spend most part of their lives in *“anonymous, universal environments which are artificially lit, mechanically ventilated, and effectively cut off from the outside world”* (Guy and Farmer 2001, p. 145). Being isolated from nature is being challenged by building users as they desire more control over their interior environments (Guy and Farmer 2001, p. 145). The use of naturally conditioned environments with the use of natural materials over synthetic materials which outgas chemicals and pollute the air should be avoided (Guy and Farmer 2001, p. 145).

“On a hot summer's day the energy being used to cool the curtain-walled building must make even the mildest “greenie” wince” (Radford 2008, p. 10).



Figure 33 (left): View of 88 Field street Office building in Durban, South Africa. The tall glass building spirals into the sky (Author 2012).

Figure 34 (right): Example of an air tight mechanically ventilated building. This building may have a severe impact on ones well-being. The building is simplistic in design and can be placed anywhere in the world because it takes no cognisance of orientation, solar shading or climate. This building is an artificial machine that requires high energy consumption (www.emporis.com).

The Elphick Proome Architects (EPA) Studio is located in Westville, South Africa. It houses the largest architectural firm in Kwa-Zulu-Natal consisting of 60 employees which was designed by this talented group of architects and technicians (www.visi.co.za).



Figure 35: North West view of the Elphick Proome Studio, showing its external glass façade which wraps around the building. The solar shading is uniform on all the facades of the building and does not take cognisance of the different affect that the sun has on different facades. Northern and southern facades require horizontal louvres where as west and east facing facades should maximise upon vertical louvres (www.eparch.co.za).

The building form is a rectangular glazed pavilion, elevated on tapering concrete columns that vary in height according to the slope of the site. The building is covered by an over sailing roof with an external grating sun screening which wraps around the buildings glass façade (www.visi.co.za).

Being in the province of Kwa-Zulu-Natal the site experiences very hot summers reaching average temperatures of 30 degrees with high humidity levels. The building has no opening windows and relies completely on mechanical ventilation to maintain thermal comfort levels. This building is an example of an airtight building that relies on human created technology to support its thermal levels, rather than relying on the natural elements to create a thermally comfortable work environment. The building's impressive design sits lightly on the slope and embraces nature but is compromised by the use of an artificial environment that relies on mechanical ventilation. Buildings are not only aesthetic creations but most importantly they should respond to the users well-being needs.

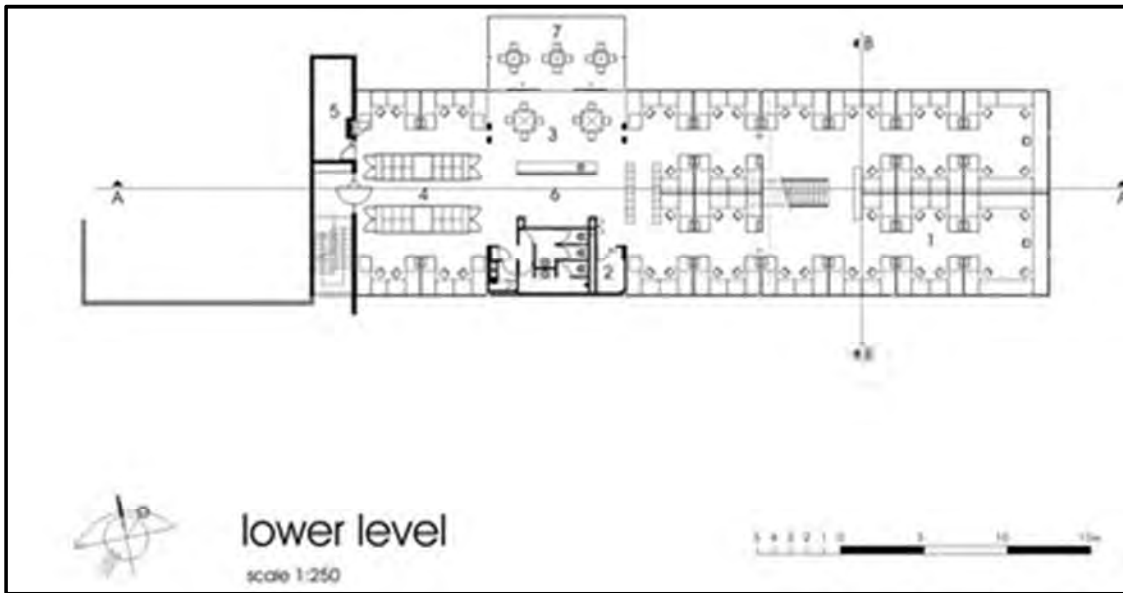


Figure 36: Open plan offices of EPA. Work desks are right next to the glass facade (www.nbmcw.com).

“The use of massive air conditioning plants to correct an ill-conceived environment does not differ in principle from the use of a masonry façade to hide an unnecessarily ugly concrete structure” (Cowan, p. 1966).



Figure 37: Interior view of EPA showing the open plan offices. One can see the mechanical ventilation used and the large blinds that control the amount of natural light entering the space. However the blinds might provide protection from glare but they certainly do not provide protection from heat gain. Due to the insufficient solar shading methods used, the building allows direct light to transmit onto the buildings glass facades (www.eparch.co.za).

A Questionnaire was sent to numerous employees (qualified architects) at the Elphick Proome Studio to see how they felt about their work environment with regards to ventilation, lighting, thermal comfort, solar shading, occupant control as well as any impacts that the architecture has on their well-being. Further the question was asked if in their opinion the well-being needs could be improved and how might they go about this? The results can be seen in Appendix 1, however numerous quotes from the respondents will be used under the relevant sections to follow which will illustrate the impact that architecture has on the well-being needs of its users.

VENTILATION

The following comments will review the impact of ventilation in the Elphick Proome Studio:

“Ventilation - Is miserable. There are zero operable windows in the entire building so obviously no natural ventilation. The HVAC system fails terribly in summer. It is under-spec'd and unreliable. It cannot operate at full capacity without breaking down. In the event of power outages, whether in summer or winter, we have no choice but to leave the building. The heat-gain is insane and especially unbearable in summer” (Anonymous, refer to Appendix 1).

One of the respondents expresses the impact that poor ventilation strategies can have on the well-being of building users. The respondent further states: *“biggest issue is the lack of fresh air; so when one person is sick, it will spread around the office rapidly. You have no option but to breathe recycled air”* (Anonymous, refer to Appendix 1).

Another respondent comments that if natural ventilation was incorporated into the design this would have a positive impact on well-being.

“Yes, natural ventilation would have a positive impact. Individual control is the ideal (from the individual's perspective) and should be provided for as standard. It would also increase the sense of ownership” (Anonymous, refer to Appendix 1).

In terms of improving the existing internal environment one of the respondents suggested:

“The general consensus in the office is that we need to either upgrade & redesign the entire HVAC system so that it caters to specific areas exactly as required; or to install operable windows. Personally, I think installing proper solar control elements right across the eastern

& northern facades would resolve most of the issues. Obviously, if the glass is shaded from the exterior, the heat gain would be greatly reduced. If that is done & found not to be as effective as expected, the next step would be to install operable window & some sort of system to ventilate the double volume & roof space” (Anonymous, refer to Appendix 1).

THERMAL COMFORT

The following comments will review the impact of thermal comfort in the Elphick Proome Studio:

“Thermal Comfort - Is dependent on where you are located in the building. As a rule, under the slab is the coolest area. Guys generally wear jerseys through summer (if HVAC is functional), upstairs meeting rooms and director desking is also ideal as they are at the very beginning of each HVAC run. The desking around the eastern end of the building is the worst off. The heat gain here is absolutely ridiculous. If you sit arms-length from the glass, you have to wear shorts and slops in summer, and consider sunglasses & sunscreen. The HVAC doesn't make any impact in these areas as they're right at the end of the runs & the double volume destroys any potential cooling they might offer” (Anonymous, refer to Appendix 1).

The last respondent has clearly indicated that the current work environment has impacted upon his well-being and is affecting production, mood and comfort. In general the same concerns are expressed by all the respondents.

Another respondent comments that: *“The office can be an unpleasant environment for users on the east side of the building during morning hours. It is difficult to please a larger workforce with a homogenous system. Thermal stability should be improved. In the case of power outages, the air circulation is inefficient and the studio space quickly heats or cools, depending on the season” (Anonymous, refer to Appendix 1).*

This creates awareness to architects that their designs do have an impact and can considerably affect the well-being needs of the building users.

NATURAL LIGHTING AND SOLAR SHADING

The following comments will review the impact of the natural lighting and solar protection strategies in the Elphick Proome Studio:

“Solar shading is merely decorative. Filigree shades were pretty trendy at the time of construction. That said there are only solar control elements on the northern & western facade (horizontal @ northern, vertical @ western). The rest of the building has an eaves overhang of approx. 1.5-2m; which is useless for a building this size. Again, this is decorative & allows for exposed, decorative steelwork to be displayed. To my mind, both sets of screens are ineffective. The horizontal screen shades the desk immediately below, but not all the desks further inset as they're hit by direct sunlight from the upper level's glazing. I sit at the east end, and as mentioned in thermal comfort, it's horrendous.” (Anonymous, refer to Appendix 1).

However another respondent expresses his concern for the east façade and considers vertical blinds as a prevention measure.

“The east facade (despite the hillside vegetation which does limit the building's exposure) does not respond to early morning east light. Vertical blinds would remove the harsh morning light” (Anonymous, refer to Appendix 1).

It is the architects task to ensure that natural lighting is enhanced, however the careful use of solar shading devices is important to reduce the harmful affects that natural lighting can have on users.

OCCUPANT CONTROL WITHIN THE BUILDING

The following comments will assess the respondents view on occupant control in their current interior environment as well as their personal comments with regards to using occupant control to enhance well-being.

“I think a degree of personal control would go a long way to improving personal experience, both physically & mentally. At the moment, the setup & environment is extremely rigid & totalitarian. Desk fans/lamps/etc are outlawed. Operable windows would be ideal, however in an office of this size you will not find people who can agree to have the window open or closed etc. However, at least having the option to open a window would play a huge part. Blinds are installed all-round the building & remain closed year-round. They only filter a maximum of 50% sunlight out, and do not help against direct sunlight.” (Anonymous, refer to Appendix 1).

“The ability to choose will improve well-being, constrictive environments would decrease motivation (I would be predisposed against it immediately)” (Anonymous, refer to Appendix 1).

The responses indicate that the current environment has a negative impact on their well-being needs. This places particular importance that architects should be aware of every element that they use in the design of their buildings. The application and function of these elements is critical. The respondent’s views indicate that occupant control over interior environments has a positive impact on building users. The following precedent has indicated that relying on mechanical ventilation as well as the poor design of natural lighting, ventilation and solar shading methods can have severe impacts on ones well-being.

Air tight buildings don’t allow the users to control their own environments as access to operable windows is non-existent. Therefore a standard temperature is set throughout the internal environment which many people might find unpleasant. According to Rubin and Elder (1980) all people are not alike, everyone feels and responds differently to different situations. However the point the researcher is trying to make is that by giving people the opportunity to control their environment through operable windows, blinds, personal desk lamps, they are able to control their own environment and can adapt to what suits their well-being needs.

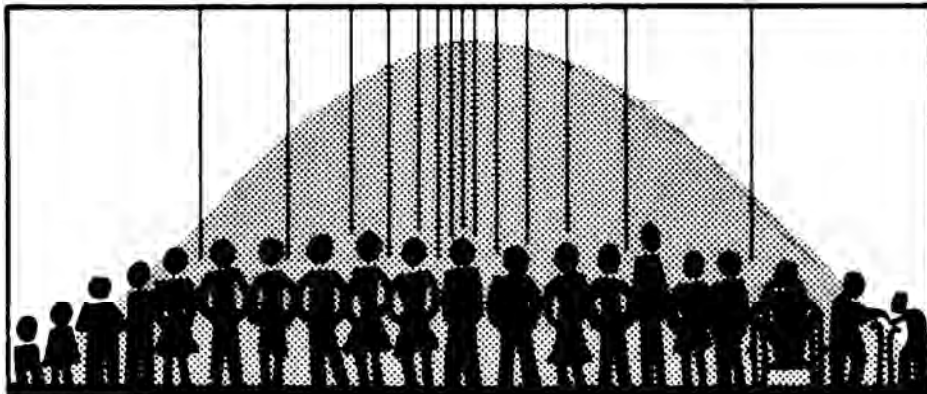


Figure 38: All people are not alike; everyone experiences temperatures as well as lighting levels differently (Rubin and Elder 1980).

Technological induced designs are highly demanding on energy consumption and impact heavily on the environment which is not helping global warming. These environments are numerous, one can see them in almost any urban environment. Architects therefore need to understand the negative impacts they can have on building occupants and should consider the design of healthy environments that enhance the well-being of its users. *“Research has shown*

repeatedly that buildings designed to conform to current standards and guidelines fail to provide occupant satisfaction with one or more of the general indoor environmental parameters – air quality, thermal conditions, illumination, and acoustics” (Levin 2003, p. 4).

Architects should create healing environments in which building users can feel “*balanced, relaxed and at one with the world*”, an architecture that can “*honour our senses*” (Pearson, 1991, p. 68-69). These ideals are embodied in the concept of Biophilia, where the concepts of both health and ecology are interwoven, and the principal aim is to design environments that meet our physical and well-being needs. Biophilia promotes the use of natural and tactile materials, utilizing non harmful emitting building materials and finishes, maximising natural day lighting and ventilation strategies as well as the use of colour to promote health and well-being. The theory of Biophilia in architectural design will be discussed next. It is this sort of approach that will create building environments that people will want to live and work within.

Research has proven that if users can control their environment they are far more likely to be satisfied and comfortable (Levin 2003, p. 11). Increasing user control over thermal comfort (operable windows, personal fans and heaters), lighting (blinds and personal desk lamps) and indoor air quality (operable windows) provides greater opportunity for occupant satisfaction and comfort (Levin 2003, p. 11).

“In fact, when users control aspects of their environment that are important to them, the reported SBS symptom rates are often lower and workers’ estimate their building’s impact on their productivity is more beneficial” (Raw et al 1990).

“If users don’t control some important characteristics of their indoor environment, it is virtually impossible to create conditions that will satisfy the vast majority of occupants” (Stolwijk 1984).

By allowing building users to have control over their environments well-being will be enhanced. Levin (2003, p. 11) shares a similar view point to the researcher and asks the question why don’t all building designs enable users to control their interior environment?

Sick Building Syndrome can be avoided through careful design strategies. The use of Biophilic attributes in architecture can create healthy environments. The use of natural

resources such as the wind (natural ventilation) and the sun (natural day lighting) can be used to create thermal and physical comfort in buildings. Architecture needs to support the well-being needs of its building occupants and not detract from it. Architecture has the influence to inspire its occupants and this opportunity should not be missed. Architecture should never be the source of illness or misery; it should enhance the well-being of those who use it.

4.2. BIOPHILIA IN ARCHITECTURAL DESIGN

4.2.1 DYNAMIC NATURAL LIGHT:

There is a considerable difference between humans experience of natural and artificial light. The main difference is that natural light is constantly changing in direction and intensity (Pollack 2006, p. 38). Pollack reinforces the experience of natural light by stating that:

"The overall rhythm of sunlight moving from day to night and from season to season reveals and highlights colours, patterns, and textures; subdues and constantly changes them; then reveals them again in an entirely new way. Changing patterns of brightness and shadow, sparkle, and reflection capture and redirect our attention, helping to relieve stress and mental fatigue" (Pollack 2006, p. 38).

According to Day (2002, p. 200) natural light plays a major role in health, which is vital to well-being. He states that light according to biologists is essential for life and to physiologists, light has a major influence on moods which can have adverse effects on health. Heerwagen, Kellert and Mador (2008, p. 11) mention numerous studies which have proved that natural light is physically and physiologically rewarding to people and contributes to their health, levels of productivity, moods and general well-being in the built environment.

By encouraging natural light to filtrate into building interiors architects can create healthier environments. The creative manipulation of both light and shadow can enhance curiosity, mystery and emphasize the various shapes and forms of buildings. Filtered and diffused light has the potential to be used to create architectural expression through shadow and light. This contrast can enhance the journey and experience within a building. Often direct light is too harsh on building occupants and this gives architects the opportunity to use reflected light off the walls and floors of the interior spaces. Light pools, for instance, allow light to penetrate into the lower part of buildings by reflection and people are often drawn into and through the interior spaces by the presence of pools of light. By using screens, light can change its hue to that of cool or warm light depending on the affect and ambience architects intend to create in

spaces. Different hues of light also create different feelings and experiences for the individuals. For instance warm light can enhance the feeling of a secure and inviting interior (Heerwagen, Kellert, Mador 2008, p. 11).

The only link between the interior environment and the exterior environment is sunlight, which facilitates our essential connection with nature. It gives us a sense of time (Bouberki, 2008: 2). Day lighting mechanisms allow building occupants to maintain an essential link to the outside world (Bouberki 2008, p. 3).

Cohen, (1984) states that: *"many such psychological problems as anxiety, chronic tension, and eating disorders are caused by our isolation from natural settings. We spend too much time indoors in artificial, man-made environments. It's unnatural and unhealthy"*.

Many buildings in the urban environment do not have access to natural daylight and this can have negative impacts on the well-being of building occupants who are reliant on artificial light. However, in some parts of the world legislation is used to guarantee buildings and their occupant's access to natural light. This is achieved by establishing local zoning ordinances that stipulate how high buildings can be built and what set backs are required from the building lines (Bouberki 2008, p. 42). In areas where local zoning ordinances are non-existent architects should consider the need for building setbacks and take cognisance of the surrounding buildings to ensure that the building being designed as well as the surrounding buildings are able to achieve maximum natural day lighting.

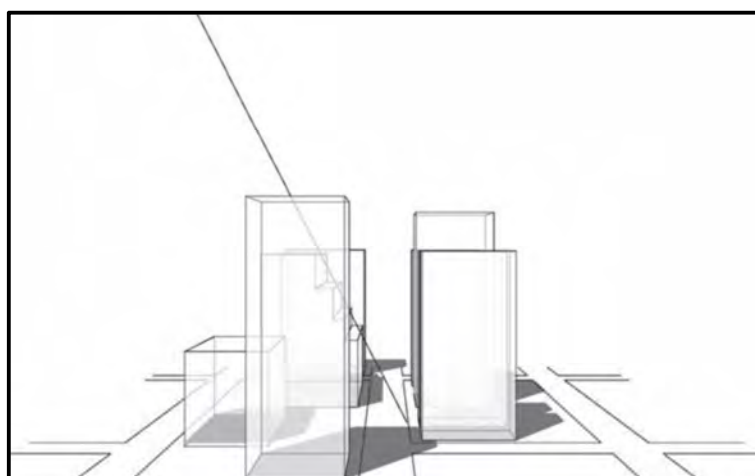


Figure 39: Set-back following a sun angle from the median along the street level to allow buildings and its occupants to receive natural daylight (Bouberki 2008, p. 46).



Figure 40: Image taken in Manhattan, New York indicating the low levels of natural light found at the base of buildings in comparison to the top (Bouberki 2008, p. 84).

4.2.1.1 Architecture as a Tool for Natural Day Lighting Strategies:

Daylight is a natural source from the sun and gives architects the opportunity to use it in building design to enhance the well-being of building occupants. There are numerous strategies in architecture that the architect can use to ensure sufficient day lighting is achieved in buildings. It is not only the use of one or two of these strategies that ensure sufficient natural day lighting but rather a combination of many strategies used successfully throughout the building .

"Daylight is a source of health and well-being as vital as fresh air" (Bouberki 2008, p. 109).

Architects need to understand the negative impact that natural light can have on building occupants and careful thought must be given, as natural light can cause stress, discomfort glare and can impact on the well-being, productivity, thermal comfort and experience within a building. Bouberki (2008, p. 111) states that a successful day lighting strategy is one that maximizes the amount of light entering a building but on the other hand it optimizes the quality of the luminous environment for the occupant. Day lighting can be distributed to interior spaces through openings on the facades, from the top and from a combination of the two. The type of building, its height, massing, climatic conditions, site and immediate context obstructions as well as other issues determine the type of strategies to be used.

The accurate placement and orientation of windows, curtain walls and skylights in buildings is important to capture natural lighting. Light should enter spaces from at least two different directions to enhance the experience of the sun's movement, and to provide changing patterns of brightness and shadow. It is not only the experience of light in a sensory way that relieves stress and mental fatigue. It is also important to have a contrast to the sensory experience of light when in spaces that are to be conducive to well-being. Too much natural light and glare hinders the process of well-being and has a negative physiological impact on individuals. Therefore it is important that the correct amount of light and placement of openings creates an ideal environment for well-being (Pollack 2006, p. 38).

The orientation of a building is critical in terms of the type of light that the buildings facades are exposed to. Every facade experiences a different quality of light and should be treated in a different way. On the northern facade exposure here provides warmth from passive solar gain whereas on the southern facade exposure produces more diffused light. Both the eastern and western facades are exposed to the most dramatic experience of light movement and particular caution should be taken here. It is not only the careful placement of openings on the various facades but also the height at which these openings are placed on the facade relative to the internal spaces of the built form. Light that enters spaces from different heights has different effects on the spaces. Windows located high on the wall allows light to reflect off the ceiling and penetrate more deeply into the room. However light from above skylights, transom and clerestory windows adds increased depth and movement (Pollack 2006, p. 38). It is important for architects to understand the different affect that day lighting strategies have on the spaces within a building as well as the occupants who use these spaces.

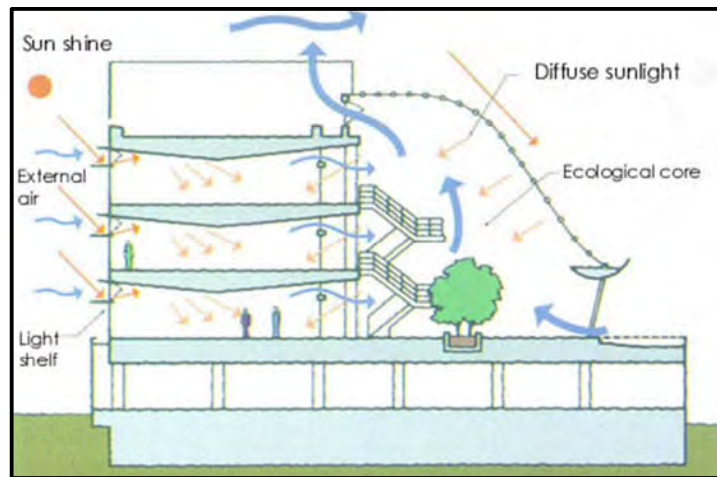
The following strategies are available to architects to ensure maximum natural day lighting is captured; side lighting, single bilateral and multilateral lighting, clerestory lighting, light shelves, top lighting, sky lights, courtyards, atriums and light wells. The following day lighting strategies are explained in architectural tools for well-being in appendix 4. An international example of a building that incorporates a variety of day lighting strategies to encourage worker well-being is the Tokyo Gas Earth Port building in Yokohoma, Japan. Before discussing the strategies used by the architects to ensure that maximum natural light was captured it is important to understand that this building is in the northern hemisphere.

This means that most of the sun will shine on the southern side as opposed to the southern hemisphere where it will shine mostly on the northern side. The building is orientated with its main axis along an east-west orientation which allows the building to take full advantage of natural lighting. In this case the architect has chosen to use an atrium with the use of both ribbon and clerestory windows which is highly effective in capturing natural light (Refer to figures 41, 42, 43 and 44) (www.ibec.or.jp/jsbd/C/tech.htm).



Figure 41: The Earth Port building takes full advantage of natural light in its atrium which faces the north (www.nikken.co.jp).

Figure 42: The interior working environment within the atrium shows diffused light entering the space which encourages a more pleasant experience on its building occupants ensuring that the interior building spaces are sufficiently day lit (www.nikken.co.jp).



SOUTH SIDE

NORTH SIDE

Figure 43 (left): Both windows and light shelves are used on the southern side to ensure effective natural day lighting (www.mech.hku).

Figure 44 (right): The atrium allows natural light to enter the office spaces on the northern side. On the south facade light shelves were used to provide solar protection from the direct light as well as to direct sunlight deeply into the building interiors. The yellow arrows indicate natural light (www.ibec.or.jp/jbd/C/tech.htm).

By combining a few day lighting strategies the architect has managed successfully to achieve a building that takes full advantage of natural light. The Earth Port precedent shows that it is not only the complicated, costly and mechanical strategies used to ensure natural lighting but also the less expensive and simpler strategies are just as effective.

4.2.1.2 Solar Shading

The choice of day lighting strategies allows architects to capture an abundance of natural light, however direct light can cause discomfort heat gains and glare. Therefore in maintaining occupant well-being architects also need to consider the choice of solar shading devices. A variety of different forms of solar shading exist each with its own characteristics, advantages and disadvantages. It is the architect's role in determining which type is best suited for the requirements depending on the nature of shading required. Solar shading is used to reduce heat gains and glare and to create an interior environment that is more suitable to the well-being needs of the building occupants. Due to the harmful nature that direct sunlight has on well-being and performance, architects need to use solar shading devices that control direct rays where necessary. Depending on the orientation of the facade the use of space will determine what the best solar shading device is necessary (Phillips 2004, p. 30 - 31).

Their effectiveness depends on the device used, the orientation on which facade they are placed on and the country that they are used in. Solar shading devices can also enhance the visual qualities of architecture and can create rhythm, patterns, textures and the shadows they cast on a particular facade or floor (Ching 2008, p. 1.18). The basic types of solar shading are vertical and horizontal devices which are used as well as egg crates, brise soleil, shutters, awnings and roof overhangs. The aesthetics and the means of shading will depend on the solar shading device used and architects need to consider its importance. The preceding shading devices are illustrated in appendix 3.

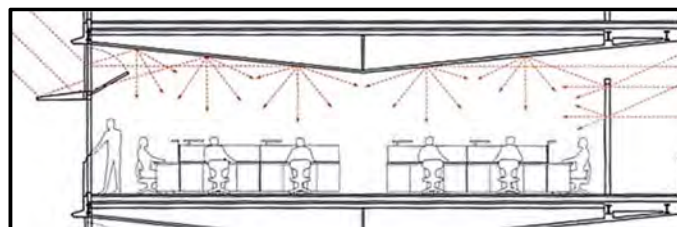


Figure 45: The Earth Port building makes use of light shelves to provide solar protection as well as allowing natural light to reflect onto the sloped ceiling which then disperses the light evenly throughout the interior space (<http://www.mech.hk>).

4.2.2 NATURAL VENTILATION

Natural ventilation in architectural design relies on both wind and thermal buoyancy as driving forces. It is these forces that are used to create the desired thermal environment and to rid the air of undesired contaminants Kleiven (2003, p. Preface). Fresh air, like fresh water, is a fundamental human need. People are healthier, work more effectively, and are more engaged when their places of work or habitation are naturally ventilated. The need for natural ventilation plays an important part in the well-being of building occupants. The discussion on Sick Building Syndrome creates an image of how a building can affect ones well-being with regards to stale polluted air and extremes in temperatures.

An international example of a building that incorporates a variety of natural ventilation strategies to ensure thermal comfort levels and constant fresh air is the Tokyo Gas Earth Port building in Yokohoma, Japan. The building's aerodynamic form allows it to scoop in fresh external air into the ecological core (atrium) and induce a natural ventilation process for the entire building. From the southern side (figure 47) the use of ribbon and clerestory windows allows natural ventilation into the building. The three levels of office spaces make use of three quarter high partition walls which allows the air to cross ventilate through the office and back into the atrium. Once there the hot air is then drawn out the top of the atriums clerestory windows through the stack affect. This allows the building to breathe.

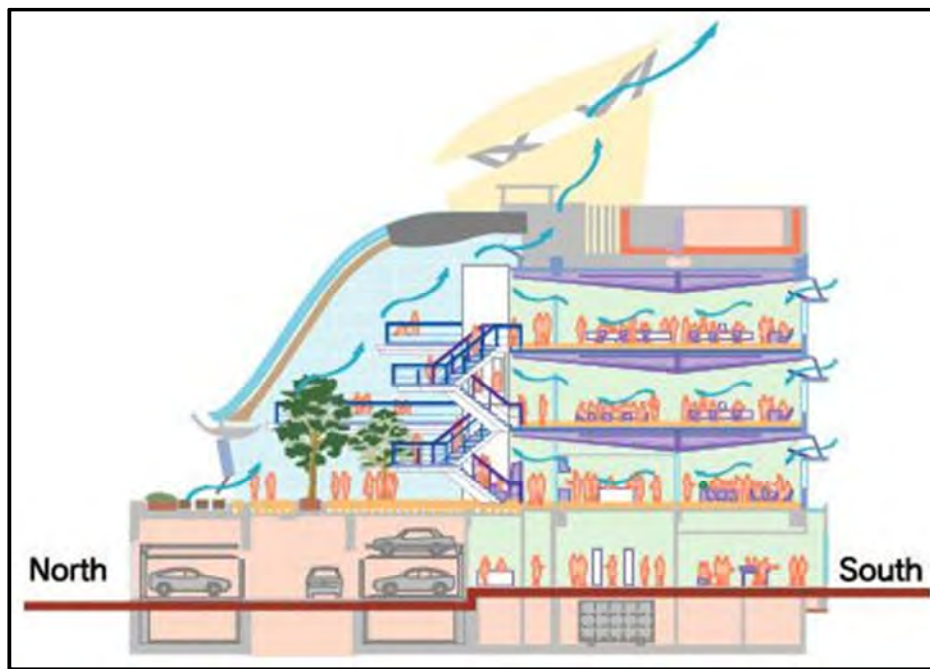


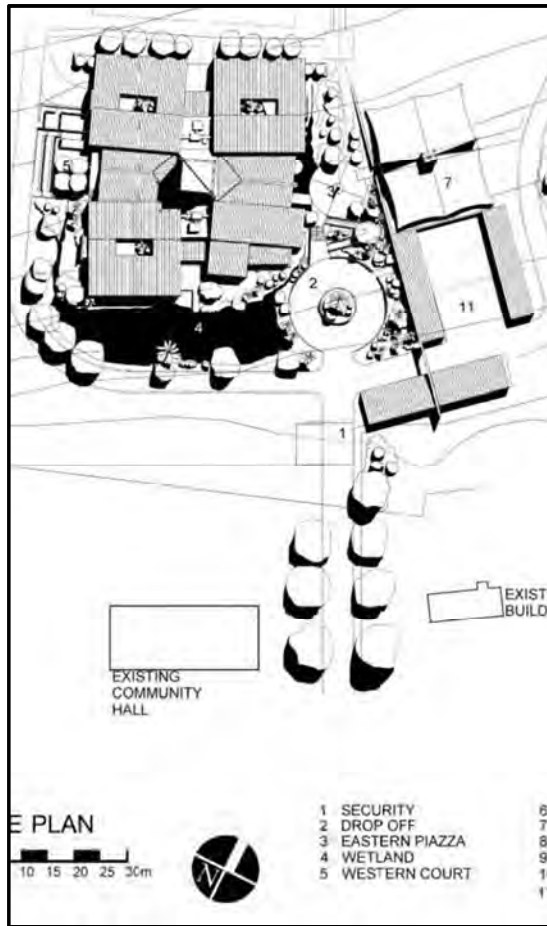
Figure 46: Section illustrating in blue arrows the natural ventilation process. Natural ventilation is also accelerated by the chimney effect of the ventilation tower regardless of the wind conditions outside (www.ibec.or.jp/isbd/C/tech.htm).



The use of the atrium, wind tower and the strategic placement of the ribbon and clerestory windows has allowed this building to successfully achieve natural ventilation allowing the whole building to breathe, controlling thermal comfort levels and getting rid of unwanted contaminants in the air. Thus ensuring a healthy and productive work environment for the buildings occupants (www.ibec.or.jp/jsbd/C/tech.htm).

Figure 47: Image showing the atrium with the clerestory windows located at the top and the office partitions which allow for cross ventilation to take place above them (www.ibec.or.jp/jsbd/C/tech.htm).

Natural ventilation is an important Biophilic element. Humans were not designed to live in closed environments although we may be able to exist there we cannot stay there for long as negative physiological effects will be experienced. The movement of fresh air through space changes everything. Not only does it provide fresh air but it alters our perception of temperature and changes a static environment into one of subtle movement. Natural ventilation also brings the world into our environments through scents that are carried by the breeze. Interior materials and design elements that respond subtly to air movement should be used to enhance the experience of natural ventilation. The importance of fresh air and the thermal comfort of environments is important when creating spaces for the well-being (Pollack 2006, p. 39). The purpose of natural ventilation in buildings is to provide occupants with good indoor air quality as well as to give building occupants the desire to control their thermal comfort and lastly it has an impact on energy savings (Allard 2005, p. 195).



A local example of a building that ensures maximum ventilation and day lighting is the Africa Centre for Health and Population studies in Somkhele, Kwa-Zulu Natal designed by East Coast Architects. The building design is a tremendous achievement in the way the architects have created the building form to achieve maximum ventilation and daylight. The main building is fragmented into four research office pods which surround a central cruciform area that is primarily dedicated to social and interactive spaces. One of the key elements used by the architect is the use of the courtyards which are situated in the middle of each of the four research pods allowing all the spaces within the entire building to receive both natural ventilation and lighting. (<http://www.eastcoastarchitects.co.za>)

Figure 48: Site plan showing the four research pods with the central internal courtyards. One can see the central space which takes the shape of a cruciform and in the centre the water tower is located (www.eastcoastarchitects.co.za).

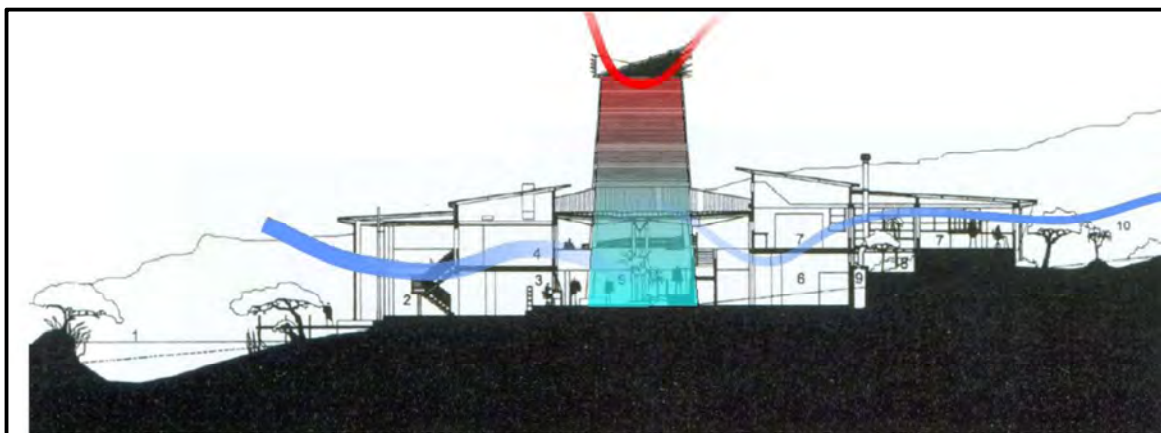


Figure 49: The central water tower acts both as a local landmark and a water tower to ensure that all the warm air that gathers within the building is drawn out through the stack effect (Butcher 2009, p. 46).



Figure 50 (left) and figure 51 (right): The images above shows one of the four research pods with the centrally located courtyard which allows an abundance of natural light and ventilation into the interior work environment. Although timber slats were used in these courtyard areas to provide solar protection, the image clearly shows that if a person was working at the work station in figure 50 they would be adversely affected by direct day lighting. This further emphasizes the need for architects to provide sufficient solar control otherwise the well-being of the building occupants will be compromised. However operable windows allow for occupant control over their environments (www.eastcoastarchitects.co.za).



Figure 52 (left), figure 53 (middle) and figure 54 (right): Deep overhangs on the north elevations and timber louvre shading devices are used on the eastern and western facades to reduce solar heat gain on the internal spaces. The solar protection used here works effectively (www.eastcoastarchitects.co.za).

It is important that architects strive to create buildings that make use of natural ventilation elements. Architects should make use of wind scoops, double facades, wind towers, atriums, chimneys as well as ventilation openings in the facade to achieve natural ventilation in their designs. In some instances a combination of the above mentioned elements are used to ensure effective ventilation. However the most common natural ventilation methods are "*wind variation-induced single-sided ventilation, wind pressure-driven cross-ventilation and buoyancy pressures-driven stack ventilation*" (Allard 2005, p. 136). The above mentioned ventilation methods and elements are explained in more detail in appendix 3.

4.2.3 WATER

"Water is not just a vital element in our lives; it can also be experienced in a whole variety of ways. It creates different kinds of atmosphere and moods that appeal to our feelings" (Dreiseitl & Grau 2001, p. 10).

It is one of the most evocative, universally shared symbols of life and is a powerful Biophilic attribute. Due to its nature, humans are instinctively drawn to water as a source of survival, as well as for aesthetic and recreational pleasure (Pollack 2006, p. 39).

4.2.3.1 Water and its Impact on Well-being:

The sound of flowing water can instil feelings of relaxation by masking unwanted noise. Water also has a cooling effect within a space through evaporative cooling, in this sense it acts as a natural humidifier. It further has tremendous affects in the interior environment as it emits negative ions into the air which naturally clean the air from pollution and acts as a visual relaxant. From this, one can realize the emotions that water instils as well as the physical effect it has on human's experience of space. Water can be used as a visual relaxant, it can mask unwanted noise and it can enhance the sensory experience through space. Water has healing properties that relive stress, helps people to relax and enhances their well-being. By using water features, ponds and fountains architects can improve the quality and experience of internal environments. Water needs to become an important part in built environments for the benefit of people who use these spaces and work and live within them. (Sanders 2011, p. 46)



Figure 55 (left): Paley Park in Manhattan, New York provides a space where the waterfall provides a dramatic focal point and a buffer to the sounds of city noise and creates a sense of tranquillity and privacy in comparison to the high levels of noise in the surrounding city. These other areas are so loud that the noise can actually raise one's blood pressure and make people more stressed even though they are unaware of it (www.shiftncsu.wordpress.com).



Figure 56 (right): A water tunnel created at Lima, Peru that encourages people to interact with it 74

4.2.4 PLANTS

"Trees, wall, ground and roof planting improve urban air. They filter dust, absorb toxins, reduce VOC volatilization, and moderate temperature and humidity as well as re-oxygenating it. Only 1.5 m² of grass can replace all the oxygen you breathe. A full sized tree (even in an atrium) can provide eighty people with fresh air. It would take this tree a day however to deal with the CO₂ produced by driving your car for 10 minutes" (Day 2002, p. 47).



Figure 57 (right): Blue Roof Health Care Centre in Wentworth, Kwa-Zulu-Natal. Natural light is admitted through the transparent roof sheets which provide a positive experience of nature in the internal central garden court. As illustrated the use of plants in the internal environments can bring new life to these spaces as well as the many psychological and improved health benefits they offer (www.eastcoastarchitects.co.za/project_pdf/BLUE-ROOF.pdf).

As stated by Papers (2008, p. 3) plants can dramatically improve the indoor climate, some indoor trees are big enough to provide shade, further all plants contribute to the cooling of the interior air through evapotranspiration. Papers astonishingly states that indoor plants and a good natural ventilation system in buildings can reduce the temperature by 2-3 degrees in comparison to that of the outdoor temperatures (Papers 2008, p. 3). Plants have the natural ability to orientate their leaves towards the source of light. This can ensure that direct sunlight penetrating into the buildings interiors is intercepted by the leaves creating dappled, diffused light which makes its way into the building adding to the atmosphere as well as creating shadows that complement the visual appeal that plants can give (Papers 2008, p. 4).



Figure 58 (left): The three images above are of The Institute for Forestry and Nature Research Centre in Wageningen, Netherlands. The gardens created serve the building occupants with social and recreational spaces. They are primarily designed as an extension of the workplace and are used for experiments as well as meetings (<http://behnisch.com/projects/22>).

Figure 59 (middle): The offices are located just off the gardens and have both doors and windows opening directly onto them encouraging building occupants to control their own thermal comfort and to interact with the outdoors (<http://behnisch.com/projects/22>).

Figure 60 (right): Outdoor seating areas encourage interaction within the pleasant environment created by the atrium. The atrium and all its plantings have a positive impact on the well-being of the building occupants (<http://behnisch.com/projects/22>).

Secondly, plants have the ability to reduce dust, carbon dioxide and indoor air pollution in the interior environment. Plants moderate the climate around themselves for their own well-being. Papers (2008, p. 6) mentions that according to studies conducted plants can reduce

dust by up to twenty percent. This keeps building environments cleaner, reduces allergies and enhances air quality and hygiene (Papers 2008, p. 6).

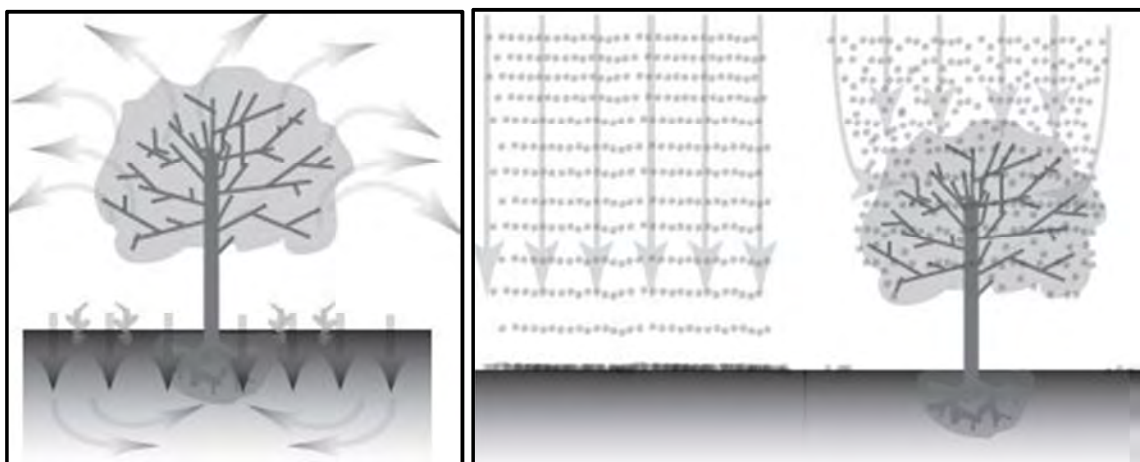


Figure 61 (left): The image depicts the process of evapotranspiration which is the process in which water moves through the soil and then is transpired by the plant which results in cooler air being produced (Papers 2008, p. 4).

Figure 62 (right): The image shows the affect that plants can have on attracting dust and reducing it (Papers 2008, p. 6).

When carbon dioxide is present at high levels drowsiness and lack of productivity increases. Plants have the ability to recycle carbon dioxide with oxygen through the process of photosynthesis which enhances the quality of air. As mentioned earlier Sick Building Syndrome ensures that the air is highly contaminated with a variety of pollutants which is released from building materials and human activities. Plants have the ability to remove many of the pollutants ensuring that the air is healthier for building occupants (Papers 2008, p. 7-8).

"to ensure sustainability of the urban environment, satisfying the 'triple bottom line' of environmental, social and economic considerations, it is expected that indoor plants will become standard technology - a vital building installation element, for improving indoor air quality" (Papers 2008, p. 8).

Lastly, plants have the ability to absorb sound therefore they can be used as acoustic materials within buildings. It has been proven that plants are effective at diffracting, reflecting and absorbing sound. Plants scatter and diffuse sound and when the sound produced is at a higher frequency the plants will reflect the sound towards another surface which absorbs the noise, such as that of the soil (Papers 2008, p. 9).

4.2.4.1 Plants as an Architectural Tool for Well-being:

"Nature in our lives is not optional but essential. We need it for our emotional health and well-being, and we need it for planetary health as well. It is not a thing or a place that we periodically visit but a surrounding condition, an ideally ubiquitous context that delights, relaxes, soothes, replenishes, inspires, and uplifts us in our daily urban lives. It is all around us, and we live in it." (Beatley 2011, p. 16).

There are a variety of methods that architects can use creatively to incorporate planting and vegetation both on the exterior of the building and in the interior environment. Such methods are green roofs, vertical gardens, planting, pots, courtyards and atriums.

4.2.4.2 Green Roofs:

Green roof tops are considered to be an important Biophilic strategy which has many remarkable benefits.

- A vegetated roof has a much lower surface temperature than that of normal roofs, this helps reduce the heat island effect in urban areas.
- The increased insulation value of a vegetated roofing system can also help stabilize indoor air temperatures and humidity and reduce the heating and cooling cost for a building.
- Used to provide pleasant, easily accessible, outside spaces with views.
- The combination of soil, plants and trapped layers of air within green roof systems can act as a sound insulation barrier.
- In dense urban environments there is often a lack of green space for residents. Roof gardens and roof top parks provide important green spaces to improve the quality of life for urban residents.
- Reduce storm water run-off by 50 to 90%, minimizing the impact on existing sewer systems. (Beatley 2011, p. 119-123)



Figure 63 (left): Durban, South Africa depicted as a concrete jungle, which contributes to the heat island affect ([www .grantpitcher.co.za/architectural-photography](http://www.grantpitcher.co.za/architectural-photography)).

Figure 64 (right): Portrays an imaginary city whose roof tops are all green. This is what cities should look like from above. This would immediately improve the quality of life ([www.world changing.com/archives /010211.html](http://www.worldchanging.com/archives/010211.html)).

Many cities around the world are greening their roofs. In Germany ten percent of all roofs are green, and in some areas such as Switzerland, Toronto and Tokyo laws require that certain sized roofs are to be green (www.worldchanging.com). However in many cities around the world these laws are non-existent. It is therefore the architect's task to make the correct decision and go green.

4.2.4.3. Vertical Gardens:

Vertical gardens are another method that can be employed to produce oxygen, remove pollutants, reduce energy consumption, tackle the urban heat island affect, retain storm water and can be visually appealing (Beatley 2011, p. 122). Beatley (2011, p. 123) reinforces the experience of a vertical wall by stating: *remarkable thing about this wall is just how magical its effect on passerby seems to beit is seemingly impossible for pedestrians to walk by the wall without interacting with it in some way...They stop to touch it, to gaze at it..*

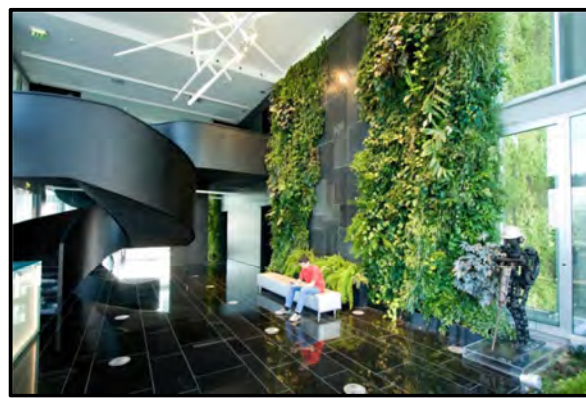


Figure 65 (left): A vertical garden wall in Paris (www.digitallearningfoundation.org).

Figure 66 (right): Vertical garden walls can also be used in the buildings interiors as demonstrated here (www.theverticalgardener.com).

4.3 OPPURTUNITIES FOR SPONTANEOUS INTERACTION WITH NATURE

Biophilic design encourages the integration and free flowing movement between interior and exterior spaces, creating an outdoor feel as well as visual access to the outdoors. Biophilic design views both the site and the built form as a series of interior and exterior spaces that are woven together in a tapestry. By integrating the natural elements of the site into the form of the building, people are able to experience unique relationships between the exterior and interior (Pollack 2006, p. 39).

Most built environments provide limited sensory experience when compared to Biophilic design which deeply engages all of the senses. It is not a passive experience to the users but rather an experience that reminds one that they are alive and a part of the life on earth. The previously discussed attributes all directly enhance our sensory connections to the natural world (Pollack 2006, p. 40). Using Biophilic attributes correctly a more meaningful architecture can be created that ensures environments are stimulating, pleasant to be in and most importantly enhance well-being. Biophilic design can further reduce stress and increase focus and concentration.

"In biophilic spaces, patients recover more quickly, students learn better, retail sales are higher, workplace productivity goes up, and absenteeism goes down. Sometimes the differences are up to 15 or 20%, which is huge (and retail sales can increase by a staggering 40% just from day lighting)" (Accessed at: www.vanseodesign.com/web-design/biophilia-effect/).

Children benefit from the interaction with nature physically, mentally, morally and emotionally in their development (Haque, Knight, McLellan, Tai 2006, p. 2). There is strong evidence that nature, in its changing and growing state, increases intelligence. Studies have been conducted that show that neural connections in the brain increase and become more complex when people or animals are surrounded by dynamic environments such as those that are provided with nature. However the opposite applies where children deprived of nature rich environments tend to lack energy and are often more prone to violent behaviour. It is through interaction with the social and physical environment that children build on knowledge and understanding. (Haque, Knight, McLellan, Tai 2006, p. 10-11).

Buildings and the sense impressions that we get from the surroundings influence our emotional life and ability to learn. Consequently, buildings provide experiences which

influence the activities, communication, social gathering and well-being of people (www.designshare.com/index.php/articles/aesthetics-and-learning/).

The theory of Biophilic design proves to be important in creating environments that promote well-being. It is by using nature in public spaces that Biophilia can enhance the experience and create opportunities for people to interact.

4.4 BUILDING MATERIALS AND FINISHES FOR WELL-BEING

"On the whole, people do not look at architecture, nor at materials. They breathe it in. It provides an atmosphere, not a pictorial scene" (Day 1990, p. 113).

"In town and in country an ever-spreading ugliness assaults our eyes, ever increasing noise assails our ears. New and often hazardous pollution of the air and water offends our noses and threatens our very bodily wellbeing. We seem no longer to trust the messages of our senses, nor heed their warnings. Ours is a society in which we are attempting to plan and manage the physical environment, but in the process we are either punishing or neglecting man's senses" Barr (1970, p. 1).

4.4.1 Importance of Building Materials:

According to Van Wyk (2009) building materials can be grouped into two sources, natural and synthetic materials. Natural building materials are those that are unprocessed or require minimal processing by a manufacturer. Such materials are stone, wood, thatch, clay, brick, blocks, concrete, metal, glass and ceramics. Synthetic materials, however, require a great deal more energy and involve high processing. The use of synthetic building materials and finishes release and outgas pollutants. Examples of these materials are synthetic plastics such as vinyl tiles, cement compounds and natural fibre composites. Generally speaking the more natural the material is and the least processing involved, the least impact it has on the environment and the least toxins that the materials gives off in the interior environment. (Van Wyk: 2009, p. 191-197)

According to Augustin (2009, 84) Biophilic design emphasizes the use of natural materials that are native to the site and the surrounding areas over artificial materials. In Biophilic design the careful selection of interior materials is of utmost importance, as is avoidance of using endangered local natural resources. Local natural surface materials (floors, walls) should also be used to further connect the interiors to nature and the site (Pollack 2006, p.

41). This is said to be part of the Biophilic design strategy which recognizes "*the important relationship between human beings and their natural environments*" (Augustin 2009, p. 84). By using natural materials that are from nature architects are able to mimic nature, either overtly or subtly and this has positive physiological impacts on building occupants (Augustin 2009, p. 84-85).

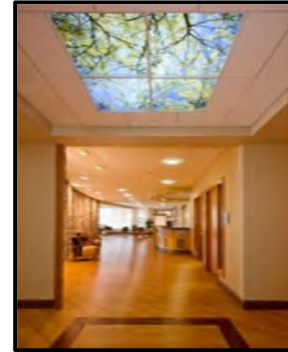


Figure 67 (left) and figure 68 (right): Image depicts the Shawona Medical Centre in Shawona, America reception area which incorporates many natural materials, which is a Biophilic design strategy (<http://www.kahlerslater.com>).

It is important that architects do not rely solely on ventilation systems to maintain good quality indoor air. They can improve the air quality by the careful selection of materials that have toxic finishes eliminated (Mirkin 1996, p. 21). It is important to consciously select building materials that are non-toxic and ecological for interior environments (Mirkin 1996, p. 85). Resource depletion and energy consumption are becoming more evident in the production and transportation of building materials. Currently many building materials are becoming scarce. It is not only the raw materials needed to produce them but also the energy needed to manufacture them. Pearson (1989, 128) significantly states that if present trends continue some of the most commonly used raw materials and energy sources will become exhausted in approximately thirty years from now (Mirkin 1996, p. 85). Biophilic design therefore encourages a careful selection of materials that use less energy and considers the depletion of natural resources.

A wide range of low and no VOCs building materials are available which include less polluting paints, adhesives, caulks, wood products, carpets and sealants. Particular care should be exercised when materials are used in large quantities throughout the building, such as those used for walls, floors and ceilings as they cover the most surface area and can

therefore contribute to the highest outgas of pollutants. It is also important to consider the treatment of natural materials as some timbers are treated with chemicals to ensure durability and prevent rot and insect attack. In this case choose untreated products or cover all surfaces and edges with laminates, low VOC paints or varnishes as these finishes act as barriers or sealers from the out gassing of harmful toxins within materials (Day 2004, p. 64). Materials should have the following qualities: perform for human comfort, manufactured locally and have reduced environmental impact (have low embodied energy; from harvesting to manufacture, to delivery of goods to the site, to construction, to lifecycle energy usage, to preventive maintenance) (Heath 2009, p. 175).

4.4.2 Materials and their Relationship to Well-being:

"Materials are raw ingredients of art, but they affect our emotions", (Day 1990, p. 112).

The selection of low or toxic free materials is not the only aspect to consider when selecting materials for the well-being of building occupants. Every material has its own character and quality. For instance wood is made from trees. It is natural and people perceive wood to be warm and cosy, inviting and welcoming in building interiors and is never uniform in pattern as every wood contains different grains. Bricks and stones have physical appeal as they give off texture, a sense of touch and create human scale. Glass is transparent, brings in light and therefore it is inviting to building users as spaces feel bigger than they actually are. Glass creates a far more dynamic experience and allows one to feel at one with the surrounding environment creating an indoor-outdoor relationship. Whereas steel is perceived to be solid and cold and gives off a feeling of strength. Plastic is perceived to be smooth, shiny and reflective, which is uniform and is alien in comparison to other natural materials that are full of texture and never have the same patterns. Concrete is perceived as being monotonous, monolithic, hard wearing and industrial. Each material has its own unique characteristic which will give off different visual impressions and emotions as they are unique in shape, size, texture and colour. Figures 69& 70 provide an example of a building's interior that uses natural materials such as wood. It will feel lighter, more airy, warmer and be more welcoming to the user due to its colour and physical properties and textures. Whereas a building interior that makes use of concrete (Figure 71, 72 & 73) or steel will feel cold, hard and uninviting (Day 1990, p. 112-113). It is important to consider the characteristics of a material and the emotions and visual impressions they can have on building users. Depending

on the design and the purpose of a building, consideration must be given to the selection of building material to have a positive impact on human experience. People are most likely to interact and be happier in an environment that captures them and uplifts their spirit.



Figure 69 (left): Sean Godsell's living room in Melbourne, Australia portrays the use of natural materials (brick, stone and timber) which give off warm and inviting colours which connect the materials and the space to nature (<http://www.tenthandstark.com>).

Figure 70 (right): The Visitor Centre in Quebec, Canada portrays how wood can be used in architecture to create a more welcoming, warmer atmosphere, with the use of glass that gives it its openness and transparency linking it to the outdoors (www.worldbuildingsdirectory.com).



Figure 71 & 72 (left): External Images showing a house in Kyoto, Japan using concrete as the predominant building material. The building appears to be more monolithic, colder and less inviting than the two buildings above due to the material choice (www.trendir.com).

Figure 73 (right): Due to the interior selection of material the house feels very heavy, confined and cold, almost as if you were in a jail (www.trendir.com).

4.4.3 Building Finishes: Impact of Colour on Well-being:

Research has proven that both colour and light are the dominant factors in manmade built environments. Together their impact influences peoples psychological reactions and physiological well-being (Manhke 1987, p. x). Light creates colour and is considered to be a form of energy that affects body function as well as influencing the mind and people's emotions (Manhke 1987, 1). Colour also influences our estimation of volumes in architectural space, weight, time, noise and temperature (Manhke 1987, 10 & Augustin: 2009, p. 53-55). It is important for architects to understand the psychological effects of colour on individuals as one is able to use colour in the most appropriate way to enhance the well-being of building occupants passing through or using a particular space.

According to Manhke (1987, x -xi) both colour and light affect humans on both a visual as well as a non-visual basis. One can describe the visual basis as relating directly to the aesthetics of a space, how people perceive shadow, light and colour. Whereas the non-visual basis explores the impact colour can have on building users and how designers can use colour as a powerful psychological tool that can influence people's reactions, emotions, mood, vitality and energy. Colour affects muscular tension, heart rate, respiration, brain wave activity as well as other functions of the nervous system (Venolia 1988, p. 57 & 59). Certain colours evoke specific emotions when viewed in a specific environment, such as lack of concentration, bad moods, nervousness, stress, visual problems, glare, anxiety, happiness, excitement etc. Colours either evoke pleasant or unpleasant reactions which in simple terms can relax us, energise us or have adverse impacts on our well-being.

4.4.3.1 Application of Colour and its Affects:

Colour has an effect on the perception of volume in architectural space. The lighter the colours used the increase in the size of the room. Conversely, darker colours decrease the apparent size of a room. Darker colours appear heavier and light colours seem less dense (Manhke 1987, p. 17 & Augustin 2009, p. 55). Colours also have an effect on the perception of temperatures in architectural space. Cool light colours are perceived to be cooler as opposed to warm brighter colours which are seen to be warmer. Lighter colours also reflect light more as opposed to darker colours which absorb light thereby adding to heat gain and loss (Manhke 1987, p. 19). It is important to consider the benefits of using the correct colours in architecture, depending on the space and its purpose. However, it must be emphasized that

a building should have a variety of colours as the psychological power of one colour throughout a building will never satisfy all of the needs in an environment. A mix of calm and warm colours as well as accent colours are crucial in creating a stimulating environment (Manhke 1987, p. 20 -21).



Figure 74: Image shows both cool and warm colours. Warm colours such as red, orange and yellow stimulate activity and creativity by eliciting a warm, comfortable and exciting mood. Cool colours such as violet, blue and green are passive and calming; they reduce tension and increase concentration and bring in freshness and a relaxed feeling into space (www.asianpaints.com).

When painting a room it is important to use colour contrasts rather than one monotonous colour. Research has proven that the eye requires any given colour to be balanced by a complementary colour. Complementary colours (figures 75 & 76) further provide a psychological balance of warmth and coolness of colours (Manhke 1987, p. 27 - 28).



Figure 75 (left): Complementary colours are opposite each other (<http://willkempartschool.com>).

Figure 76 (right): Shows a bedroom using complementary colours. The colours contrast one another and create a vibrant and dynamic feel (www.asianpaints.com).

4.4.3.2 Analysis of the Dominant Hues:

Colour has an impact on building occupants. Not only does it produce mood associations and subjective and objective impressions but it also influences the estimation of weight, volume, time, temperature and noise in architectural environments. According to Manhke (1987 & 1996) numerous studies have been conducted that show common affective values of certain hues. This has made it possible for the architect or designer to assess mood-tones of colours with reasonable accuracy. The major colour hues, red, orange, yellow, green, blue, purple, black and white are presented in the table below through substantial research (Manhke 1987, p. 10-13 & Manhke 1996, p. 53-54). **Table 1:**

COLOUR	HUE EFFECT, SYMBOLISM	IMPRESSIONS	CHARACTERISTICS
RED	<u>EFFECT</u> Arousing Exciting (bright red) Stimulating (red) Lively <u>SYMBOLISM</u> Fire, Life, living, combat and war, love.	<u>POSITIVE:</u> Passion, strength, activity, warmth, energy, excitement <u>NEGATIVE:</u> Aggressive, intense, rage, blood.	Most dominant and dynamic of all colours. It draws attention and over rules all other hues. Red has the longest wavelength and is a powerful colour that appears to be nearer than it is and therefore grabs our attention first. Raises our pulse rate.
ORANGE	<u>EFFECT</u> Exciting (bright orange) Stimulating (orange) Cheering (light orange) <u>SYMBOLISM</u> Colour of nature in autumn, sunsets.	<u>POSITIVE:</u> Jovial, lively, energetic, sociable, warmth, fun. <u>NEGATIVE:</u> Blustering, frustration	Orange is less imposing than red. Has almost no negative cultural or emotional associations. Aesthetically lighter hues of orange may appear cheap, without vigour.
YELLOW	<u>EFFECT</u> Cheering <u>SYMBOLISM</u> Signifies enlightenment, expansion, sunlight, communication	<u>POSITIVE:</u> Sunny, cheerful, radiant, welcoming, high spirited, friendliness. <u>NEGATIVE:</u> Glaring	Yellow is considered to be happiest of all colours. Radiates warmth, cheerfulness and inspiration. Yellow wavelength is fairly long and stimulating. The correct yellow will lift our spirits and self-esteem.
GREEN	<u>EFFECT</u> Retiring (light green) Relaxing (green) Refreshing (blue, green) <u>SYMBOLISM</u> Represents power of nature, of life, yet it is the symbol of mould.	<u>POSITIVE:</u> Tranquil, refreshing, quiet, natural, peace, balance. <u>NEGATIVE:</u> Common, blandness.	Green represents a withdrawl from stimulus. Green strikes the eye in such a way as to require no adjustment and is therefore considered to be the most restful colour to the eye.

COLOUR	HUE EFFECT, SYMBOLISM	IMPRESSIONS	CHARACTERISTICS
BLUE	<u>EFFECT</u> Retiring (light blue) Relaxing (blue) <u>SYMBOLISM</u> Wetness, cleanliness, odourless, sea, sky.	<u>POSITIVE:</u> Calm, secure, comfortable, sober, cool. <u>NEGATIVE:</u> Depressing, cold.	Psychologically the cool and relaxing nature of blue is a direct opposite to the warmth and excitement of red. Red seems vulgar at times while blue exhibits a noble character. Blue calms the mind and aids in concentration, its serene and mentally calming. It is considered to be the world's favourite colour.
PURPLE	<u>EFFECT</u> Subduing <u>SYMBOLISM</u> Magic, wealth, mysticism.	<u>POSITIVE:</u> Exclusive, luxury, truth, quality. <u>NEGATIVE:</u> Lonely, mournful, suppression.	Purple may evoke delicacy and richness or appear unsettling. Purple is considered to be the least visible wave length.
WHITE	<u>EFFECT</u> Reflection (white) Sterile <u>SYMBOLISM</u> White represents goodness, means clean.	<u>POSITIVE:</u> Light, sterility, holiness, innocence, simplicity, hygiene. <u>NEGATIVE:</u> Coldness, unfriendly, bland.	White is the most reflective colour. In effect it reflects the full force of the spectrum into our eyes. It is a strain to look at with intense light. It is the cleanliest, most hygienic and sterile of all colours.
BLACK	<u>EFFECT</u> Heaviness (black) Dark (pitch black) <u>SYMBOLISM</u> The night sky, power of darkness, the fear of the unknown, death.	<u>POSITIVE:</u> Sophistication, glamour, elegant. <u>NEGATIVE:</u> Oppression, coldness, heaviness, darkness, terror.	Black heightens other colours and makes them appear more luminous. However it absorbs light, makes rooms appear smaller than they are and very heavy and confined.
GREY	<u>EFFECT</u> Quiet, calm (pure grey) <u>SYMBOLISM</u> Industry, man-made structures of concrete and metal.	<u>POSITIVE:</u> Neutral, quiet, calm <u>NEGATIVE:</u> Dampness, depression, lack of energy, tedious.	Grey lacks energy and has no will of its own to make a statement. In colour design it takes on the characteristic of the adjacent colour.

*Table adapted from Manhke (1987 & 1996).

4.4.3.3 The Impact of Colour in the Interior Environment:

As discussed previously each colour has its own unique symbolism and effect on building occupants. They each have their own characteristics and convey different impressions. However when applied to the interior environment the location of a particular colour may have a great impact influencing a room's character, the reactions it will create and the impacts it has on building occupants psychologically. Colour can be applied to the floor (bottom), the walls (sides) and the ceiling (top) and it is therefore important that one considers the physiological and emotional affects both positive and negative that different colour hues can have on each of these important surfaces. It is important to understand the impact that a particular colour can have on each different surface. For instance a colour that compliments the floor may not necessarily compliment the walls or the ceiling (Manhke 1996, p. 66). **Table 2:**

COLOUR	CEILING	WALLS	FLOOR	COMMENTS
RED	Intruding, disturbing, heavy.	Aggressive, advancing.	Conscious, alert, pompous.	This colour is seldom used as the dominant colour on walls, it is more of an accent colour.
PINK	Delicate, comforting	Aggression, intimate, too sweet if not greyed.	Delicate, unfamiliar in this location.	Generally considered feminine and used in feminine spaces. Used for walls in a girls bedroom.
BROWN	Oppressive and heavy if dark.	Secure, assuring if wood.	Steady & stable.	Great difference between browns of natural materials in comparison to that of paints.
ORANGE	Stimulating, attention seeking.	Warm, luminous.	Activating, motion orientated.	Orange is cheerful, lively and sociable.
YELLOW	Light (lemon yellow), luminous, stimulating.	Warm (if towards orange) Exciting to irritating (if highly saturated).	Elevating, diverting.	High visibility used in industrial environments for safety purposes.
GREEN	Protective (reflection can be unattractive).	Cool, secure, calm, reliable, passive, irritating if glaring.	Natural, soft, relaxing, cold (if toward blue-green).	Creates an environment for meditation and tasks involving concentration.
BLUE	Cool, less advancing (if light), heavy & oppressive (if dark).	Cool & distant (if light), encouraging and space deepening (if dark).	Inspiring feeling of effortless movement, (if light).	Tends to be cold and bland if applied to large areas, especially in passages.

GREY	Shadowy.	Neutral to boring.	Neutral	Should be used in conjunction with another colour.
WHITE	Empty, no design objections, helps to diffuse light, reduces shadows.	Neutral to empty, sterile, without energy.	Touch inhibiting (not to be walked on)	Has many physiological effects.
BLACK	Hollow to oppressive.	Ominous, dungeon like.	Odd, abstract.	Hardly ever used in large expanses.

*Table adapted from Manhke (1987 & 1996).

4.5 ARCHITECTURE AS A TOOL FOR SOCIAL INTERACTION

"Architecture is not Art, at least as we use the word today," declared Canadian architect Moshe Safdie" *Architecture is building environments well*" (Sommer 1983, p. 11).

4.5.1 Sociopetal and Sociofugal Layouts:

Building layouts that are designed to actively discourage interaction are called sociofugal (Sommer 1983, p. 42). The experience one gains from a sociofugal layout can be considered stark, cold, institutional and resistant to personalization or change (Sommer 1983, p. 42). However building layouts that achieve the opposite are called sociopetal. Sociopetal buildings are buildings that intend to bring people together, to allow people the opportunity to socially interact with one another (Sommer 1983, p. 42). According to Sommer (1983) these environments embody warm colours, absorbent surfaces and movable furnishings which allow for numerous possibilities of personalization and change. In light of the research topic it is important that one creates spaces that are sociopetal as they encourage social interaction which ultimately enhances the well-being of people.

4.5.2 Opportunities for Social Interaction:

Deasy (1974, p. 48) stresses the fact that human species seek social contact with one another. He continues to say that the way in which social spaces are designed will have a positive or negative effect on the interaction that takes place. There are two factors that play an important role in creating opportunities for people to meet and interact. These factors are proximity and configuration (Deasy 1974, p. 48). Proximity plays an important part in

achieving social interaction, it is important that the functional distance of space is more crucial than the physical distance. Desay (1974, p. 54) states that *"If proximity is the crucial factor in determining the group of people we are the most likely to meet, configuration is the crucial factor in determining how well the meeting comes off"*. In other words the public spaces people pass through within buildings on a common day to day basis are the spaces where they are likely to engage in contact with other people and have the opportunity to interact. Those public spaces that are located across the road or in other buildings are less likely for an individual to interact in as they are not on a common route. This brings about the second factor that is crucial - configuration. In public spaces that are in close proximity, the configuration of seating can play an important part in creating opportunity for people to interact. Traditional benches are placed in long rows. The problem with this configuration is that this makes it hard to talk to anyone but the person next to you. However an example of good design configuration has been proved to have movable chairs, so people can arrange their seats to best suit their natural preference for face to face conversations or to be private (Deasy 1974, p. 52). Behavioural scientists have proved that design professionals still have plenty to learn about proximity and configuration and their influence on group behaviour (Deasy 1974, p. 57). To configure seating arrangements that encourage social interaction is far more important for the well-being of people than to have isolated seating places that prohibits interaction. Both proximity and configuration play a vital role in the success of creating opportunities for social interaction to occur.

Architects need to consider the social needs of people within buildings and provide them with opportunities to interact with one another. The following analysis mentions a few of the most successful opportunities architects can use in their designs to encourage social interaction if designed with passion and careful consideration for those who will ultimately use the space.

4.5.2.1 Balconies, Patios and Roof Gardens:

Balconies, patios and roof gardens are essential design elements to create spaces for social interaction to occur. Architects should consider the width and the space of balconies and patios to allow sufficient space for building users. Balconies and patios serve the purpose of creating outdoor spaces that people can escape to where mental relaxation is provided by the views, fresh air and natural light. These spaces can create excellent opportunities for social interaction to occur. Balconies further allow people to look down into other spaces or onto the street and this provides further opportunities for interaction. On the topic of roof gardens,

sometimes it is essential to provide some sort of activity or facilities that people can partake in or utilise as this encourages the social use of the roof. For instance in residential complexes the roof can be used for communal swimming pool and braai areas.

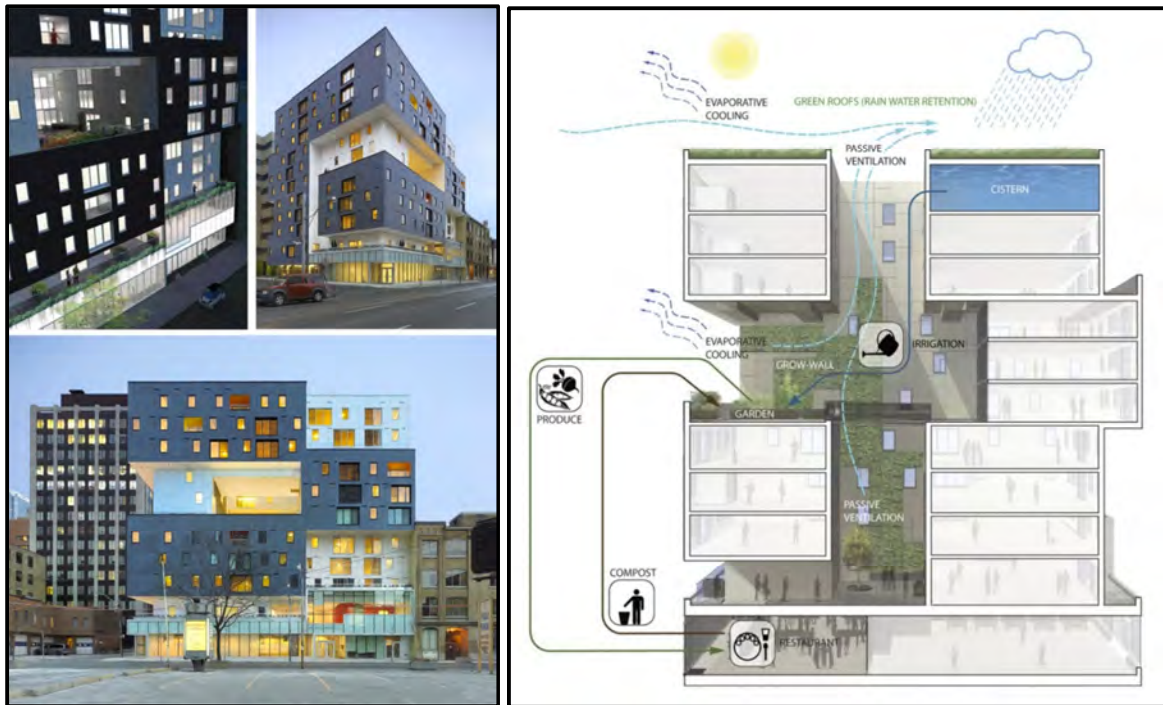


Figure 77 (left) and figure 78 (right): Richmond East Housing in Toronto, Canada is a great example of how the architect has manipulated the form and the massing of the building to create voids in the building mass which clearly defines and animates a dynamic public realm. (This can be seen in the building section in figure 78). This allows an abundance of natural light and ventilation to enter into spaces within the building which would not have been possible if the building was left as a solid mass. It has further allowed the building to create spaces for courtyards, roof gardens and balconies, giving the people who live within the building outdoor spaces that they can use and socially interact with one another forming a community within the building. The building's form has demonstrated an impressive response from the architect to create a building that considers the importance of its user's well-being and social interaction needs (www.archdaily.com).

4.5.2.2 Atriums and Courtyards:



Figure 79 (left): Tokyo Gas Earth Port building in Yokohama demonstrates how inspiring the interior environment can be using Biophilic design attributes. The staircases and balconies both overlook the atrium encouraging staff interaction and collaboration (<http://www.arch.hku.hk/~cmhui/japan/tokyo%20gas/gasin1.jpg>).

Figure 80 (right): Dells Children's Medical Centre, Austin Texas creates a courtyard that is to act as a healing garden and wellness retreat for kids. The courtyard makes use of Biophilic attributes which certainly enhance its experience and character. The type of facilities and activities provided inspires kids to play here and interact with one another (<http://www.jetsongreen.com/2007/12/first-leed-plat.html>).

Both atriums and courtyards can create attractive environments that can be used for several purposes. These spaces can be used for gardens, cafes, canteens, seating areas and so on. The most important thing to note about these spaces is that they can facilitate and encourage social interaction. However in both atriums and courtyards it is important to consider the arrangement of seating places as well as the character and atmosphere created within the space as this will determine the level of interaction and use that takes place.

4.5.2.3 Staircases:

It is important for architects to consider social interactive spaces along common routes used within a building. Both staircases and passageways are always used on a day to day basis and these elements should create opportunities for social interaction to occur. The widening of passageways or recesses within them can create interesting spaces for people to take a break, relax and interact. The landings on staircases should be increased in width to allow users to take breaks along them and possibly to interact and admire the view where made possible. In

some instances stair landings could form quite large areas that could possibly have seating which could also encourage use and interaction.

4.6 CONCLUSION

Many of the causes of Sick Building Syndrome are the result of poor architectural design. The lack of thought and interest in the design of many buildings has had a negative impact on the well-being of building occupants. It seems evident that many architects consider artificial ventilation and lighting strategies are sufficient to use in their designs. However it has been proven that inadequate ventilation systems and artificial lighting has a negative impact on building occupants and has many side effects and consequences. Ideally the building designed for a specific purpose should meet the needs of the building occupants and users and should enhance the environment to positively contribute to the primary purpose of the buildings function.

The theory of Biophilia in architecture in relation to well-being has provided a variety of important attributes that architects should be aware of and should use in their designs to have a proven positive impact on well-being. Architects have the ability to capture natural daylight into the interior spaces of buildings. This has numerous benefits as it can provide significant energy savings as well as recognising the recent concerns over global warming. Further, day lighting affects the psychological and physiological health of building occupants and their well-being. Windows also connect the building users to nature. It is imperative that architects use day lighting as a strategy for building illumination if they are to consider the general well-being of building occupants. Light can allow architects to manipulate it in a variety of ways that offers the occupants a dynamic, sensory and enhancing experience. Architects may not be able to meet this need in the design of every space and every building for a number of reasons but it is important that it is utilized where possible as its effects are essential. Where problems exist architects could provide exposure to natural lighting elsewhere within the building. It could be incorporated into atriums, courtyards, balconies and outdoor roof gardens where occupants have access to sunlight.

Natural Ventilation also plays a major role in the success of a building in achieving occupant well-being. The use or combination of a variety of natural ventilation methods is a necessity that architects should consider in architectural design to create effective means of ensuring that the building is naturally ventilated at all times. As discussed Sick Building Syndrome has

the ability to adversely affect building occupants and its impact on them has negative effects. Architects therefore should be aware of the impact that Sick Building Syndrome and poorly designed architectural environments have on its occupants and this should encourage and motivate them to use natural ventilation methods and elements to ensure the well-being of the building users.

One of the key elements that architects need to consider in building design for social interaction and well-being is to avoid deep plans. The massing and form of a building plays a crucial role in determining this and architects need to create voids within the building mass and form to create spaces that allow for effective natural ventilation and day lighting to enter into the various parts of the building. These voids created are perfect opportunities to create atriums, courtyards and balconies, whereby architects can also create spaces that encourage social interaction to occur. Within these voids in the form and massing of the building it is important that architects utilise the various day lighting and ventilation tools mentioned in appendix 4. A combination of these tools will ensure that effective measures are taken to achieve successful ventilation and day lighting which is critical in achieving occupant well-being.

Creating voids within building forms and mass gives architects the opportunity to play with these spaces. The uses of Biophilic elements such as water and plants in these spaces help create environments which further enhance the well-being of building occupants. These spaces are perfect for architects to create opportunities for people to socially interact and get away from the many stresses encountered on a daily basis to provide for relaxation which is necessary in any architectural environment.

It can also be concluded that water plays a valuable role in healing people from stress, through its calming and tranquil properties. As well as its ability to purify the air, reduce unwanted noise and act as a visual relaxant that stimulates the journey through space impacting on the five senses. Architects need to consider the impact that water can have in enhancing the interior environment and the effects it has on well-being by exploring the properties that water holds. It is therefore important to include water in designs as it generates positive feelings and experiences within an individual.

Healthy air is vital for the well-being of building occupants. As discussed plants, water and sun play a major role in purifying air (Day 2002, p. 51). Grinde & Patil (2009, p. 2334) state

that the use and visual presence of plants in the built environment can further reduce stress, as responses to aesthetically pleasing visual stimuli can release tension. It is clear that the presence and the ability of plants to purify, cool the air, attract dust, absorb air pollutants and produce oxygen has a positive impact on building occupants and they play a vital role in determining human well-being.

The careful selection of colours as well as the placement of colours (floors, walls, ceilings) is crucial in terms of the success of the architectural space. Colour is a major factor in establishing a room's experience, it contributes significantly to the emotional loading that a space portrays as well as the ambience. Architects should consider the selection of colour as it can enhance their designs. When colour is selected with thought to every space within a building it can aid in supporting the function of the building and the tasks that are to be performed within it. It can also avoid overstimulation and under stimulation to building users. It further contributes to the well-being and experience of the building users and does not create negative emotional and physiological effects that impact on the role that the building was designed for. Architectural spaces that capture the ambience of the space are aesthetically pleasing and thus can create environments that positively impact on the building users by leading to restfulness, pleasantness, enjoyment and excitement which all contribute to their well-being. It is important that architects advise clients on the choice of colours to create environments that have no physiological implications on the building users.

Mahnke states: *An architectural space should not just have a colour (for colour's sake), but rather its appropriate colour that fits the purpose of the building or space*" (Mahnke 1996, p. 131).

The materials selected are important in the way they represent themselves to the users and how these users perceive the building through material selection. The more natural the building material selected the more positive these environments will appear to building users and the healthier the indoor air quality. It is important to select natural materials over synthetic materials as they contain fewer toxins, pollutants and are more environmental friendly. Careful consideration should be given to selection of materials that are VOC and toxin free over materials that are toxic and place the well-being of building occupants at risk. It has been clearly stated that both materials and building finishes do have physiological impacts on well-being. Consideration and care should be taken in selecting appropriate building materials and finishes.

It is imperative that architects design sociopetal spaces within buildings to bring people together and allow them the opportunity to interact. Both proximity and configuration have an impact on the spaces created and these need to be considered when designing successful places for interaction. There are numerous opportunities which architects can use to their advantage to create spaces for interaction. Balconies, patios, roof gardens, atriums, courtyards and staircases can be turned into lively environments that encourage this interaction through activity, facilities and good architectural design.

This chapter has highlighted the destructive qualities that the built environment can have on both social interaction and well-being. To avoid Sick Building Syndrome careful selection of building finishes and materials, natural day lighting, natural ventilation, water features and planting must be considered. It is important that through good architectural design environments are created that enhance well-being. Perhaps more importantly the architect needs to create a healthy environment that is conducive to its primary purpose. Through the study of Biophilic attributes in architecture, architects are able to understand the positive impact these attributes have on the occupants and users well-being and they should therefore be considered in their designs.

CHAPTER FIVE: KEY PRECEDENT STUDY

5.1 INTRODUCTION/JUSTIFICATION

The following analysis will explore how through architecture one can create an environment that enhances well-being and social interaction. The analysis will be based on the following criteria:

- Concept and general layout.
- Biophilic Elements: Natural lighting, ventilation, planting and water features.
- Building materials.
- Spaces for social interaction.

These four points were explored and an analysis was formed. By doing so the researcher was able to gain relevant knowledge on how positive architectural environments are capable of enhancing ones well-being and creating opportunities for social interaction to occur.

5.2 MICRO CONTEXT: GENZYME CENTER IN CAMBRIDGE, MASSACHUSETTS.

5.2.1 Location and Purpose

The Genzyme Centre is a commercial office building that houses a biotechnology company that consists of offices, employee's cafeteria, library, gardens, conference centre, training rooms, cafes and public retail space. The building is located in Cambridge, Massachusetts (United States of America) and is framed by the Charles River, the MIT campus and the East Cambridge neighbourhood. The building is part of a ten acre development for pedestrian life that offers an urban, mixed use community that consists of offices, residential buildings, hotels, restaurants, theatres and retail uses. The Genzyme Building and the surrounding context form a cultural, recreational and retail hub. The building is one of 30 buildings to achieve LEED platinum rating (<http://leedcasestudies.usgbc.org/images.cfm>).

5.2.2 Concept and General Layout

The initial concept was to design the building from the inside working environment and then to the overall structure of the building considering an environmentally friendly design. The design was to create an exceptional environment that would enhance productivity in the workplace. The concept was to break down the building volume and deal with the challenge of a large floor plate through a pattern of deep cut outs and terraced internal openings that would allow for social interaction and natural light to enter the building (figure 81). A large central atrium formed the start of the concept (<http://leedcasestudies.usgbc.org/images.cfm>).



Figure 81: One of the floor plans illustrating the cut out and atrium concept. Open plan offices, gardens and patios allow for easy collaboration and social interaction to occur with a truly dynamic internal environment created with the use of natural light, plantings and trees (<http://www.solaripedia.com>).



Figure 82: The main stairs at the entrance into the building leads into the central atrium area surrounded by trees and an abundance of natural light filters into the space (<http://www.solaripedia.com>).

5.2.3 Biophilic Elements

By incorporating Biophilic elements into the design of the Genzyme Centre the architects were successfully able to create an environment that certainly enhances the users well-being and encourages collaboration and social interaction to occur. The Biophilic elements used will be explored and will form part of the analysis of this precedent.

5.2.3.1 Natural Lighting

The building's central atrium acts as a light shaft which allows for light to penetrate deep into the interior spaces. Day lighting is one of the most important features of the building. Seventy-five percent of workers receive natural daylight. Day lighting is enhanced through a combination of innovative strategies that allow the light to penetrate deep into all parts of the building. These strategies include the glass shell, heliostats, skylight, reflective panels and surfaces, prism chandeliers, and a light wall. The building makes use of several day lighting strategies to capture light efficiently without causing discomfort and glare (<https://sustainability.tufts.edu/downloads/Genzyme.pdf>). These strategies are listed below and are crucial in the success of the users well-being:



Figure 83: Section through the building showing the open plan offices surrounding the central atrium. The central atrium is the key element used to allow an abundance of light into the building. The section further explores the use of garden and patio balconies which allows the users to have views both internally and externally and allows social interaction to occur. The dynamic cut outs and use of plants throughout the building can clearly be seen (<http://www.solaripedia.com>).

HELIOSTATS: The building makes use of mirrors which are located on the roof that follow the path of the sun during the day. They reflect daylight onto mirrors which then reflect and direct the light down into the atrium.

SKYLIGHTS: These allow an abundance of natural light to enter into the atrium.

LIGHT WALL: The building incorporates a light wall which is made of polished aluminium strips that help distribute the daylight within the building.

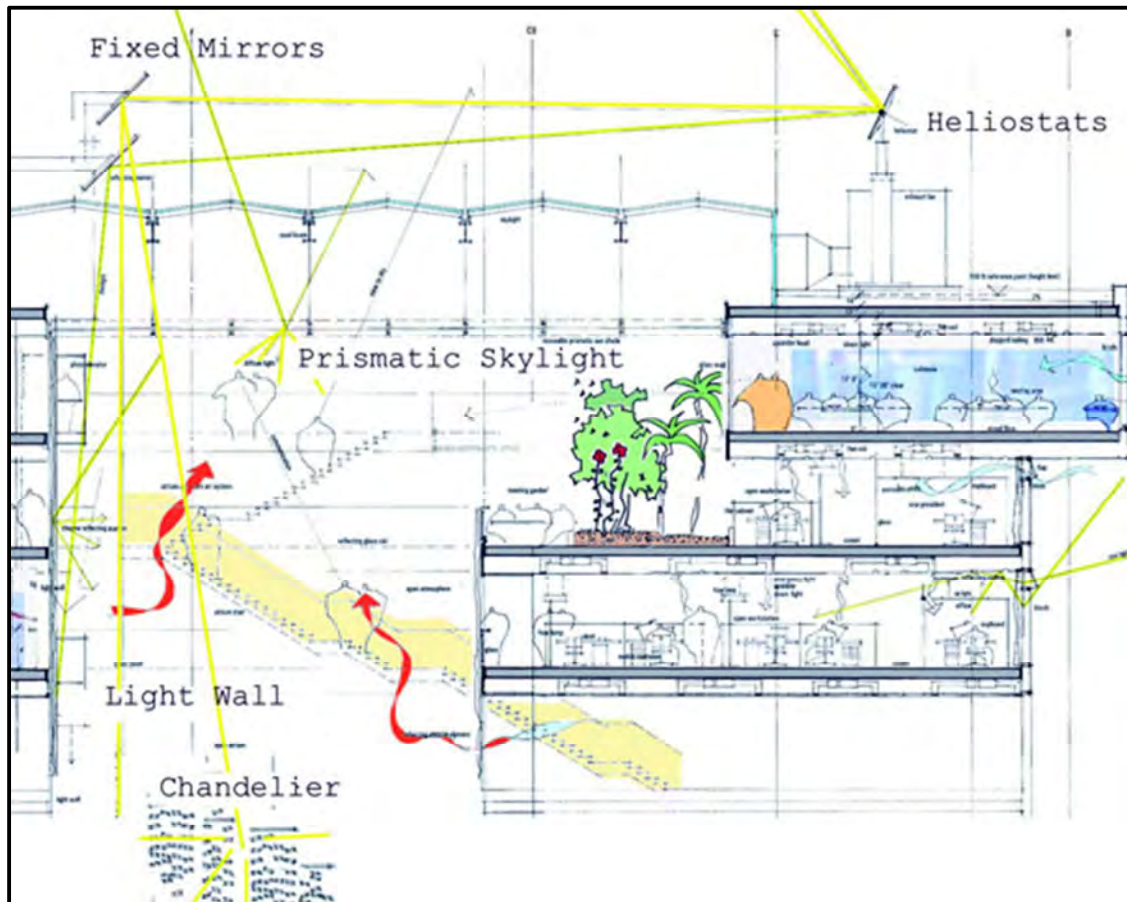


Figure 84: Heliostats are large mirrors located on the roof of the Genzyme Center. They follow the path of the sun throughout the day, reflecting sunlight onto a set of fixed mirrors which then direct light down into the atrium, where a skylight allows the sunlight to enter the building. A central component in the light enhancement system, the chandelier, consists of 768 animated prismatic plates that distribute light from the skylight into interior spaces throughout the building (<http://www.solaripedia.com>).



REFLECTIVE CEILING

PANNELS: Reflective ceiling panels help direct light deeper into the building.

CHANDELIERS:

A central component in the atrium which further enhances the distribution of daylight is the chandelier which consists of 768 animated prismatic plates that distribute light from the skylight into interior spaces throughout the building.

Figure 85: Throughout the central atrium illustrated, the Genzyme Centre maximises natural light and views throughout the interior. One can see the use of indoor plants and the internal gardens which act as social meeting places (<http://www.solaripedia.com>).

PERFORATED BLINDS: Along the glass exterior of the building, computer controlled blinds automatically track the sun's position and open the blinds to desired angles. This allows light in whilst deflecting excessive heat gains (www.solaripedia.com).

5.2.3.2 Ventilation

The envelope of the building consists of a high performance curtain wall glazing system with operable windows on all twelve floors. Most of the exterior envelope is a double ventilated façade that blocks solar gains in summer and captures it in winter.

The central atrium acts as a return air duct that allows for fresh air to move into the atrium and up and out through exhaust fans that are located towards the top as well as the stack effect. The design of the building allows for occupants to control the temperature in their area by the installation of operable windows which allows for natural ventilation to take place (<http://leedcasestudies.usgbc.org/images.cfm>). With sophisticated and advanced technology the Genzyme Centre uses a state of the art air monitoring system that ensures the air is of sufficient quality. The building is designed to ensure sufficient ventilation standards and allow an abundance of fresh air to enter into the building environment which certainly enhances the well-being of the building users.

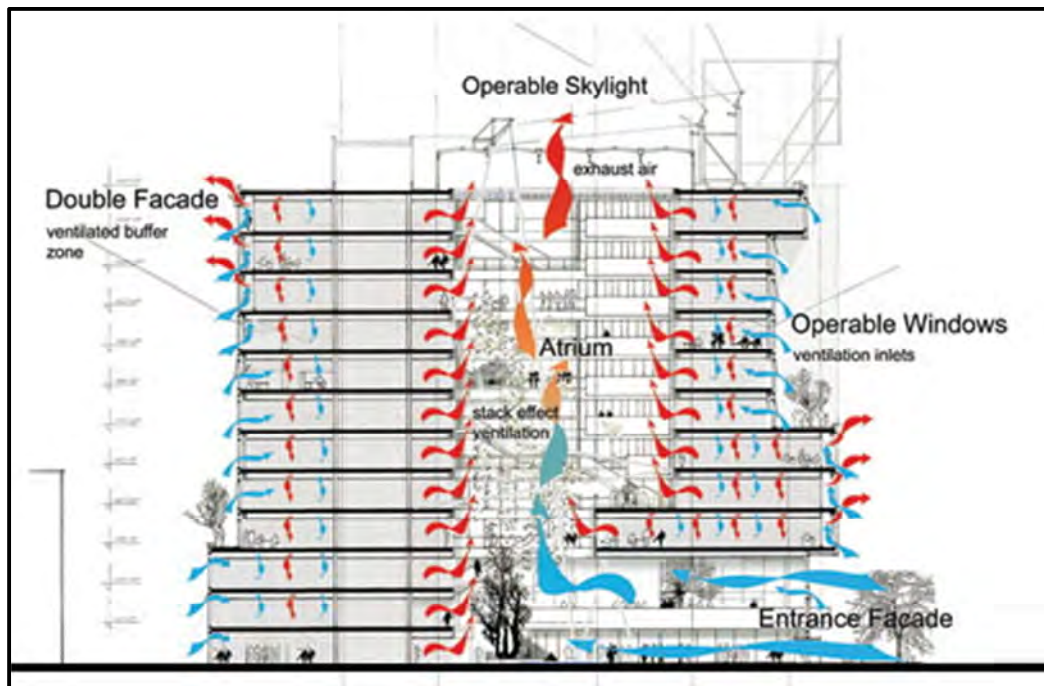


Figure 86: Section exploring the ventilation methods used within this building. Air enters the building through the operable windows and the hot air escapes into the atrium and out the top from the stack effect. Blue arrows indicate fresh cooler air coming in whilst the red arrows indicate the warm air escaping (<http://www.solaripedia.com>).

5.2.3.3 Planting

The Genzyme Centre makes use of a green planted concrete roof in most parts of its roof which reduces the environmental impact. Indoor air quality was of high importance to the design team as it is one of the main ways of ensuring that the building is a healthy work environment for employees.

The indoor plants and trees also help to naturally regulate humidity levels, prevent pollution and provide oxygen for the building users. Eighteen interior gardens and seven accessible outdoor garden terraces increase the workers connection to nature and contribute to better indoor air quality. Both the plants and the moving art structures (chandelier) with the reflective pool on the first floor make the indoor environment seem more natural and dynamic (<http://sustainability.tufts.edu/downloads/Genzyme.pdf>).

5.2.3.4 Water and Water Features

Besides the reflective pool located on the first floor, the building could have incorporated more water features which would have had a more profound effect on the interior environment, further enhancing the dynamic experience of the building and the well-being of building occupants.

5.2.4 Building Materials

The materials selected were chosen for their low emissions, recycled content and local manufacturing with 75 percent of materials being used from local sources (<http://leedcasestudies.usgbc.org/images.cfm>). This selection of materials respectfully considers the impact that they can have on the environment as well as on the well-being of the building occupants. Low emission materials allow for a far healthier environment.

5.2.5 Spaces for Social Interaction

Glass is used extensively in the open plan offices to permit views to the outside and into the atrium from all regularly occupied spaces. Eighteen indoor gardens and accessible outdoor patios are created to further enhance the occupant's connection with the natural environment and to allow for interaction of building occupants. Numerous spaces for interaction throughout the building are strategically placed to allow for employee interaction such as coffee bars, interior gardens and seating areas with balconies that overlook the atrium (<http://leedcasestudies.usgbc.org/images.cfm>).

The innovative use of day light brings up to 90 percent of natural lighting to the workspaces. The high proportion of open space naturally facilitates interaction among employees and the glass walls both internally and externally make the building transparent. Together these features create a bright and socially interactive atmosphere within the building (<https://sustainability.tufts.edu/downloads/Genzyme.pdf>).



Figure 87: View of the ground floor showing the openness created which allows all the spaces within the building to interact with one another. The exposed staircase and the cafeteria with its balcony create a social environment where all can enjoy (<http://www.solaripedia.com>).

Christoff Jantzen who was involved in the design of this building describes the atmosphere: *“There are all these views. It is communicative. You can wave to your colleague two floors down and across the central space. It is not so much about the details....it is a combination of how these elements come together as a whole”* (<http://greenbuildingelements.com>).



Figure 88: Indoor gardens allow for people to relax and take a break from work and gives them the opportunity to interact with other colleagues (<http://www.solaripedia.com>).



Figure 89: Glass walls allow for views over the city and create inviting meeting spaces throughout the building. (<http://www.solaripedia.com>).

5.3 CONCLUSION

The main points discussed have been successfully used throughout this building to ensure a healthy and pleasant environment that enhances well-being and social interaction. A recent survey was conducted to see how the employees felt about their work environment. The results are stated below:

"88% said having direct views and access to the interior gardens improved their sense of well-being." "72% said they feel more alert and productive as a result of the lighting features in the building" "58% said having the ability to control the temperature of their workspace improved the quality of their work environment" "75 percent said the building's clear glass design has increased their sense of connection with colleagues" "64 percent – informal meeting spaces facilitate collaboration" (<http://greenbuildingelements.com>).

The Genzyme Centre was designed with the employee's best interest in mind. The building provides an environment where people can work comfortably and productively and with greater focus and efficiency. Employees are able to enjoy an abundance of natural light, windows that open and the ability to control workspace temperature and light levels. The use of Biophilic elements and the careful selection of materials have certainly proved to enhance the well-being of building occupants. This building has created an outstanding example of how one can design a building that considers well-being and social interaction with minimal criticism.

CHAPTER SIX: CASE STUDIES

6.1 INTRODUCTION

The following section explores and analyses through the selection of case studies to what extent both local urban precincts (macro scale) and local buildings (micro scale) have successfully promoted and achieved a positive impact on social interaction and well-being of their inhabitants through architecture and urban design. Visits to local places and buildings within South Africa were undertaken to obtain a more intimate and personal view. The criteria selected for this analysis is listed below:

MACRO CASE STUDY: MELROSE ARCH

- Principles of New Urbanism
- Social Interaction (Street and Public Spaces)
- Biophilic Elements
 - Water and Water Features, Landscaping and Planting
- Image of the Environment (Identification and Orientation)

MICRO CASE STUDY: MUNICH REINSURANCE BUILDING

- Biophilic Elements
 - Dynamic Natural Light
 - Natural Ventilation
 - Water
 - Planting
- Materials and Colours
- Spaces for Social Interaction

Through the use of the specific research criteria the researcher was able to understand the advantages and disadvantages of each architectural environment in relation to social interaction and well-being. In many instances this allowed the researcher to obtain numerous design elements that can be used to enhance social interaction and well-being through urban and architectural design.

6.2 MACRO CONTEXT: MELROSE ARCH (JOHANNESBURG)

6.2.1 Justification:

The following case study was selected as a macro scale urban intervention that based its urban design on New Urbanism principles as discussed in chapter 3. The case study will put the New Urbanism principles to the test and see whether they have a positive impact on the architectural environment in light of the research topic. Further a study of the urban design of an architectural environment is undertaken to analyse what impact it has had on social interaction and well-being with the criteria mentioned in the introduction of this section. The analysis and information obtained from both a positive and negative perspective will aid in creating a list of design principles that can be used to create a successful architectural environment on a macro scale.

6.2.2 Location and Concept:



The Melrose Arch precinct is roughly triangular in shape and is situated in a low density suburb between Sandton and Johannesburg CBD on the M1 freeway. The site is easily accessible from all over Johannesburg. Corlett Drive bounds the site to the north and Athol Oaklands road to the left. Both of these roads have on and off ramps to the M1 freeway making the flow of traffic more efficient.

Figure 90 (left): Location Map showing the site and the surrounding context (www.googleearth.com).

The concept for the design of this precinct is based on the principles of New Urbanism (Chapter 3), which is based on medieval planning principles. It is these very principles of design that make Melrose Arch successful.

6.2.3 Analysis and Discussion:

When entering Melrose Arch one is immediately met with order. Every aspect has been well thought out and it is immediately evident that one is entering into a pedestrian dominated context. Melrose Arch is ordered around two main roads and orientated around two main squares. High Street is surrounded by mixed-use buildings that encourage the movement of pedestrians along the retail sides. Melrose Boulevard, the most prominent road, runs along the eastern boundary and is flanked by corporate offices creating connections to the access roads. This path creates a buffer to the M1 highway edge. Instead of creating large areas of parking which are both visually intrusive as well as being dead zones, street and basement parking is provided. The entire Melrose Arch development rests upon two levels of super basement which provides 1983 parkings for tenants and 2158 parkings for the public.

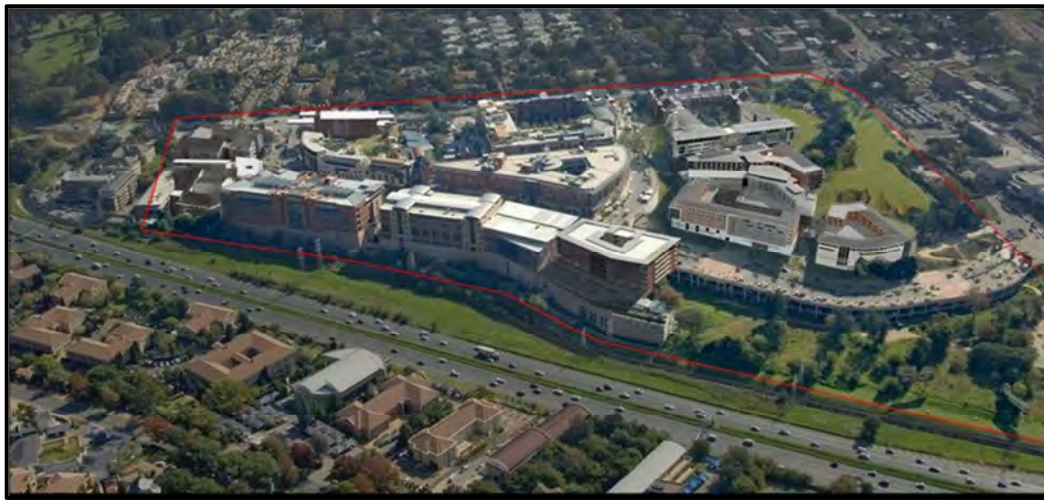


Figure 91 (left): Aerial view showing the high density development with the two storey basement parking (www.googleearth.com).

The remaining 200 parkings are carefully planned on ground level throughout the precinct. By creating a basement for the majority of cars Melrose Arch can be enjoyed and explored in a highly safe pedestrian environment. Melrose Arch can be seen as a social environment and as a whole it acts as a community and a place where people can eat, live, do business, enjoy a good conversation, interact and be entertained.

6.2.4 Principles of New Urbanism:

The principles of New Urbanism are discussed in terms of how successful they have been implemented at Melrose Arch.

WALK ABILITY: Melrose Arch encourages walk ability by close proximity of activities and also by creating a pedestrian friendly street design. The strict control by security and cameras allows for this to occur. The environment created allows for both people living and visiting Melrose Arch to use this precinct on foot.

CONNECTIVITY: Melrose Arch is made up of three main streets which form an interconnected street grid which is successful.

MIXED USE AND DIVERSITY: The combination of mixed uses is applied effectively in Melrose Arch. This has been achieved in both blocks and buildings. The careful consideration of use owes much to its success.

MIXED HOUSING: This principle was not considered and as a result only middle income to upper income apartments are available thus creating an elitist development that does not consider the needs of other socio economic groups.

ARCHITECTURE AND URBAN DESIGN: The architecture and urban design is of a high quality and complies effectively with this principle. This was made possible by the focus of aesthetics, comfort and creating a sense of place.

TRADITIONAL NEIGHBOURHOOD STRUCTURE: Melrose Arch successfully achieves this principle as it does have a discernable centre with a public space at its heart. Sufficient public space is provided and the planning of the streets and walkways has been very well thought out.

INCREASED DENSITY: Buildings are on average five to six storeys in height with close walking distances. Therefore increased density has been achieved.

SMART TRANSPORTATION: The precinct does encourage public transport by the means of providing bus stops and taxi ranks. However, the majority of the population comes to Melrose Arch by car.

QUALITY OF LIFE: Considering all the above principles Melrose Arch is a place well worth living in. The principles discussed lead to its success as an architectural environment that encourages both social and community interaction.

6.2.5 Social Interaction: The Street and Public Spaces

On street parking has been provided to create an environment where vehicular activity can co-exist successfully with pedestrian movement throughout the precinct and this supports street life vibrancy. Large pavements of up to five metre wide in some places with the use of urban furniture, seating places and trees further contribute to an environment that the pedestrians can enjoy. One of the critical aspects which create a vibrant street life that is filled with activity is the safety that is ensured and felt throughout the precinct. Melrose Arch is very secure as it has numerous manned patrols and has twenty four hour CCTV surveillance in just about every single place within this precinct. All parking and public areas are well protected by foot patrols and security guards throughout the precinct. Cobbles have been used instead of tarmac to create awareness to people driving that they are in a pedestrian environment and are to be cautious.



Figure 92 (left) and figure 93 (right): Restaurants spill out onto the square creating a vibrant, social environment (<http://www.imagine-group.com/melrosedb/melrose-map.html>).

Melrose Arch has created an environment that encourages social interaction through the many seating spots, the wide friendly pedestrian pavements, the constant interaction between pedestrians and people dining at the restaurants that spill out onto the pavements as well as the two public squares. This encourages a vibrant social atmosphere around the precinct where people from all walks of life can meet and mingle. This allows people the opportunity to interact as the precinct has been well designed to encourage social interaction to occur.



Figure 94 (left): Seating areas, restaurants and balconies evident in the image create for a socially interactive environment that enhances well-being (Author 2012).



Figure 95 (right): Shows a restaurant whereby patrons and pedestrians are able to interact with this common space (Author 2012).

One of the most successful elements of Melrose Arch is the way in which it successfully allows for social interaction to occur at many levels. From a macro level the urban design and layout of the precinct with the strategic positioning of the squares, allows for people to socially interact. The individual building blocks incorporate central courtyards which further allows for a more private interaction.

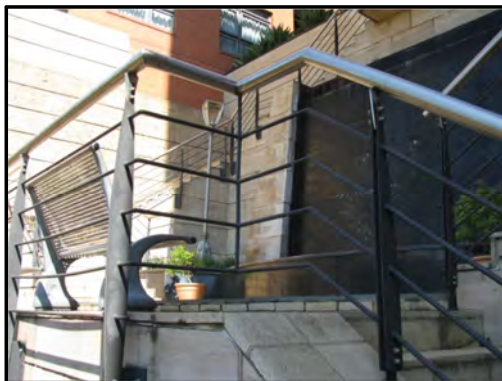


Figure 96 (left): Seating and open space provided on stair landings to encourage social interaction and resting breaks (Author 2012).



Figure 97 (right): Concrete seats located along retail pedestrian thoroughfares (Author 2012).

Even the architecture created provides a link between the people who use the buildings and the general public who are walking the pavements and partaking in activities in the squares. Balconies allow people to observe the squares and the pavements and also give people the opportunities to interact with people at street level.

6.2.6 Biophilic Elements:

6.2.6.1 Water and Water Features:

The lack of water features may be seen as a criticism of Melrose Arch as these features can create many positive associations. As analysed there are only two water features evident in the entire precinct and where the water features were located positive experiences can be related to them. This further emphasizes the disappointment of the lack of them and how beneficial they can be in urban environments.

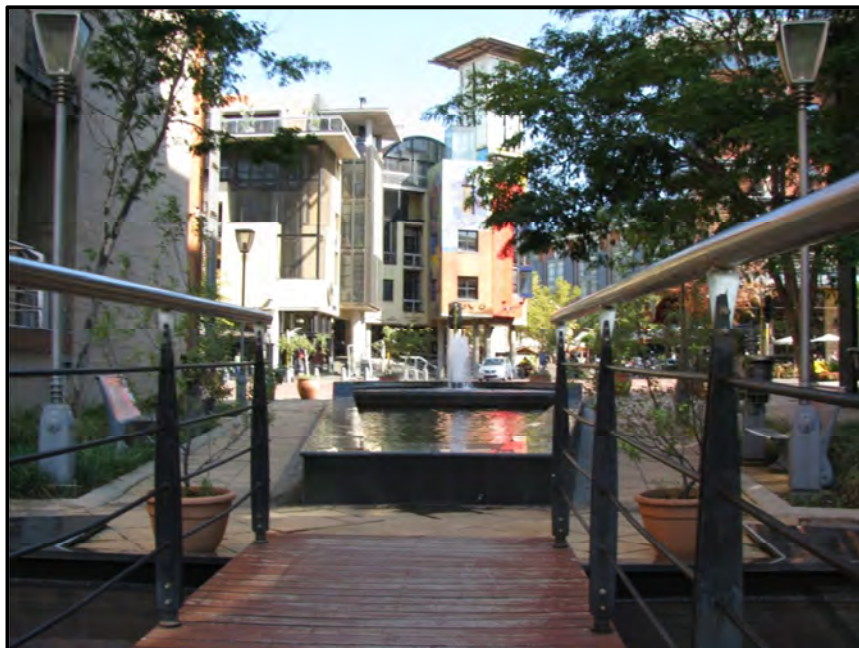


Figure 98 (left): The placement of both trees and seating by water features allows one to fully relax and enjoy the soothing and tranquil qualities that water offers (Author 2012).

6.2.6.2 Landscaping and Planting:

Most of Melrose Arch is hard landscaped although there are not large areas of greenery and vegetation. Careful thought has been given to the strategic placing of trees particularly where people walk to provide shade. The trees not only provide shade but they break the harshness of the urban environment and create human scale. Many of the above aspects that trees and greenery provide affect ones well-being psychologically as well as their overall experience. Providing contact with nature ensures there is a positive impact on the well-being of the users in the built environment. It is obvious from analysing the design of Melrose Arch that the architects and urban designers considered the well-being of the people who would use the precinct.



Figure 99 (left): Image shows a typical floor layout of a mixed use building that incorporates an enclosed landscaped courtyard (www.skyscrapercity.com).

Figure 100 (right): This image shows the landscaped courtyard mentioned in figure 99. The use of trees and water elements enhances the space and allows for people to relax and enjoy the beneficial atmosphere that these elements can have on its user's well-being ([http:// www.skyscrapercity.com](http://www.skyscrapercity.com)).

The corridors, pedestrian walkways and the streets are planted with trees and vegetation with the strategic placement of seating all around the precinct. This encourages people to take some time out from the general stresses that each day may bring. While resting, one can watch the pedestrians and experience some mental relaxation. The surrounding buildings are generally of human scale and in most instances the architects have provided human scale by making canopies over walkways. These also protect the users from the elements. The shop fronts are transparent, inviting people in. In the middle of shopping corridors the hard paving is broken up by the use of pot plants which also provide a little bit of nature throughout the

precinct. When walking around the precinct one gets a sense that people can just simply stroll and relax without a single worry. Private courtyards for the residents and office workers have been created in the middle of urban blocks. Within these courtyards the beautiful landscaped gardens and greenery allows people to be reminded of nature through the views and balconies created. These inner courtyards are soft and intimate and allow people living in Melrose Arch to escape from the vibrant street life when they feel the need to.



Figure 101 (left): Planter boxers liven up the space, provide shade and create a link to nature (Author 2012).



Figure 102 (right): Landscaping and trees provide shade for the pedestrians. Bollards separate the pedestrian walkways from the street to provide safety (Author 2012).



Figure 103 (left): One of Melrose Arch squares illustrating the landscaping, positioning of trees and concrete seats that enclose the square (www.google.com).

6.2.7 Image of the Environment: Identification and Orientation:



It is interesting to see that the squares within the Melrose Arch precinct are visually accessible from key positions in the grid. They are further assisted with local landmarks that creates a visual reference point that people are able to identify with and orientate themselves through the precinct. Melrose Arch is a very legible environment which aids the user in navigating and orientating himself within and around the precinct. The paths are successful as many of them lead to nodes such as squares which are highlighted by landmarks.

Figure 104 (left): The image portrays the vibrant coloured landmark tower which forms a visual reference to the square (node) located at Melrose Arch (Author 2012).

6.3 MICRO CONTEXT: MUNICH REINSURANCE BUILDING

6.3.1 Justification:

The case study was selected for its relevance in light of the research topic, incorporating the main themes discussed in this dissertation. The intention was to study this building through the relevant themes mentioned in the introduction and assess how this has created an environment that enhances well-being and social interaction through architecture.

6.3.2 Location and Concept

The building is located on a major arterial into the Johannesburg CBD, at number 47 Empire Road. The building backs onto Empire Road and has a tranquil stream and a ridge to the north which offers exceptional views into the natural flora (figure 105).

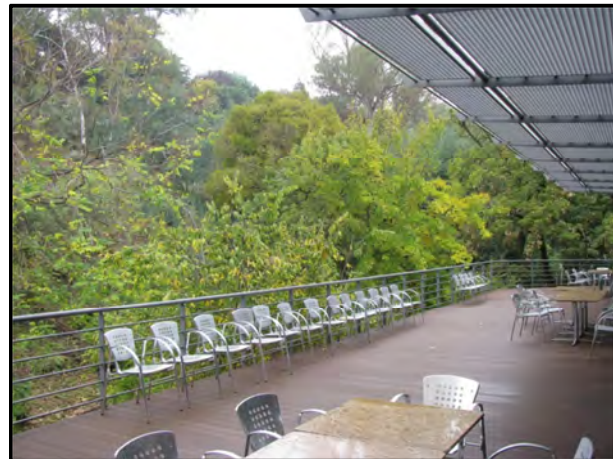
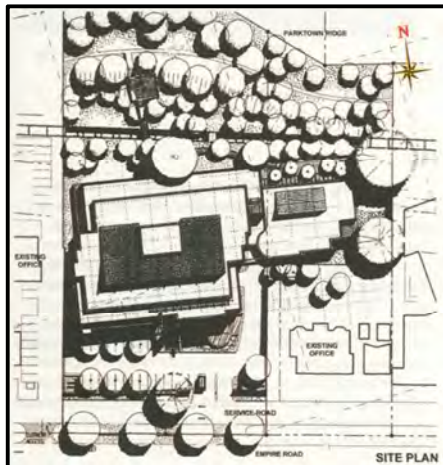


Figure 105 (left): Site plan with building surrounded by nature (SA Architect 1999, p. 47).

Figure 106 (right): View to the North with staff outdoor area (Author 2012).

According to the architect the concept developed from the client's commitment to green building design. The client's brief required a new head office comprising of five thousand five hundred square metres of office space, with a highly energy efficient design resulting in a building that addresses climatic control, life cycle costs as well as ease of maintenance and simplicity of operation.

6.3.3 General Layout:

One enters into the main reception, directly in front of the reception two interconnected atriums are present which are considered to be the breathing spaces of the building. The entire two storeys of office accommodation are planned around the atriums allowing workers to experience it. In general the office layouts are open plan divided with partitions.

6.3.4 Biophilic Elements:

The combination of architectural elements, combined with the overall setting of the environment, gives the building a balance between design and nature. The setting is inviting, welcoming and a relaxing environment to be in.

The orientation, mass, shape of the building and the type of fenestration all have a significant effect on the Biophilic elements discussed on the following pages. The office wing has depths of 13m combined with the atrium which enables the building to achieve effective and sufficient natural lighting and ventilation. The building depth and height was determined by the requirements to obtain effective natural lighting and ventilation.



Figure 107: The images show the importance of orientation, shape and mass in achieving a building that has the ability to enhance the well-being of the building occupants (SA Architect 1999, p. 47).

6.3.4.1 Dynamic Natural Light:

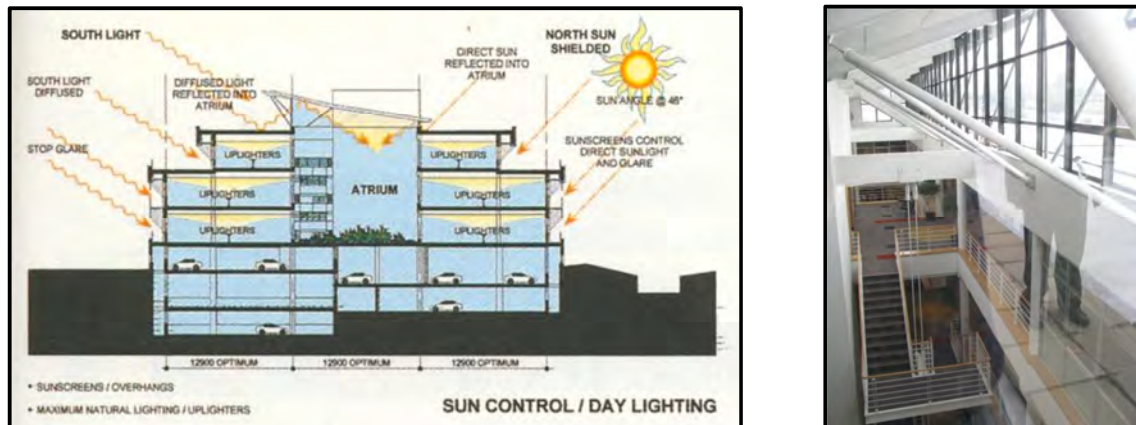


Figure 108 (left): Section illustrating day lighting and solar shading (SA Architect 1999, p. 47).

Figure 109 (right): South side clear storey windows allow an abundance of natural light to flood the interior space (Author 2012).

The architects have taken full advantage of a true north / south orientation that makes full use of natural light and offers spectacular views over the landscaped ridge, minimising exposure to the east and west facades. The strategic placement of fenestration type and size as well as the overhangs of the building structure and solar shading methods have been excellently integrated within the building. This has ensured no discomfort in the internal environment from uncontrollable heat and glare. The careful selection of fenestration and solar shading methods has allowed the building to receive as much natural light that is possible without affecting the well-being of the occupants. However, the main element that successfully allows light to flood the building interiors is the strategic placement and form of the roof which is a simple mono pitch. This allows light to penetrate into the building on the south side. South light is diffused and is welcomed in the buildings interiors.



Figure 110 (left): Northern overhangs and louvers prevent direct sunlight (Author 2012).

Figure 111 (right): Louvres located on the southern side (Author 2012).

6.3.4.2 Natural Ventilation:

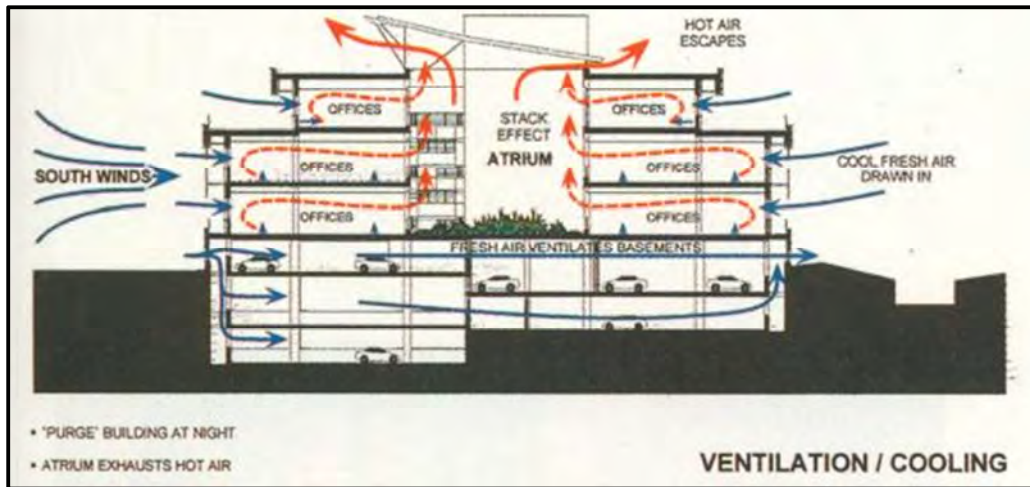


Figure 112: Section illustrating the natural ventilation system that the building takes advantage of. Blue arrows indicate fresh air into the building and orange arrows represent the warm air that is exhausted from the building through the stack affect (SA Architect 1999, p. 47).

The building's long narrow form allows it to take full advantage of natural ventilation methods. With atriums being centrally located, air is drawn in on the north and is entered on the south side by the south winds. The air then circulates through the office space and the atrium acts as a natural heat exhaust stack which allows the hot air to escape out the roof eaves at the top. The building takes full advantage of natural ventilation ensuring that a constant fresh supply of air is available. Windows along the north and south facades also allow building occupants to control the temperature in the internal environment. Double glazing was also incorporated to avoid excessive heat gains and loss.

6.3.4.3 Water:

It is a disappointment that water has not been incorporated into the internal environment. However, there are two water features located at the south side of the building which create a sense of peace and tranquillity when approaching and entering the building (figures 113 and 114). The water features which extend throughout the full façade on the south create a buffer from the unwanted noise that could be experienced from Empire Road. The sound of water truly enhances the connection with nature and the spirit of the place. The many benefits of

using water in the interior environment should have been incorporated and used to create an environment that is even more enhancing, relaxing and stimulating.



Figure 113 (left) and Figure 114 (right): From the time you step out of your car you are immediately met by the fresh smells of nature and the sounds of the water features and instantly there is a sense and feeling of peace and tranquillity before entering the building. As one walks around the site, or views it from the balconies or the many windows which have views out, one feels at peace and at ease within the setting (Author 2012).

6.3.4.4 Planting:

As one enters the building the flow of nature continues and its presence is felt strongly in the indoors by the two large atriums that are planted with vegetation and flooded with soft natural light. There is always a link to nature and to the surroundings so a person is constantly reminded of this sense of place. This link is important in the working environment as it keeps people calm and allows a healthy building environment which enhances productivity. There is no greater view than that of nature and in this case to be at ease and at one with the surroundings.



Figure 115 (left): One of the two interconnected atriums (Author 2012).

Figure 116 (right): View from staircase looking into an atrium (Author 2012).

The interior environment has a vast amount of vegetation with one or two trees located within the two atriums. Pot plants are further distributed throughout the building to provide a link with nature (figure 117). Indoor planting has numerous benefits on the well-being of building occupants as mentioned earlier on in this document. Through the interviews conducted and research undertaken in this dissertation it may be concluded that the use of plants in the interior environment certainly enhance the well-being of building occupants for a variety of reasons.



Figure 117 (left): Interior positioned pot plants (Author 2012).



Figure 118 (right): Exterior positioned pot plants (Author 2012).

6.3.5 Materials and Colours:

The materials, colours and textures chosen for the building's exterior makes use of natural textured materials such as sandstone and stone coloured slate tiles which blend into the natural surroundings. The material selection respects the spirit of the place and creates an architectural feeling that the building forms part of the surroundings and is at one with nature.

The interior selection of materials and colours creates positive spaces that allow an abundance of natural light, fresh air and tranquillity into the space. This creates an environment that is stimulating and productive to work in. This is exactly what the Munich building does with the majority of materials and colours being very muted and natural with accents and hints of brighter colours to contrast and create interest in the interior environment (figures 119, 121, 122, and 123).



Figure 119 (left): The choice of natural materials such as stone and the muted colours used create an environment that is pleasant to be in with accents of orange and green to create a subtle interest in the passageways (Author 2012).

Figure 120 (middle): Portrays the dominant exterior finishes which are natural and complement one another, whilst exploring different material textures which create interest (Author 2012).

Figure 121 (right): A typical example of the wooden flooring used in the offices with a contrast of stone creates a warm feeling that compliments the natural surrounding environment of the site (Author 2012).

The materials and colours chosen provide a relaxing warm environment that one can feel at ease with. Most of the materials are tactile and have textures to them so that they are more visually stimulating than smooth finishes. By creating different textures on the walls a sense of feeling and interest is created. In general the material and colour selection palette was very well thought out and certainly creates the right atmosphere for the type of function the building was intended for. According to the architect environmentally conscious materials were considered where possible.

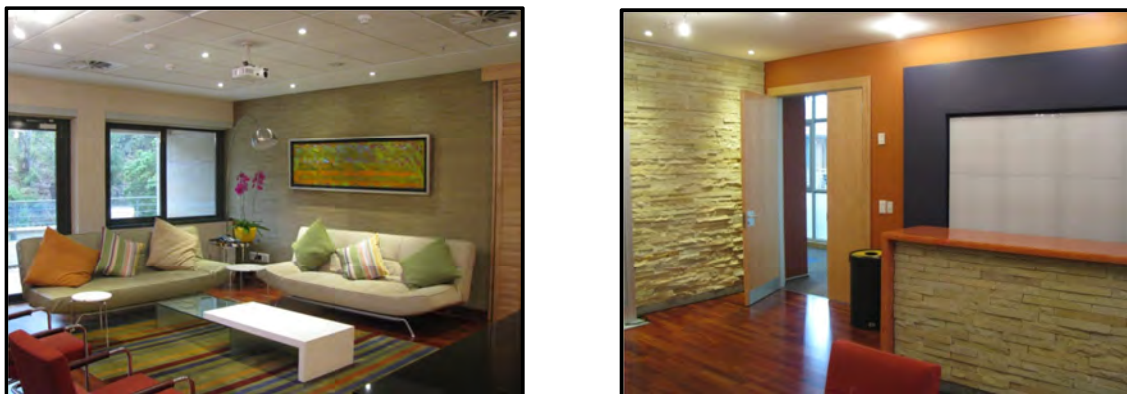


Figure 122 (left) and 123 (right): The interior of the meeting room explores the use of natural materials with the use of muted colours with accents of brighter colours. Contrasts in textures create interest (Author 2012).

6.3.6 Spaces for Social Interaction:

In the atrium a feature staircase (figure 124) has been designed that encourages staff members to use the stairs which allows for staff interaction. A number of rest areas in the different divisions have been created which interact with the outside environment which further encourages staff interaction. In front of the lift lobbies extra area has been created with places to sit (figure 125), this further creates more opportunities for people to interact with one another. The building also has a canteen which allows for staff interaction over lunch which opens out onto a huge deck on the north façade that overlooks the ridge.



Figure 124 (left): Main staircase allows for interaction between workers (Author 2012).



Figure 125 (right): Seating areas (Author 2012).



Figure 126 (left): Staff canteen allows for office workers to interact during lunch time which opens onto a large deck that overlooks nature (Author 2012).

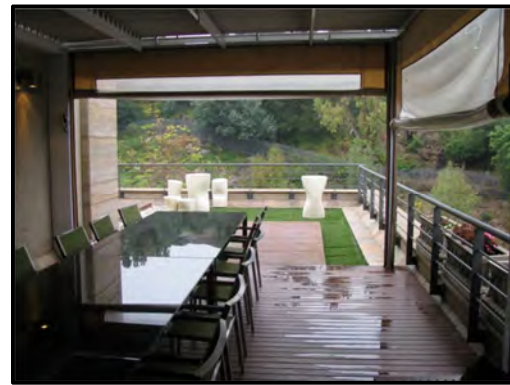


Figure 127 (right): An outside table allows for people to have meetings and experience the beauty of the natural surroundings which has physiological benefits (Author 2012).

Although the building does create places for social interaction to occur, this idea could have been taken further by providing seating within the planted atrium areas. If access to the atriums and seating was provided this could really be an amazing space to take a break from work, to sit, relax and interact with other employees. However the atriums remain untouched and miss out on the opportunity for interaction and resting seating areas (figure 129). Lastly, the majority of the roof is predominantly a flat concrete structure that has no purpose and is entirely wasted (figure 128). The advantages of a roof garden with a balustrade around are endless with numerous benefits.



Figure 128 (left): Large expanse of wasted un-used roof surface (Author 2012).

Figure 129 (right): Shows the atrium enclosed by a balustrade with no seating areas (Author 2012).

6.4 CONCLUSION

The Melrose Arch precinct on a macro scale creates an environment that is well worth living in and has many elements that contribute to the well-being of its users. In its design it further encourages social interaction to take place which creates a vibrant, interesting place to be in. The principles of New Urbanism have proved to be successful in creating a local environment that has a positive impact on its users and inhabitants. Further, the strategic placement and design of plazas created a socially interactive environment that was secure, vibrant and full of activity. The consideration of the pedestrians who use the street was evident in the spacious cobbled sidewalks, trees, planting and the use of urban furniture. Kevin Lynch's five elements were used successfully to create an environment that was conducive to both orientation and identification. The architecture created was of human scale and respected the pedestrian, with the thoughtful planning of activities on ground floor, the transparent facades and restaurants spilling out into the street created a dynamic environment that encouraged usability, interest and interaction. The use of plazas, benches, urban furniture, twenty four hour use, mixed use of activities, surveillance, layout and three dimensional relationship of built form to open space created an environment that is conducive to social interaction

The Munich Reinsurance office building demonstrates on a micro scale a well-designed building that takes into account both social interaction and well-being of its users, creating an environment that is conducive to its function. Even though there are a few criticisms such as excessive circulation, lack of seating areas that overlook the atrium, lack of water features, and unrestricted access to the atrium, the building achieves a high standard of architectural design. The use of Biophilic elements and the careful selection of both materials and finishes have allowed the building to achieve a positive impact on well-being. The design of pockets of seating areas, staff canteen, outdoor balconies, outdoor areas and open plan offices allows for collaboration and social interaction of users to occur.

This section has analysed two relevant local architectural environments, one on a macro scale and the other on a micro scale using the relevant themes mentioned throughout this dissertation to create an assessment criteria. The analysis of the buildings has helped create both positive and negative criticisms about the designs of each, which will ultimately help the researcher in designing architectural environments that enhance social interaction and well-being.

CHAPTER SEVEN: ANALYSIS AND DISCUSSION

7.1 INTRODUCTION

This chapter will analyse and discuss the information obtained in the relevant precedent and case studies and the online survey and compare it to the literature reviewed. The discussion will only deal with the most important and relevant themes mentioned.

An online questionnaire was created in which over 200 emails were sent to architectural and urban design companies all over South Africa, with the majority of them being sent to Johannesburg, Durban and the Cape Town metropolitan areas. The email addresses were selected randomly from architectural magazines and the internet. Out of the 200 emails that were sent only 31 responses were received from architectural professionals, candidates, technologists and urban designers. The online questionnaire was anonymous and the people involved had the option to partake or not. The main intention of this questionnaire was to see what the trained professionals who are responsible for our built environment had to say with regards to well-being and social interaction in architecture environments. The full questionnaire and percentages on each question can be found in appendix 2.

The questionnaire was broken up into two headings being social interaction and well-being, with each topic dealing with the macro and the micro aspect of each in relation to architecture.

7.2 ANALYSIS OF RESULTS

7.2.1 SOCIAL INTERACTION

7.2.1.1 MACRO CONTEXT ANALYSIS

Question 3: Does your urban environment create an environment for social interaction to occur? If yes please list the key contributing factors that allow for this?

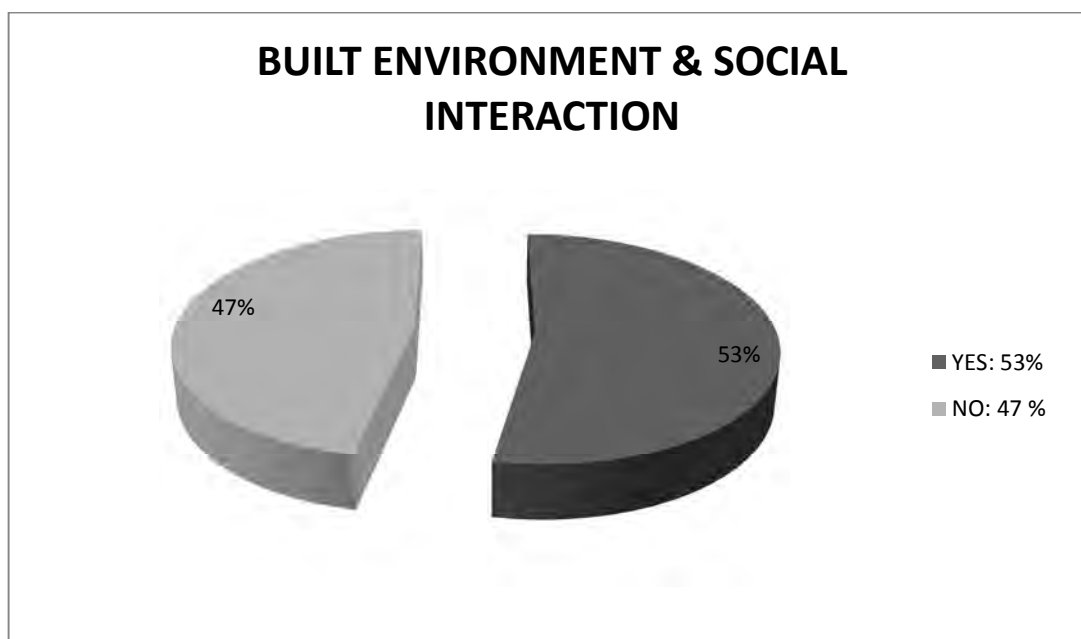


Figure 130: Illustrates the percentages of respondents whose environments allow for social interaction to occur (Author 2012).

The results indicate that there is a lack of opportunities for people to socially interact in the built environment. Some of the most prominent issues mentioned from the respondents who answered no are:

- “vehicle dominated contexts contributes to social isolation as well as large parking lots, open tarred surfaces.”
- “urban planning allows very little interaction.”
- “current urban environment does not provide enough facilities.”
- “safety is a concern in public areas that are available.”
- “lack of pedestrian routes, alleys and lack of public gathering spaces.”

A view from one of the respondents:

“I live on the periphery of Durban north and Umhlanga, i commute by car, often just myself to and from work, which takes around 20 minutes each way. The number of people I may happen to encounter on a daily basis, is relatively minimal, often none until I get to work. Interaction with the public at large is relatively minimal and the reason for this, as far as I’m concerned, this is down to densities. I live and work in very low densified areas, which tend to force people into various modes of transportation to commute to and from places, some

having to travel over 2 hours each way every day just to get to work. The notion of chance encounters with people or bumping into people is completely removed as there is no sense of human interface to the design of the built environment."

However many of the respondents that answered yes felt that social interaction is limited and could better be taken care of. The respondents who said that their environments do contribute to social interaction mentioned the following key factors:

- *"Yes. Parks, Public squares, urban landscaping. Inner city projects, design districts, art district, fashion district, etc."*
- *"Yes, safe walking neighbourhood, large amount of street activity and a Local park."*
- *"yes, amenities- schools, shops, park all within easy distance - variety and vibrancy."*
- *"pedestrian activity is the main forum through street side vendors, bus stops and taxi ranks and in some cases early morning coffee shops."*
- *"Yes, beachfront, activities and large pavements."*
- *"Yes, 24 hour mixed use, vibrant and safe atmosphere."*
- *"Yes- but is limited. Believe good quality parks are critical."*

Although 53 percent of the respondent's environments do offer places for social interaction, what is of concern is the 47 percent of the respondents who said that their environments do not. Social interaction is part of life and should be considered in environments to enhance people's lifestyles, communities should flourish and everyone should have the opportunity to use public facilities that are safe and well looked after. The design of new environments should certainly consider this important need. The answers obtained from the respondents are similar to what the literature reviewed. This justifies both the positive and negative issues mentioned in the literature review. The impact created in the literature review therefore highlights the destructive nature of many current architectural environments as well as creating guidelines that architects, designers and urban designers can use to create environments that enhance social interaction and well-being.

7.2.2 WELL-BEING

7.2.2.1 MACRO CONTEXT ANALYSIS

Question 5: Does your urban environment create a sense of well-being? If yes kindly provide a brief description of the elements that contribute to this well-being?

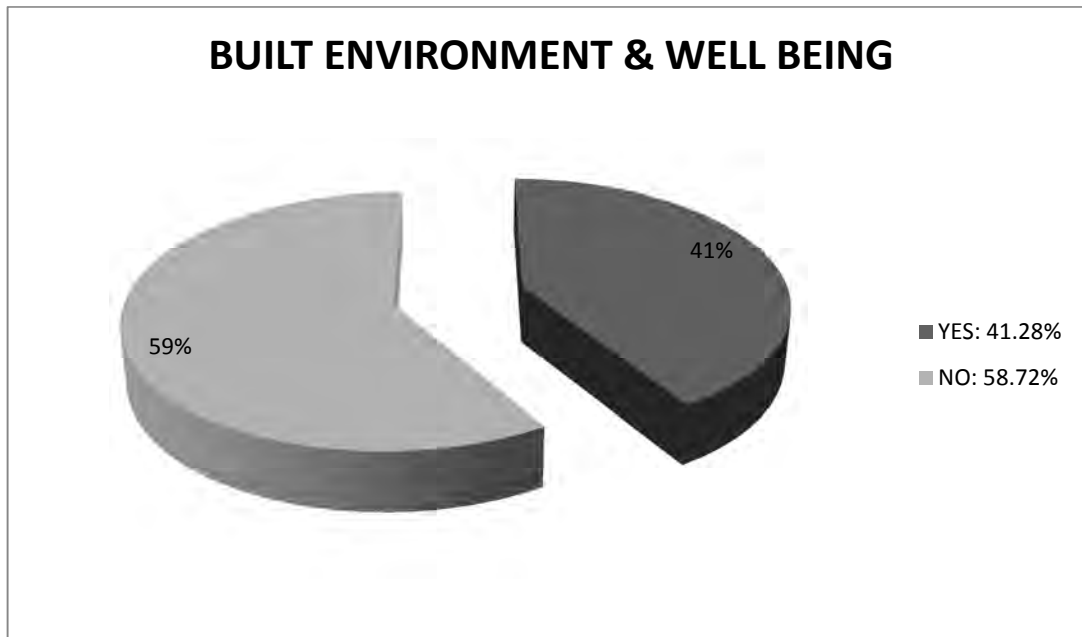


Figure 131: Illustrates the percentages of respondents whose environments create a sense of well-being (Author 2012).

More than half of the respondents (59%) said that their metropolitan areas do not create a sense of well-being which was expected. However 41% of the respondents answered yes. One must also consider that the people who answered yes are responding from a personal point of view, from their own experiences, rather than how the rest of society thinks about their environment.

Some of the comments from the respondents who said that their metropolitan areas do provide a sense of well-being are listed below:

- *Yes. Parts of it do. For example the beachfront creates a 'free' space open to the public which can be used for exercise, socialising, religious meeting, recreation, artistic expression etc*

- *Yes, high density and diversity of uses, convenient public transport, streets are safe parks and squares accommodate for recreational purposes*
- *The environment provides huge influences via climate, trees and plants provide shade and oxygen.*
- *Yes, pedestrian walkways, safety is vital and lastly amenities are close*
- *Yes good pedestrian facilities mixed use developments*
- *Yes. Garden furniture, public interface areas*
- *Yes -wide street with large trees and wide green verges*
- *Yes, choice and accessibility*
- *Social interaction creates a feeling of well-being*
- *Close to amenities with no real traffic issues.*

It must be noted that there are a fair amount of successful environments that certainly enhance the well-being of their users, but if one thinks of society in general the researcher thinks that well-being suffers. Most of the respondents are individuals from middle to a higher income bracket and therefore they have the money and access to private modes of transports and better facilities and areas. However if these respondents where the average person with a low income bracket they would be more affected by the lack of quality and reliable public transport systems as well as facilities available.

Some of the responses from the respondents who said that their metropolitan areas do not create a sense of well-being are mentioned below:

- *“No, people make places, thus, if there is not enough urban density of population and/or 24-hour opportunities for different activities in places – i.e. lack of choice, no meeting spaces, isolation, and no action – wellbeing suffers.”*
- *“No, too much fear for one's own security and well-being, thus very little interaction occurs, makes a strong selling point for property sellers.”*
- *“No, the industry is more focused on financial viability and not on good spatial development. This is where the problem lies, if more concern and focus was on spatial development the well-being of people would certainly flourish.”*

The majority of the respondents mentioned the following: lack of spatial organisation, haphazard planning, lack of trees, seating areas, human scale, design with money in mind,

noise, traffic, pollution, overcrowding, safety, crime, large parking lots, car dominated contexts, lack of public spaces.

These comments take into account the general population and are the more prominent issues that are evident in the urban environments. The design of the macro level falls more into the hands of the urban designer, however thought should still be given to this context. There is a desperate need for good public transport, more green and public spaces. Where possible architects should try to incorporate these elements into their designs or should work in collaboration with urban designers. It is a harsh reality considering that the industry is focused on financial viability and not on good spatial development. However, this is the reality we live in, and is one of the reasons why social interaction and well-being suffers.

Question 6: Do you believe that architecture can impact on well-being? 6.1 Yes 6.2 No

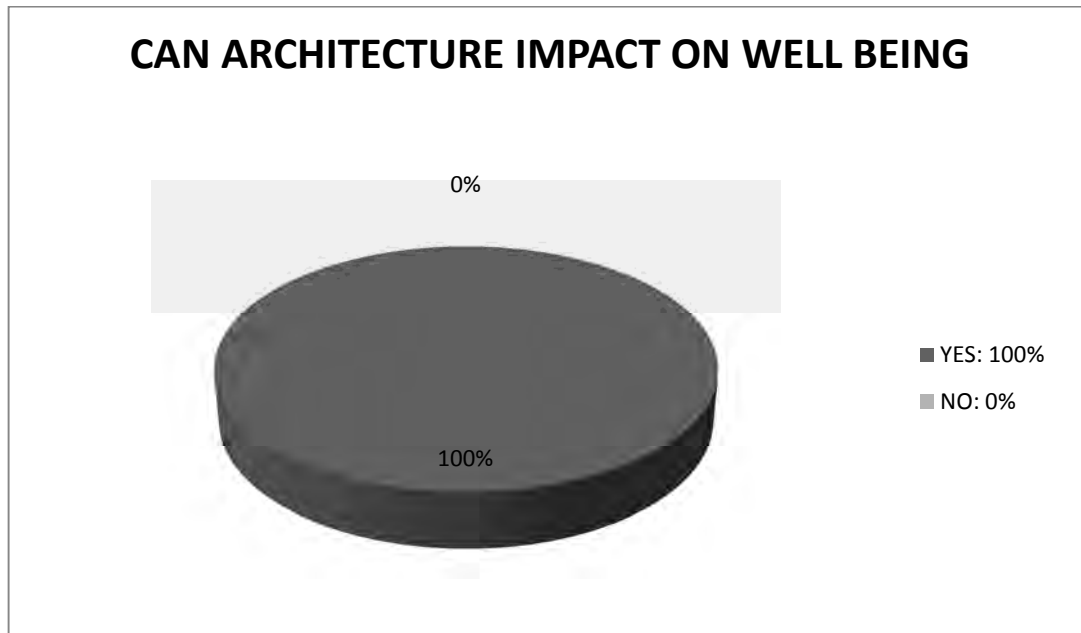


Figure 132: Illustrates the percentages of respondents who believe that architecture can impact upon well-being (Author 2012).

The respondents do believe that architecture can affect people's well-being. The researcher finds this curious. Is well-being therefore considered in all aspects when designing architectural environments for building occupants and users?

Question 7: In Urban design which of the following elements enhance well-being? (Pedestrian dominated environments, Mixed Use facilities, Good Public Transport, Paths, Edges, Nodes, Landmarks, Green spaces and Trees, Urban furniture, Plazas, The Street, Water and water features).

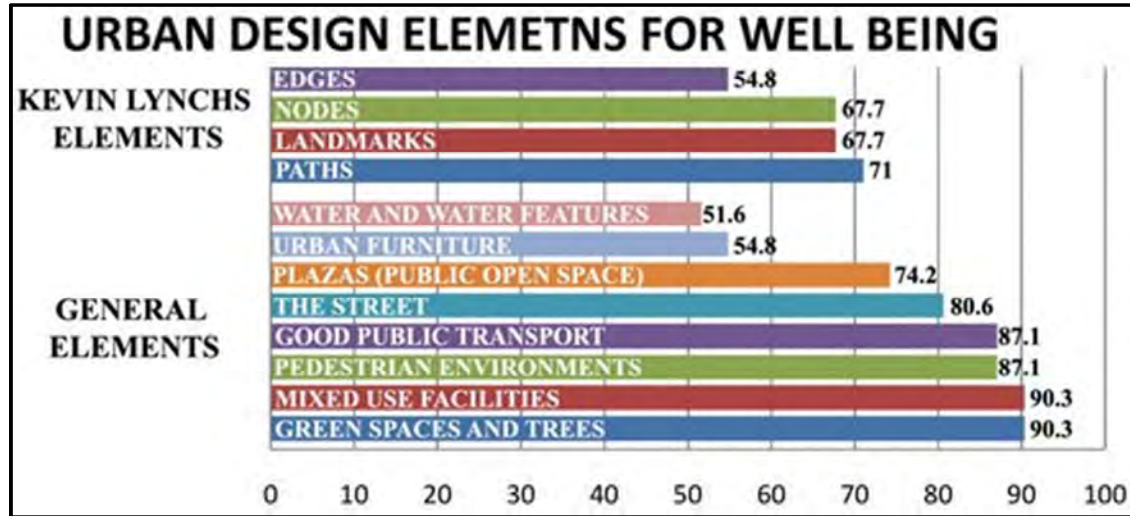


Figure 133: Illustrates the percentages of urban design elements used to enhance well-being according to the respondents (Author 2012).

In general most of the respondents agreed that a large percentage of these elements do enhance people's well-being. The results were as expected and one can deduce that both urban designers and architects need to consider these elements when designing for well-being. The highest percentage of the urban design elements were green spaces and trees, mixed use facilities, good public transport, pedestrian environments, plazas and the quality of the street. What is interesting to note is that all these elements fall under the principles mentioned in New Urbanism. Therefore architects should consider using the New Urbanism principles as a guideline in future designs. This proves the theories of New Urbanism, Image of the City and Biophilia as relevant in terms of producing architectural environments that enhance well-being.

It must be noted that the researcher was expecting there to be a one hundred percent response for each of the above mentioned elements from the respondents. The literature reviewed has brought to attention that every element mentioned does have positive impacts and should be used in creating healthy architectural environments. Architects and urban designers should consider all of the above mentioned elements in future design as they all have a strong impact on enhancing well-being in architectural environments.

7.2.2.2 MICRO CONTEXT ANALYSIS

Question 8: In your experience which of the following elements of architectural and interior design affect an individual's well-being? (Building Spaces, Layout and Circulation, Material Selection, Choice of Colour, Noise, Ventilation, Day Lighting, Indoor Planting, Water and Water Features).

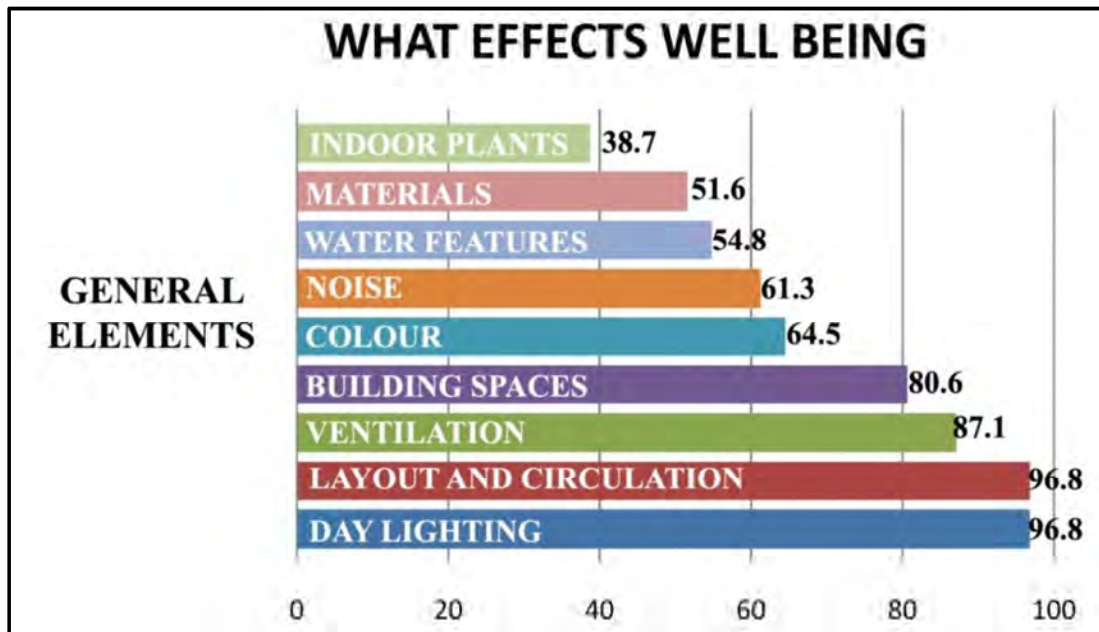


Figure 134: Illustrates the percentages of architectural elements that effect well-being according to the respondents (Author 2012).

The response was a shock. Many of the respondents failed to recognize the importance of indoor planting, water and water features, and material selection. These three elements play a significant part in enhancing well-being and should definitely be explored and considered in the design of buildings. However, layout and circulation, day lighting and ventilation are fundamental aspects according to the respondents to enhance well-being. The literature reviewed has proved this.

7.2.2.3 ARCHITECTS RESPONSE AND ANALYSIS

Question 9: In both past and present projects do your designs consider the well-being of the building occupants with reference to? (Building Spaces, Layout and Circulation, Material Selection, Choice of Colour, Noise, Ventilation, Day Lighting, Indoor Planting, Water and Water Features).

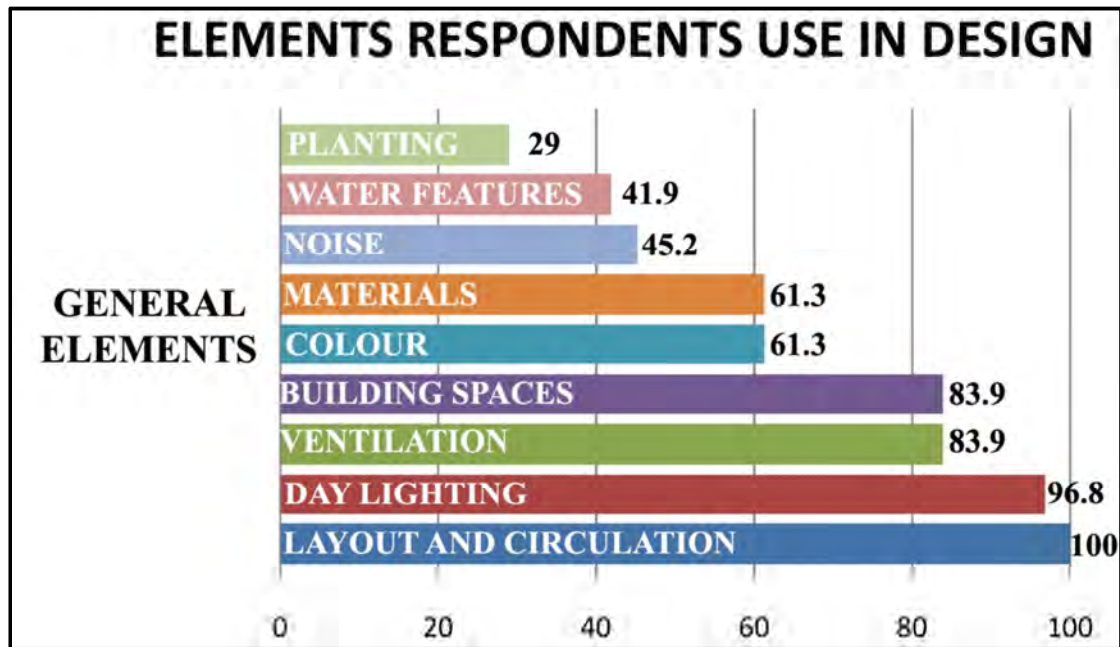


Figure 135: Illustrates the percentages of specific architectural elements that the respondents use in their designs (Author 2012).

Once again layout and circulation, day lighting and ventilation were the main elements that scored the highest percentage, indicating that most of the professionals are aware of its importance. The survey has proved that some of the designers responsible for the built environment do not consider the well-being needs with regards to all of the above elements. Planting was a surprise, scoring a low percentage. However the literature reviewed created many positive experiences with plants, water features, building materials and colour on well-being. The following question needs to be raised. Are the respondents aware of the positive impacts associated with the elements mentioned above in enhancing well-being? Lack of knowledge on the subject matter can have negative impacts on the design for well-being. All elements mentioned should be used to create healthy building environments.

Question 10: When creating a building do the following affect the design for well-being? (Budget Constraints, Cost and availability of environmentally conscious materials, Client Preferences, Municipal and Building Regulations, Lack of knowledge on the subject matter.

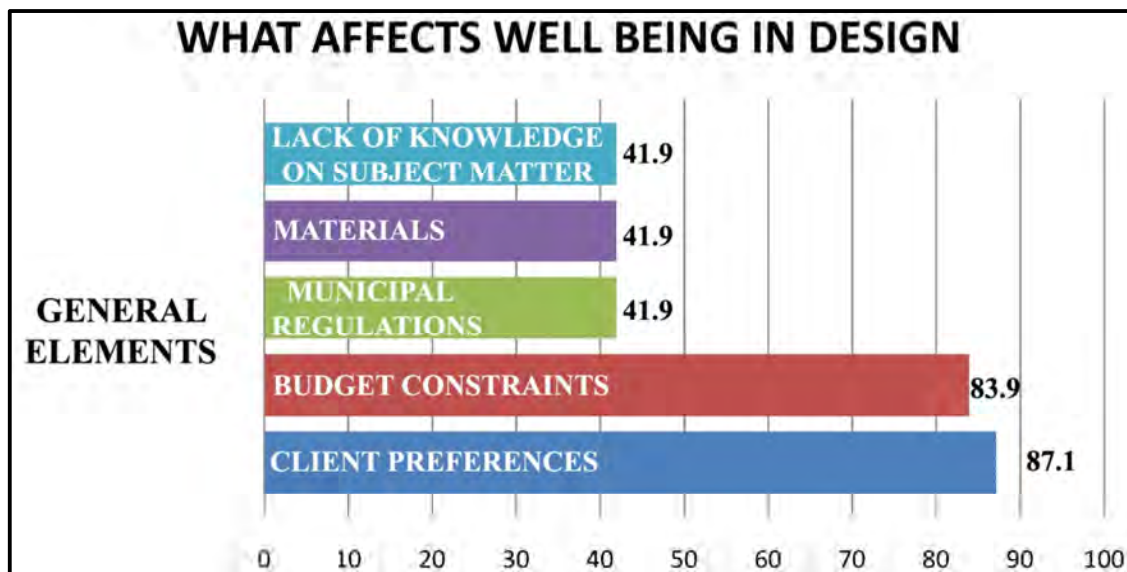


Figure 136: Illustrates the percentages of particular elements that affect the design for well-being (Author 2012).

The results clearly indicate that budget and client preferences restrict the design for well-being. This is a reality check for architects and designers and clearly indicates that in the real working world there are constraints against what is possible to produce in regards to environments that enhance well-being. It is really discouraging to think that architects and designers can create a better place for building occupants and users but client preferences interfere with this. Many projects are built to respond to client preferences within budget constraints with the well-being of building users being compromised. Architects need to put the client first and understand what the client wants but where possible well-being should be considered in every aspect.

Budget is not always a factor in the design for well-being as mentioned in the Blue Roof Health Care Centre (page 75). Cheaper alternatives can be created to ensure well-being. Architects should be innovative and creative and develop new, more affordable ideas which can produce positive outcomes for well-being. Architects should advise and inform their clients how important designing for well-being is, not only from an individual perspective but in terms of enhanced productivity, reduction in absenteeism and the many important positive impacts designing for well-being has as revealed in the literature review. Architects need to be able to design and sell their ideas so that they not only impress their clients, but constantly keep in mind the people who will be using and occupying their buildings.

On a negative note it was discouraging to see that 41.9 percent of the respondents mentioned that they have a lack of knowledge on the subject matter. This clearly indicates that the

designers responsible for the built environment are not designing environments as they should for the building users. The ability to sell the concept of well-being in architecture is therefore compromised. When an opportunity presents itself where the client gives the designer carte blanche the design is hindered due to a lack of knowledge.

7.3 CONCLUSION

Architects, designers and urban designers are the trained professionals in the design of architectural environments. They therefore have the knowledge which potential clients do not have with regards to the field of design. Clients go to these trained professionals for their expertise and design capabilities. It is important for these designers to inform their respective clients of the considerable advantages both social interaction and well-being has on building occupants and users.

In the literature reviewed and in the precedent and case studies presented it has been demonstrated that designing for well-being increases worker efficiency, production, and a reduction in absenteeism. It is the responsibility of the designer to enlighten the client of the positive aspects and sell the idea of designing for well-being. This will create an awareness of how poorly designed buildings can impact upon people.

As mentioned in the dissertation technological induced designs have a severe impact on the user's well-being, if considering, for example an airtight glass office building. Rather design a building that enhances the building's users well-being and will also contribute to the productivity and experience of the building's function. These points need to be emphasised to the client. In the researcher's opinion an informed client would want a building designed that would produce as many positive results as possible.

Through the literature reviewed and the numerous precedent and case studies explored, it can be stated that in order to achieve social interaction and well-being in cities numerous interventions will be required. The principles of New Urbanism, Image Of The City and Biophilia will need to operate collectively to ensure the creation of architectural environments that enhance social interaction and well-being.

In the real working world architects and urban designers are often subjected to limitations such as client preferences, budget constraints and municipal regulations. These limitations impact negatively on the design process and often the importance of considering and applying social interaction and well-being is ignored. This has resulted in many poorly designed architectural environments which as a result place a considerable amount of unnecessary stressors on society. In certain instances both the client and the architect create buildings without the consideration of the long term negative impact that these buildings will have on the users. However, the dissertation highlights important aspects that should be incorporated into architectural environments to alleviate human stress and create healthy architectural environments that enhance social interaction and well-being.

The importance of analysing the existing architectural environments has both illustrated and explored the negative impact that these environments have on social interaction and well-being. The negative impact that technological induced designs have on the well-being of building occupants is given particular attention. This is compared to the dynamic experience and positive impact that Biophilic designs have on the well-being of building users. There is a distinct difference between the experience of the architecture and the impact it has on the users.

The Genzyme Building, the key precedent study and the Munich Reinsurance building case study have illustrated the quality and the considerable benefits, positive impacts and increased productivity that these environments offer to their building users.

Through the literature reviewed on occupant control and from the results of the questionnaire conducted in appendix two with reference to the Elphick Proome Architect's Studio it can be concluded that users who are in control of their own interior environments are far happier than those who do not. The use of Biophilic attributes in architectural design enhances well-being and allows for a greater use of occupant control in the interior environment when compared to technological induced designs.

The lack of trees, green areas and connection to the natural environment creates a negative impact on both the social interaction and well-being needs of the city's inhabitants. However, the literature and the study of Biophilic and New Urbanistic environments which consider the importance of nature have proven considerable positive impacts on social interaction and well-being. The relevant key precedent and case studies demonstrate this approach to be beneficial on the users in the architectural environment.

Through the theories, case and precedent studies this dissertation has provided designers of the built environment with numerous tools that they can use to design for social interaction and well-being. Architects and designers need to know of these tools. They have the responsibility of shaping the well-being and social interaction needs of the world. Further this dissertation has provided valuable insight and awareness to those responsible for the architectural environment and the impact that they have on users worldwide.

CHAPTER EIGHT: RECOMMENDATIONS AND CONCLUSION

8.1 RECOMMENDATIONS

The contributions noted in this dissertation are all valuable, but their worth will only be realised if translated into architectural design recommendations. Based on the outcomes of the research (literature review, precedent and case studies) the following recommendations are made to both urban designers and architects faced with the task of designing architectural environments that are to enhance social interaction and well-being. These recommendations are implemented in the design of a Multi-Use-Facility and urban design component in Durban, South Africa which will fall under Part Two of this study. In summary, the research has shown how destructive the architectural environment can be on social interaction and human well-being. Architects and urban designers can alleviate these issues through the recommendations listed below:

8.1.1 URBAN SPRAWL:

- Consider the negative impacts of urban sprawl and create environments that do not contribute to this.
- Designs should make use of New Urbanism principles which is aimed at combating urban sprawl.
- Revitalisation of the inner city rather than development on the periphery that perpetuates urban sprawl.
- Reducing car usage in high-density cities is one of the significant ways of increasing a city's resource efficiency and well-being.
- Focus on creating movement by public transport. Thus reducing carbon emissions and noise pollution by reducing the use of private transport.
- Provision of park and ride facilities provide support for public transport usage through eliminating the cost of inner city parking triggered by private car usage.

8.1.2 IMAGE OF THE CITY: IDENTIFICATION AND ORIENTATION:

- Create legible environments using paths, edges, districts, nodes and landmarks as they allow for structure in relation to the overall environment and therefore result

in an increase in legibility of the overall environmental image, allowing users to identify and orientate with their surroundings.

- Create Paths that are identifiable and continuous and have directional quality. Paths with well-known destinations have stronger identities and make the user feel more safe and orientated along them.
- Create Edges that are visually prominent and continuous in form so that they can achieve directional quality.
- Create districts by using uniform materials and textures to create visually cohesive environments.
- Create Nodes to form strategic spots in the city that allows for social interaction to occur. They should be the centre of activity which gains their importance from being the condensation of some use or physical character as a public plaza encouraging social interaction.
- Create Landmarks as they aid as reference points and can assist in orientation as well as emphasising the importance of a particular building. Landmarks should have a clear form and should contrast their background.
- The use of these five elements in urban design is fundamental in creating environments that are legible. Legible environments encourage pedestrian use, orientation and pleasurable experiences, therefore enhancing the well-being of its users.

8.1.3 NEW URBANSIM:

- The following design recommendations are New Urbanism principles which aim at creating friendly walkable, compact, vibrant, mixed use communities that address the physical health and social well-being of its users. With a strong emphasis on community and the creation of parks, open spaces and community gathering spaces such as that of a plaza which encourage social interaction to occur.
- Create walkable environments that encourage physical activity and social interaction.
- Create environments that are pedestrian friendly rather than vehicle dominated contexts.

- Create high quality pedestrian networks and public realms that encourage walkability and social interaction.
- Create architectural environments that encourage a mixed use of functions such as retail, offices and residential, that encourages a diversity of people from all ages, socio economic groups and cultures.
- Creating mixed use environments encourage twenty four hour activity as well as surveillance.
- Create a variety of housing to accommodate for a diversity of users as well as socio economic classes.
- Create architectural environments that are of human scale, vibrant and pedestrian friendly as they nourish the human spirit which is important for the well-being of the individuals.
- Public facilities and public spaces to be strategically placed to allow for ease of accessibility to the wider community.
- Create density for a more efficient use of services and resources and for ease of walking.
- Create parkings alongside busy roads to create a buffer for the pedestrians from the cars.
- Create environments where public transport is reliable and sufficient.
- Create environments that have minimal impact on the environment and respect nature as well as the use of materials and resources that are energy efficient and less harmful to the environment.
- The following principles that New Urbanism adheres to, when combined together create architectural environments that offer a high quality of life, and create environments that enrich, uplift and inspire the human spirit. All these elements are important in the well-being of an individual in the urban environment.

8.1.4 PUBLIC SPACES: THE STREET AND THE PLAZZA:

- Coupled closely with green spaces, the design of public plazas and spaces can help with social interaction of people.
- Create areas for surveillance by incorporating mixed use developments near public spaces, this will encourage safety of public spaces and will create

opportunities for people to use public spaces which will encourage social interaction and recreation.

- Create rest spaces where people can sit, relax and interact.
- Designing plazas is highly recommended, as it creates multiple opportunities for buildings to be designed and moulded around a central point which creates a safer, vibrant and socially interactive environment.
- The design of plazas creates a sense of place within an area.
- Public spaces and plazas aid with legibility in the environment.
- Create public spaces that are appealing by using trees, water features, statues, seating areas, urban furniture and the use of soft and hard landscaping so that it is more appealing to the public.
- Architects and urban designers should take cognisance of the street and create interest along it by the use of planting trees, creating seating areas, creating building setbacks to entice people into spaces and create interest along the street as the street offers great opportunities for social interaction to occur.
- The street should be considered as an outdoor living room for the public and architects should consider the way their buildings present themselves to the street in terms of human scale, size and choice of materials and colours.
- Encourage outdoor activities because youth contained in an urban environment without any outdoor public space for positive recreation will suffer.
- Ground floor street fronts of buildings should be transparent and inviting.
- Buildings should never exceed more than five storeys in height along active pedestrian streets. When more storeys are required building setbacks should be considered.

8.1.5 BIOPHILLIA AND THE URBAN ENVIRONMENT:

- Create green open spaces to encourage social interaction as well as to enhance well-being and create a connection to nature which has many psychological benefits to the cities inhabitants.
- Create green areas within built up cities as they offer a range of services and amenities to the city dweller. Trees and natural vegetation absorb carbon dioxide

and release oxygen. In a city environment with a myriad of sources of air pollution, green areas can make a significant contribution.

- Create green spaces in the form of trees, parks and vegetation to provide visual relief from the harshness of the built environment (buildings and tarmac).
- Use trees to create human scale and provide shade.
- Design green spaces as they create spaces that promote recreation and social interaction.
- Allow for areas of relaxation, self-reflection, allowing people to take in the fresh air and take a time out.
- Vehicles to be limited to certain areas.

8.1.6 BIOPHILIA IN ARCHITECTURAL DESIGN:

- Create environments that produce integrative free flowing movement between interior and exterior spaces, creating an outdoor feel as well as visual access to the outdoors.
- Create environments that use Biophilic elements as they engage all of the senses in comparison to most built environments.
- Consider the relationship that people have with their natural environment.
- Create opportunities for building users to interact with nature, whether it is being outdoors in a natural setting or just having a view from the interior of the building.
- Allow for light and wind to flow through interior spaces.
- Bring the outdoors to the indoors to connect building users with the site and the landscape where possible.
- The use of indoor planting and planting in general provides humans with physical, psychological and cognitive benefits.
- Use trees to create human scale, shade and provide a contrast to the harshness of the built environment.

8.1.7 DYNAMIC NATURAL LIGHT:

- Create buildings that make use of natural light over artificial light.
- Manipulate light and shadow to enhance curiosity, mystery and emphasize the various shapes and forms of buildings.

- Create filtered and diffused light as it has the potential to create architectural expression through shadow and light.
- Avoid direct light and glare as this may cause stress, discomfort and can impact on well-being, productivity and thermal comfort.
- Create light pools as they allow light to penetrate into the lower parts of buildings by reflection and this encourages people into those spaces.
- Create different hues of natural light as they create different experiences and feelings.
- Create buildings that offer links between the interior and exterior environment through day lighting mechanisms, as natural light facilitates our essential connection with nature and gives us a sense of time.
- Consider the affect buildings will have with regards to blocking light on neighbour's buildings. Therefore one should consider this in the overall form and massing of the building and should accommodate for setbacks so that the whole environment can benefit from natural light.
- The use of natural lighting in design enhances well-being, productivity, sick people heal faster, students perform better and it reduces stress levels.
- Allow daylight into buildings from both the façade and the top.
- Design buildings that use the following day lighting strategies to enhance and welcome natural light into buildings as well as views to the exterior environment: single, bilateral and multilateral side lighting, clerestory lighting, light shelves, top lighting, skylights, heliostats, reflective panels and surfaces and prism chandeliers.
- Consider the type of building, its height, massing, climatic conditions, site and immediate context when designing for natural light.
- The strategic placement and orientation of windows, curtain walls and skylights should be considered.
- Where possible allow for light to enter from two possible directions to enhance the experience of the sun's movement and provide for changing patterns of brightness and shadows.
- Orientation must be considered and is key in achieving natural lighting.
- In the southern hemisphere the northern façade is where you want to place your most occupied spaces as this is the façade which receives the most warmth and solar gain. However careful placement of day lighting methods must be

considered on this façade as unwanted glare and direct sun is not advisable. On the south side more diffused light enters and one can use lots of glass on this façade as it is welcomed and has numerous benefits on building users. However one must take precaution on the eastern and western facades as they are exposed to the most dramatic experience of light movement.

- The placement of openings should be carefully considered in terms of the height at which these openings are placed on the façade relative to the internal spaces of the built form. Light that enters different heights has different effects on the space.
- Buildings or sites that have large ground floor plans should make use of courtyards, atriums and light wells to allow light into the building as well as creating spaces that allow for social interaction to occur.
- One must consider that when capturing day lighting in most instances solar shading is required to prevent stress, glare discomfort and thermal comfort.
- Careful thought in the selection of solar shading devices must be taken into account off depending on the orientation of the façade.
- Use solar shading devices to reduce the harmful effects of the sun as well creating visual qualities, rhythm, patterns, textures and shadows on building facades and on the floor.
- Use solar shading devices to from part of the buildings language and expression.
- The use of horizontal louvres is most affective on northern facades in the southern hemisphere and are therefore encouraged.
- The use of vertical louvres are most affective on eastern and western facades in the southern hemisphere and are therefore encouraged.
- One can use brise soleil, shutters, awnings, and roof overhangs to act as solar shading devices.
- Architecture is able to assist with human well-being, through the use of open, intimate, well light and ventilated spaces

8.1.8 NATURAL VENTILATION:

- One must create buildings that allow for as much natural ventilation as possible as it makes people healthier, work more effectively and engages them in their places

of work and habitation, as well as having numerous positive effects on thermal comfort and moods.

- Create operable windows in building design so that people can control their own environment.
- Design buildings forms that are long and narrow where possible as this allows the building to take full advantage of natural ventilation.
- Architects should make use of wind variation-induced single-sided ventilation, wind pressure-driven cross-ventilation and buoyancy pressures-driven stack ventilation in order to achieve sufficient natural ventilation. These methods allow for fresh air to enter and warm stale air to be removed from the interior environment creating a far healthier environment to be in.
- Architects should make use of wind towers, chimneys, double facades, atriums and windows to achieve natural ventilation in buildings.
- Consider sill heights and sight lines of nature for the benefit of occupants.
- The more natural ventilation, the more the energy cost savings will be.

8.1.9 WATER:

- Use water in the form of ponds, water features and fountains in the interior and exterior environment as it creates a variety of different atmospheres and moods that appeal to our feelings.
- Use water and water features to mask unwanted noise to create an environment that can instil a feeling of relaxation.
- One should use water in the interior of buildings in hot climates as water acts as a natural humidifier which has a cooling affect within space through evaporative cooling.
- Water and water features should be used in the interior environment to help cleanse the air from pollution as it emits negative ions into the air.
- Use water and water features to enhance the dynamic experience of space as it acts as a visual stimulant.
- Design water features that introduce tranquillity.
- Introduce water into the urban environment as an aesthetic feature that is captivating for local citizens.

8.1.10 PLANTS:

- The use of plants, greenery and vegetation in the interior environment is highly recommended and is very affective in achieving well-being for numerous reasons:
- They dust filter, absorb toxins; reduce VOC volatilization, moderate temperature and humidity re oxygenating the air, improve the climate inside, improve air quality, reduce noise, allergies and provide a connection to nature.
- Architects should incorporate planting and vegetation into their buildings creatively by using methods like green roofs, vertical gardens, planting, pots, courtyards and atriums.
- Green roofs should be used were possible as they have a lower surface temperature than normal roofs and reduce the urban heat island affect. They further increase insulation of the roof moderating indoor air temperatures, reduce heating and cooling costs, acts as a sound barrier and reduce storm water run-off.
- Green roofs should be incorporated into designs and should be easily accessible to allow for pleasant outdoor space.
- Create interior gardens and accessible outdoor roof gardens to increase building occupant's connection to nature and to contribute to a better indoor air quality.

8.1.11 BUILDING MATERIALS AND FINISHES FOR WELL-BEING:

- When selecting building materials and finishes one should select them carefully as they characterise the building, can affect indoor air quality and the important affect they can have on the moods and emotions of building users.
- Materials selected should have the following qualities: they should perform for human comfort, be locally manufactured, have reduced environmental impact (low embodied energy) and contain the least amount of harmful toxins and volatile organic compounds as certain materials are known for off gassing which pollutes the air.
- The use of more tactile and natural materials to be used as they enhance the sensory experience.

- The use of natural materials over synthetic materials as they are inherently healthier than some recycled materials which have been known to give off harmful toxic gases.
- A careful selection of paints should be chosen as colours affect the psychology of people and can generate different emotions and moods. Refer to Table 1 and table 2 in chapter 4 for the correct recommendation of colour to use for a particular space.
- The selection of paint colours that are therapeutic.
- The use of warmer earthier tones is more welcoming.
- Avoid the monotonous use of a particular colour; rather paint certain walls with accent colours to create for a different, more dynamic experience.
- Choose untreated products or cover all surfaces and edges with laminates, low VOC paints or varnishes as these finishes act as barriers or sealers from the out gassing of harmful toxins within materials.
- The selection of low or toxic free materials.
- It is important to consider the characteristics of a material and the emotions and visual impressions they can have on building users. Depending on the design and the purpose of a building consideration must be given to the selection of building material to have a positive impact on human experience. (Refer to chapter 4.3.3 for an analysis of emotions and visual impressions that materials give off).
- The choice of colour influences our estimation of volumes in architectural space, weight, time, noise and temperature. Therefore it is important that one chooses the correct colour depending on the mood they are trying to create.
- Lighter colours are recommended to be used as they increase the apparent room and volume size as opposed to darker colours which decrease the room size. Further the use of lighter colours has a great effect on the perception of temperature. Cool light colours are recommended to use over bright warm colours. Lighter colours create an atmosphere that feels lighter and is more pleasant to be in than a darker coloured space that appears heavier. Light colours reflect light whereas dark colours absorb light.
- A mix of calm and warm colours as well as accent colours are crucial in creating a stimulating environment.

- When painting a room it is important to use colour contrasts rather than one monotonous colour.
- Use orange to create energetic, warm and sociable environments. Bright orange creates an exciting atmosphere, orange creates a stimulating atmosphere and light orange creates a cheering atmosphere. Good to use in spaces that encourage social interaction.
- Use yellow to create a sunny, cheerful, radiant, welcoming, high spirited and friendly atmosphere. The happiest of all the colours that will uplift our spirits and self-esteem. Good to use in spaces that encourage social interaction.
- The use of green is highly recommended for well-being as it creates an atmosphere that is tranquil, refreshing, natural and peaceful and is the most restful colour on the eye.
- The use of blue is also highly recommended for well-being as it creates an atmosphere that is relaxing, calm, secure and comfortable. Psychologically blue is a cool and relaxing natural colour that calms the mind and aids in concentration as well as being serene and mentally calming.
- Colour is a major factor in establishing a rooms experience; it contributes significantly to the emotional loading that a space portrays as well as the ambience.

8.1.12 ARCHITECTURE AS A TOOL FOR SOCIAL INTERACTION:

- Buildings that face onto public spaces such as the street or onto plazas or parks should be designed with balconies to create for surveillance and a more socially interactive environment where building occupants can interact with the person on the street, park or plaza.
- Interaction between the people in the public spaces through the provision of urban furniture and resting areas.
- Create areas that are secure and have surveillance as this has a great impact on the success of spaces that are to be socially interactive.
- Configuration, activity and proximity of public spaces and seating areas are crucial in achieving social interaction.

- Provide for rest areas/seating areas within buildings in the form of atriums, internal courtyards, atriums, internal gardens as well as balconies and patios.
- Create flat green concrete roofs as they allow for outdoor space which can be used to create socially interactive spaces for building users.
- Design sociopetal spaces to achieve social interaction as these spaces bring people together. These environments should embody warm colours, absorbent surfaces, movable furnishings, and allow for numerous possibilities of personalization and change.

8.1.13 SITE SELECTION:

The research suggests that the following characteristics and recommendations should be considered in selecting a site for social interaction and well-being:

- The site should be in an urban context so it can have the biggest possible impact on the citizens and a large population is required.
- The site should be selected in the CBD so that it does not contribute to sprawl and in many deteriorating cities it can bring life back to the heart of the city.
- The site should be along well know roads, and have access to public transport.
- The site should have a variety of public spaces within the near context to provide linkages to them.
- Site should have a busy active street so that through urban and architectural design one can encourage social interaction to occur.
- Site that has access or has green space is first prize, as this space can be used in conjunction with the proposed design to soften the harsh urban environment and reduce heat build-up.
- Sites that are near recreation spaces to offer its inhabitants opportunities for active and passive exercise.
- Sites that are not contributing to the well-being of its cities inhabitants, so that these places can be transformed into new environments that enhance both social interaction and well-being.

The following characteristics and recommendations suggest that the site selected for the building and urban design is to be in the Durban CBD, as Durban is well known for its deteriorating CBD environment and its cause of urban sprawl which does not contribute to the well-being of its inhabitants. The creation of a new urban design in the Durban CBD can uplift and rejuvenate the area through spaces that encourage social interaction and the design of environments that enhance the well-being of its inhabitants.

8.1.14 BUILDING TYPOLOGY SELECTION:

The research suggests that the following characteristics and recommendations should be considered in selecting a building typology for social interaction and well-being:

- Building should encourage surveillance and provide for a twenty four hour use.
- The building should encourage a mixed use of functions that encourages a diversity of people from all ages and socio economic groups and cultures.
- Building should create a variety of housing types to accommodate for a diversity of users as well as socio economic classes.
- Building should be flexible and adaptable to change to accommodate for the buildings full life and use.
- Building should be dense for a more efficient use of services and resources.

Through the following characteristics and recommendations the design for a Multi-Use-Facility consisting of a retail, office and residential component was chosen to meet the above mentioned requirements. It is in these three components that people spend most of their lives in architectural environments. Therefore the creation of this building typology will demonstrate the positive impact a building of this nature can have in all three components, utilising the tools throughout this document in creating a healthy architectural environment that enhances both social interaction and well-being.

8.2 CONCLUSION

This dissertation investigated social interaction and well-being in architectural environments on both a macro and a micro level. It analysed how destructive and stressful the architectural environment can be on social interaction and human well-being, creating an awareness to those responsible for the built environment. It emphasized the importance of creating architectural environments that enhance social interaction and well-being using the key concepts and theories of New Urbanism, Kevin Lynch's Image of the City and most importantly the theory of Biophilia. This has created a set of tools that both urban designers and architects can use to produce positive architectural environments that enhance social interaction and well-being.

In order to avoid unnecessary repetition the researcher will conclude this dissertation by exclusively dedicating this section to answering the main research question and testing the hypothesis against the literature reviewed. For the benefit of the reader both the research problem and the hypothesis are restated:

Research Problem: A poorly designed built environment affects the well-being of people and places a considerable amount of stress upon the users. According to Day (2002, p.7), “*Stress breeds illness*”, the environment therefore has the ability to create stress in a number of ways just as well as it has the potential to reduce it. The spirit of a particular place is fed by the attitudes and the many actions of the people responsible for the built environment (Day 2002, p. 7).

Key Research Question: How can the well-being of an individual and social interaction be achieved through architectural and urban design in the built environment from both a macro and a micro perspective?

Hypothesis: Those responsible for the built environment need to understand the impact that they have on the users of the architectural environment to enable them to successfully create spaces that enhance social interaction and well-being.

Humans are constantly placed under huge demands and an abundance of stresses in the urban environment. It is important for the healthy functioning and well-being of the physical body that humans are at peace mentally. Approaching the built environment with a focus on

creating environments that have a positive impact on human well-being and creating opportunities for people to interact with one another will convert architectural environments into spaces that have physical and psychological benefits for the users. These benefits can promote well-being, a sense of place within the user, encourage productivity and provide a meaningful journey and experience through architectural environments in both a macro and a micro context regardless of culture and age.

Through the literature review, theories, precedent and case studies the key questions have been answered and the hypothesis emerges as being principally true.

This dissertation has explored the theories of Biophilia, New Urbanism and Image Of The City. These theories have proved to be beneficial in creating healthy environments. They have allowed the researcher to create a variety of design tools that designers can use to enhance their designs for social interaction and well-being. This is important because it is the professional's task to lead in creating environments that alleviate human stress caused by poorly designed architectural environments and promote positive environments.

New Urbanism has proved through its principles and in the Melrose Arch case study that this approach is fundamental in creating communities, encouraging both social interaction and well-being in architectural environments. Further the use of Kevin Lynch's Image of the City has created awareness of the importance of both identification and orientation within architectural environments. The consideration and careful application of his elements, landmarks, nodes, edges, districts and paths will ultimately enhance both social interaction and well-being in the architectural environment.

The theory of Biophilia in architectural design has recognized the inherent need for nature together with universal and sustainable design strategies that creates environments that truly enhance life (Pollack 2006, p. 38). The essential need for humans to interact and affiliate with nature through Biophilic design attributes is essential (Pollack 2006, p. 37). Biophilic design attributes are the elements and qualities of the physical natural environment that connect humans to the physical, psychological and cognitive benefits derived from direct experiences with nature. It has been proven through this dissertation that Biophilic attributes are preferred over other design strategies to enhance the process of well-being. Biophilic

attributes bring buildings to life physically through the use of design strategies and materials and strives to reconnect the built environment with nature through these attributes.

Biophilic design attributes of natural light, natural ventilation, water, planting, selection of natural materials, colours, frequent, spontaneous and repeated contact with nature should be given recognition throughout the architectural environment. Such an approach in architectural design can create architectural environments that restore and maintain human health, well-being, reduces stress, increase concentration, productivity, decrease absenteeism and enhance learning. Most built environments provide limited sensory experience when compared to Biophilic design which deeply engages all of the senses. It is not a passive experience to the users but rather an experience that reminds one that they are alive and a part of the life on earth. Human beings have a love for nature. As discussed Biophilic architectural design attributes play a positive role in the architectural environment and have tremendous benefits in psychological, physical and social well-being.

By creating architectural environments that enhance well-being through the theories discussed in this dissertation, architects can create environments that are socially interactive. Social interaction works hand in hand with well-being. If the well-being in architectural space suffers so does social interaction. However when well-being thrives spaces have the potential to create numerous opportunities for social interaction to occur. Through the use of sociopetal spaces and the consideration of proximity, configuration and well-being architects can utilise the various tools to create spaces for social interaction to occur.

In concluding this dissertation the most important finding and design recommendation for architects to use when designing for social interaction and well-being is the creative manipulation of the buildings form and massing. Breaking up the buildings solid mass allows for opportunities to create spaces for social interaction and well-being. It further allows the building to take full advantage of both natural ventilation and daylight strategies. The additional use of nature in the form of planting and water in these spaces further complements and enhances these spaces and creates environments that enhance and aspire to the social interaction and well-being needs of the building users.

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LIST OF FIGURES:

Figure 1: Model of well-being. (Image online) Available at: http://www.marshalls.co.uk/trans form/ _Data/pdf/brochure/Intro.pdf (Accessed 2 April 2012).....	17
Figure 2: Urban sprawl in Johannesburg. (Image online) Available at: http://urbanchoreography.net/2011/03/ (Accessed 2 April 2012).....	23
Figure 3: Urban sprawl in California. (Image online) Available at: http://tvmrising.blogspot.com/2010/01/far-battle.html (Accessed 2 April 2012).....	23
Figure 4: Durban Land Use. (Image online) Available at: www.googleearth.co.za (Accessed 2 April 2012).....	24
Figure 5: Johannesburg rush-hour traffic. (Image online) Available at: http://www.cnbc.com/id/44863344/Worst_Cities_for_Commuting?slide=7 (Accessed 2 April 2012).....	24
Figure 6: Traffic related stress. (Image online) Available at: http://www.247funworld.com/reduce-commuter-stress-work/ (Accessed 5 April 2012).....	24
Figure 7: Road rage. (Image online) Available at: http://surp.tumblr.com/post/1156953832/study-bus-commuting-33-less-stressful-than-driving (Accessed 5 April 2012).....	24
Figure 8: Kevin Lynch's Paths in Paris. (Image online) Available at: http://decortoadore.blogspot.com/2011/05/shopping-on-avenue-des-champs-elysees.html (Accessed 5 April 2012).....	26
Figure 9: Kevin Lynch's Edge: Thames River in London (Image online) Available at: http://www.bbc.co.uk/london/content/articles/2009/01/19/pla_2009_feature.shtml (Accessed 5 April 2012).....	27
Figure 10: Kevin Lynch's Districts: Durban. (Image online) Available at: http://www.zulu.org.za/index.php?districthome+23++56934 (Accessed 8 April 2012).....	27
Figure 11: Kevin Lynch's Nodes: St Peters, Rome. (Image online) http://www.digitapoptosis.com/category/top10/page/3/ . (Accessed 8 April 2012).....	28
Figure 12: Kevin Lynch's Landmark: Eiffel Tower, Paris. (Image online) http://www.reuters.com/article/2011/11/30/us-france-eiffel-idUSTRE7AT28B20111130 (Accessed 8 April 2012).....	29
Figure 13: South Coast shopping mall. (Image online) http://thepropertytimes.co.za/2011/11/south-coast-mall-coming-up-for-auction.html . (Accessed 11 April 2012).....	31
Figure 14: Pedestrian shopping strip. (Image online) http://1.bp.blogspot.com/-vG3raWBZoUQ/T5mzGiNj6xI/AAAAAAAAAGzk/SRiEU9183aE/s1600/boulder_pedestrian_01.jpg . (Accessed 11 April 2012).....	31
Figure 15: Big Box shopping centre. (Image online) http://lds.localdataimages.com/large/2109/21099938.jpg . (Accessed 11 April 2012).....	32

Figure 16: Vibrant, active street. (Image online) http://www.gautengcc.co.za/images/melrose-arch.jpg . (Accessed 11 April 2012).....	32
Figure 17: Chicago's Dan Ryan Expressway. (Image online) http://www.ensnewswire.com/ens/apr2006/2006-04-10-02.html (Accessed 11 April 2012).....	32
Figure 18: Durban Street. (Author 2012).....	32
Figure 19: Durban Street (Author 2012).....	32
Figure 20: Times Square, New York. (Image online) http://www.streetsblog.org/2009/10/29/times-square-bid-leader-on-the-art-of-street-reclamation/ . (Accessed 11 April 2012).....	34
Figure 21: The street as a tight corridor (Image online) http://www.sights-and-culture.com/cruise/Venice-shopping-1.jpg (Accessed 11 April 2012).....	35
Figure 22: The street as an open corridor (Image online) http://hugeasscity.com/ (Accessed 11 April 2012).....	36
Figure 23: The museum of fine arts in Houston (Image online) http://www.neohouston.com/2011/02/liner-buildings/ (Accessed 15 April 2012).....	37
Figure 24: <i>The AT&T long lines building in Manhattan, New York.</i> (Image online) http://www.flickr.com/photos/bamberry/6851193697/ . (Accessed 15 April 2012).....	37
Figure 25: Isolation and human scale threshold (Gehl 1987, p. 25).....	37
Figure 26: Rotterdam experience of colour (Bacon 1967, p. 231).....	39
Figure 27: Open space network, Brisbane. (Image online) http://www.charterworld.com/news/superyacht-brisbane-flood-update/brisbane-city-before-the-floods (Accessed 15 April y 2012).....	41
Figure 28: Inferior space network, Mexico (Image online) http://www.mustangevolution.com/forum/f168/t26103/ (Accessed 15 April 2012).....	41
Figure 29: New Yorks Central Park aerial view (Image online) http://www.centralparknyc.info/central_park_top_places.htm (Accessed 15 April 2012).....	41
Figure 30: New Yorks Central Park. (Image online) http://franciseng.blogspot.com/2012/04/run-in-central-park-new-york.html (Accessed 15 April 2012).....	41
Figure 31: Canary Wharf office tower. (Image online) http://explow.com/25_Bank_Street (Accessed 15 April 2012).....	41
Figure 32: Canary Wharf office interior. (Image online) http://explow.com/25_Bank_Street (Accessed 15 April 2012).....	41
Figure 33: Exterior view of 88 Field Street (Author 2012).....	41
Figure 34: Close up of 88 field street (Image online) http://www.emporis.com/building/88onfield-durban-southafrica (Accessed 15 April 2012).....	41

Figure 35: EPA Studio exterior. (Image online) http://franciseng.blogspot.com/2012/04/run-in-central-park-new-york.html (Accessed 15 April 2012).....	41
Figure 36: EPA ground floor plan. (Image online) http://franciseng.blogspot.com/2012/04/run-in-central-park-new-york.html (Accessed 15 April 2012).....	41
Figure 37: EPA interior view. (Image online) http://franciseng.blogspot.com/2012/04/run-in-central-park-new-york.html (Accessed 15 April 2012).....	41
Figure 38: People are not alike (Rubin and Elder 1980)	41
Figure 39: Setback following sun angle. (Bouberki 2008, p. 46).....	54
Figure 40: Low levels of lighting. (Bouberki 2008, p. 84).....	55
Figure 41: Earth Port Building. (Image online) http://www.nikken.co.jp/en/projects/Others/tokyo-gas-earth-port.html (Accessed 19 April 2012).....	57
Figure 42: Earth Port Building interior. (Image online) http://www.nikken.co.jp/en/projects/Others/tokyo-gas-earth-port.html (Accessed 21 April 2012).....	57
Figure 43: Southern façade of Earth Port. (Image online) http://www.mech.hku.hk/sbe/case_study/case/jap/Earthport/index.html Accessed 21 April 2012).....	57
Figure 44: Section through Earth Port Building. (Image online) http://www.ibec.or.jp/jsbd/C/tech.htm / (Accessed 01 May 2012).....	57
Figure 45: Earth Port Buildings light shelves. (Image online) http://www.mech.hku.hk/sbe/case_study/case/jap/Earthport/index.html Accessed 01 May 2012).....	58
Figure 46: Section illustrating natural ventilation. (Image online) http://www.ibec.or.jp/jsbd/C/tech.htm (Accessed 01 May 2012).....	59
Figure 47: Atrium and clerestorey windows (Image online) http://www.ibec.or.jp/jsbd/C/tech.htm / (Accessed 01 May 2012).....	60
Figure 48: Site Plan of the Africa Centre. (Image online) http://www.eastcoastarchitects.co.za (Accessed 02 May 2012).....	61
Figure 49: The central water tower of the Africa Centre. (Butcher, 2009:46).....	61
Figure 50: Africa Centre courtyard view 1. (Image online) http://www.eastcoastarchitects.co.za (Accessed 02 May 2012).....	62
Figure 51: Africa Centre courtyard view 2. (Image online) http://www.eastcoastarchitects.co.za (Accessed 02 May 2012).....	62
Figure 52: Africa Centre solar protection 1. (Image online) http://www.eastcoastarchitects.co.za (Accessed 02 May 2012).....	62
Figure 53: Africa Centre solar protection 2. (Image online) http://www.eastcoastarchitects.co.za (Accessed 02 May 2012).....	62

Figure 54: Africa Centre solar protection 3. (Image online) http://www.eastcoastarchitects.co.za (Accessed 02 May 2012).....	62
Figure 55: Paley Park in Manhattan, New York (image online) http://shiftncsu.wordpress.com/2010/10/27/manhattans-parks-are-dangerously-loud-study-finds-dnainfo-com/ (Accessed 02 May 2012).....	63
Figure 56: Africa Centre solar protection 3. (Image online) http://ecolocalizer.com/2009/05/26/a-fun-new-water-fountain-park-beautifies-lima-peru/ (Accessed 02 May 2012).....	63
Figure 57: Blue Roof Health Care Centre. (Image online) www.eastcoastarchitects.co.za/project_pdf/BLUE-ROOF.pdf (Accessed 02 May 2012).....	64
Figure 58: Institute for Forestry and Nature Research Centre. (Image online) http://behnisch.com/projects/22 (Accessed 02 May 2012).....	65
Figure 59: Office located off the gardens. (Image online) http://behnisch.com/projects/22 (Accessed 02 May 2012).....	65
Figure 60: Outdoor seating areas. (Image online) http://behnisch.com/projects/22 (Accessed 02 May 2012).....	65
Figure 61: The process of evapotranspiration. (Papers 2008, p.4).....	66
Figure 62: Plants and dust prevention. (Papers 2008, p.6).....	66
Figure 63: Durban city depicted as a concrete jungle. (Image online) http://www.grantpitcher.co.za/architectural-photography (Accessed 05 May 2012).....	68
Figure 64: Imaginary city with green roofs. (Image online) http://www.worldchanging.com/archives/010211.html (Accessed 05 May 2012).....	68
Figure 65: A vertical garden wall in Paris. (Image online) http://www.digitallearningfoundation.org (Accessed 05 May 2012).....	68
Figure 66: Vertical garden wall. (Image online) http://www.theverticalgardener.com (Accessed 05 May 2012).....	68
Figure 67: Shawona Medical Centre. (Image online) http://www.kahlerslater.com/expertise/healthcare/san-juan-regional-medical-center (Accessed 10 May 2012).....	72
Figure 68: Shawona Medical Centre. (Image online) http://www.kahlerslater.com/expertise/healthcare/san-juan-regional-medical-center (Accessed 10 May 2012).....	72
Figure 69: Sean Godsell's living room in Melbourne (Image online) http://www.tenhandstark.com/2011/11/24/like-father-like-son-architects-david-sean-godsell/ (Accessed 10 May 2012).....	74
Figure 70: The Visitor Centre in Quebec. (Image online) http://www.worldbuildingdirectory.com/project.cfm?id=1084 (Accessed 10 May 2012).....	74

Figure 71: House in Kypto, Japan 1. (Image online) www.trendir.com (Accessed 10 May 2012).....	74
Figure 72: House in Kypto, Japan 2. (Image online) www.trendir.com (Accessed 10 May 2012).....	74
Figure 73: House in Kypto, Japan 3. (Image online) www.trendir.com (Accessed 10 May 2012).....	74
Figure 74: Cool and warm colours. (Image online) http://www.asianpaints.com/world_of_colours/signature_walls.aspx (Accessed 12 May 2012).....	76
Figure 75: Complementary colours. (Image online) http://willkempartschool.com (Accessed 12 May 2012).....	76
Figure 76: Bedroom using complementary colours. (Image online) http://www.asianpaints.com/world_of_colours/colour_guides.aspx (Accessed 12 May 2012).....	76
Figure 77: Richmond East Housing in Toronto exterior (Image online) http://www.archdaily.com/85762/60-richmond-housing-cooperative-teeple-architects/ (Accessed 12 May)	84
Figure 78: Richmond East Housing in Toronto section. (Image online) http://www.archdaily.com/85762/60-richmond-housing-cooperative-teeple-architects/ (Accessed 12 May 2012).....	84
Figure 79: Tokyo Gas Earth Port building. (Image online) http://www.arch.hku.hk/~cmhui/japan/tokyo%20gas/gasin1.jpg (Accessed 12 May 2012).....	83
Figure 80: Dells Children's Medical Centre. (Image online) http://www.jetsongreen.com/2007/12/first-leed-plat.html (Accessed 12 May 2012).....	83
Figure 81: Floor plan of Genzyme Centre. (Image online) http://www.solaripedia.com/files707.pdf (Accessed 16 May 2012).....	89
Figure 82: Interior of ground floor, Genzyme Centre. (Image online) http://www.solaripedia.com/files707.pdf (Accessed 16 May 2012).....	90
Figure 83: Section through Genzyme Centre. (Image online) http://www.solaripedia.com/files707.pdf (Accessed 16 May 2012).....	91
Figure 84: Natural lighting strategies, Genzyme Centre. (Image online) http://www.solaripedia.com/files707.pdf (Accessed 16 May 2012).....	92
Figure 85: Central Atrium, Genzyme Centre. (Image online) http://www.solaripedia.com/files707.pdf (Accessed 16 May 2012).....	93
Figure 86: Section exploring the ventilation methods, Genzyme Centre. (Image online) http://www.solaripedia.com/files707.pdf (Accessed 16 May 2012).....	94
Figure 87: View of the ground floor, Genzyme Centre. (Image online) http://www.solaripedia.com/files703.pdf (Accessed 16 May 2012).....	96

Figure 88: Indoor gardens, Genzyme Centre. (Image online) http://www.solaripedia.com/files704.pdf (Accessed 16 May 2012).....	96
Figure 89: Glass walls, Genzyme Centre. (Image online) http://www.solaripedia.com/files704.pdf (Accessed 16 May 2012).....	96
Figure 90: Location map of Melrose Arch. (Image online) www.googleearth.com (Accessed 20 May 2012).....	99
Figure 91: Aerial view of Melrose Arch. (Image online) www.googleearth.com (Accessed 20 May 2012).....	100
Figure 92: Restaurants of Melrose Arch. (Image online) http://www.imagine-group.com/melrosedb/melrose-map.html (Accessed 20 May 2012).....	102
Figure 93: Melrose arch square atmosphere. (Image online) http://www.imagine-group.com/melrosedb/melrose-map.html (Accessed 20 May 2012).....	102
Figure 94: Seating areas, restaurants and balconies, Melrose Arch. (Author 2012)	103
Figure 95: Restaurant interaction, Melrose Arch. (Author 2012)	103
Figure 96: Seating and open space, Melrose Arch. (Author 2012)	103
Figure 97: Concrete seats, Melrose Arch. (Author 2012)	103
Figure 98: Water feature, Melrose Arch. (Author 2012)	104
Figure 99: Typical floor layout of a mixed use building, Melrose Arch. (Image online) http://www.skyscrapercity.com/showthread.php?t=160977&page=18 (Accessed 20 May 2012).....	105
Figure 100: landscaped courtyard, Melrose Arch. (Image online) http://www.skyscrapercity.com/showthread.php?t=160977&page=18 (Accessed 20 May 2012).....	105
Figure 101: Planter boxes, Melrose Arch. (Author 2012)	106
Figure 102: Landscaping and trees, Melrose Arch. (Author 2012)	106
Figure 103: Melrose Arch squares ground floor plan. (Image online) http://www.skyscrapercity.com/showthread.php?t=160977&page=18 (Accessed 10 May 2012).....	106
Figure 104: Landmark in square, Melrose Arch. (Author 2012)	107
Figure 105: Site plan with building surrounded by nature (SA Architect 1999, p.47).....	109
Figure 106: View to the North with staff outdoor area (Author 2012).	109
Figure 107: Site and massing diagrams, Munich building. (SA Architect 1999, p. 47)	110
Figure 108: Section illustrating day lighting and solar shading (SA Architect 1999, p.47).	111
Figure 109: Clear storey windows, Munich building. (Author 2012).	111
Figure 110: Northern overhangs and louvers prevent direct sunlight (Author 2012).	111

Figure 111: Louvre's located on the southern side (Author 2012).	111
Figure 112: Section illustrating the natural ventilation system, Munich building. (SA Architect 1999, 47).	112
Figure 113: Water features, Munich building. (Author 2012).	113
Figure 114: Water features, Munich building. (Author 2012).	113
Figure 115: One of the two interconnected atriums (Author 2012).....	113
Figure 116: View from staircase looking into atrium (Author 2012).....	113
Figure 117: Interior positioned pot plants (Author 2012)., Munich building. (Author 2012).	114
Figure 118: Exterior positioned pot plants (Author 2012).....	114
Figure 119: Natural materials, Munich building. (Author 2012).....	115
Figure 120: Dominant exterior finishes, Munich building. (Author 2012).....	115
Figure 121: Wooden flooring, Munich building. (Author 2012).....	115
Figure 122: Interior of meeting room , Munich building. (Author 2012).....	115
Figure 123: Interior of meeting room, Munich building. (Author 2012).....	115
Figure 124: Main staircase allows for interaction between workers (Author 2012).	116
Figure125: Seating areas (Author 2012).....	116
Figure 126: Staff canteen, Munich building. (Author 2012).....	116
Figure 127: Outside table meeting room, Munich building. (Author 2012).....	116
Figure 128: Large expanse of wasted un -used roof surface. (Author 2012).....	117
Figure 129: Shows the atrium enclosed by a balustrade with no seating areas. (Author 2012).....	117
Figure 130: Pie chart. (Author 2012).....	116
Figure 131: Pie chart. (Author 2012).....	116
Figure 132: Pie chart. (Author 2012).....	116
Figure 133: Bar graph. (Author 2012).....	116
Figure 134: Bar graph. (Author 2012).....	116
Figure 135: Bar graph. (Author 2012).....	116

Figure 136: Bar graph. (Author 2012).....116

LIST OF TABLES

Table 1: The Major Colour Hues87-88

Table 2: The Effects of Colour on humans89-90

APPENDIX 1: PRECEDENT STUDY: ELPHICK PROOME ARCHITECTS STUDIO



QUESTIONNAIRE: Workers at the Elphick Proome Architects Studio

RESEARCHER: Name: David Sharkey. **Email:** davidsharkey@cybersmart.co.za

SUPERVISOR: Juan Solis

TAKE NOTE

1. This Questionnaire is for academic purposes only.
2. Confidentiality: Efforts will be made to keep personal information confidential. Your real name / identity are not required.

Please answer questions to the best of your ability. You do not have to answer all the questions, but it is preferred that you do. There is no right or wrong answers. Use your instinct. Please could you write your answers in bold or in another colour and lock the text before sending the response back to me.

GENERAL:

1. Does the building environment have a positive or negative impact on your well-being, with regards to lighting, ventilation and thermal comfort? (Please justify)

As a general note, you have to consider that the building is a 4-sided glass box & therefore users in different parts of the building will have an entirely different experience. Lighting - Overall, the quality of light is really good. The artificial lighting only really plays a part in the meeting rooms & below the slab; the balance of the office is a double volume with full height glazing. That said, in inclement weather, the artificial lights battle to maintain a high-enough level.

Ventilation - Is miserable. There are zero operable windows in the entire building so obviously no natural ventilation. There are 2 doors on lower level (namely, entrance door & sliding door to deck) and there are 5 upstairs (front door, and 1 sliding door per meeting room & one at directors desk space). The HVAC system fails terribly in summer. It is under-spec'd and unreliable. It cannot operate at full capacity without

breaking down. In the event of power outages, whether in summer or winter, we have no choice but to leave the building. The heat-gain is insane, and especially unbearable in summer.

Thermal Comfort - Is dependent on where you are located in the building. As a rule, under the slab is the coolest area. Guys generally were jerseys through summer (if HVAC is functional), upstairs meeting rooms and director desking is also ideal as they are at the very beginning of each HVAC run. The desking around the eastern end of the building is the worst off. The heat gain here is absolutely ridiculous. If you sit arms-length from the glass, you have to wear shorts and slops in summer, and consider sunglasses & sunscreen. The HVAC doesn't make any impact in these areas as they're right at the end of the runs & the double volume destroys any potential cooling they might offer.

2. The building utilises the same solar shading device that wraps around the buildings glass facade even though solar protection should vary depending on the facade. Does this have an effect on your well-being? (Please justify)

Solar shading is merely decorative. Filigree shades were pretty trendy at the time of construction. That said, there are only solar control elements on the northern & western facade (horizontal @ northern, vertical @ western). The rest of the building has an eaves overhang of approx. 1.5-2m; which is useless for a building this size. Again, this is decorative & allows for exposed, decorative steelwork to be displayed. To my mind, both sets of screens are ineffective. The horizontal screen shades the desk immediately below, but not all the desks further inset as they're hit by direct sunlight from the upper level's glazing. (Make sense? Shout if you need sketches) The western screens (vertical) are likely superficial as well given that the hillside rises to the west & the neighbouring building screens us from afternoon sunlight. So to answer your question, yes. I sit at the east end, and as mentioned in thermal comfort, it's horrendous.

3. The current environment is mechanically ventilated and does not allow for individual occupant control. Do you think interiors that allow occupants to control their own environments will have a positive impact on well-being? (access to operable windows, personal fan, desk lamps and blinds)

Yes, I think a degree of personal control would go a long way to improving personal experience, both physically & mentally. At the moment, the setup & environment is extremely rigid & totalitarian. Desk fans/lamps/etc are outlawed. We have been granted 2 desk fans for the east end so that directors could implement the new now shorts/slops office dress code. Operable windows would be ideal, however in an office of this size you will not find people who can agree to have the window open or closed etc. However, at least having the option to open a window would play a huge part. Blinds are installed all-round the building & remain closed year-round. They only filter a maximum of 50% sunlight out, and do not help against direct sunlight. Further, there's an unspoken rule that is reminiscent of Mies' Lakeside Drive Apartments in that if the lower level blinds are opened, they need to be aligned with the mullions or fully open.

4. In your opinion how could the internal environment improve your well-being needs?

The general consensus in the office is that we need to either upgrade & redesign the entire hvac system so that it caters to specific areas exactly as required; or to install operable windows. Personally, I think installing proper solar control elements right across the eastern & northern facades would resolve most of the issues. Obviously, if the glass is shaded from the exterior, the heat gain would be greatly reduced. If that is done & found not to be as effective as expected, the next step would be to install operable window & some sort of system to ventilate the double volume & roof space.

5. Does the environment affect your health in any way? (symptoms of Sick Building Syndrome)

Not an easy one to answer, the biggest effect is on comfort level & mood. Obviously if the environment is unpleasant and uncomfortable, mood & morale drops. The second biggest issue is the lack of fresh air; so when one person is sick, it will spread around the office rapidly. You have no option but to breathe recycled air.

Thank you for your time and assistance (" ,)



QUESTIONNAIRE

RESEARCHER: Name: David Sharkey. Email: davidsharkey@cybersmart.co.za

SUPERVISOR: Juan Solis

TAKE NOTE

3. This Questionnaire is for academic purposes only.
4. Confidentiality: Efforts will be made to keep personal information confidential. Your real name / identity are not required.

Please answer questions to the best of your ability. You do not have to answer all the questions, but it is preferred that you do. There is no right or wrong answers. Use your instinct.

GENERAL:

1. Does the building environment have a positive or negative impact on your well-being, with regards to lighting, ventilation and thermal comfort? (Please justify)

The building environment in general? It can obviously have both and spaces which have the most flexibility are therefore the most revisited and remembered. In terms of the spaces within my working environment: lighting has a positive impact. Large amounts of natural light, within a narrow floor plate make for consistent natural lighting and thus the space only requires high level artificial light to temper the conditions for consistency throughout the day. The external connection improves well-being and arguably, productivity. If the working conditions were poor, focus would be taken away from tasks at hand. The users experience can be highly influenced by reflections on computer screens, the studio is successful in minimising reflections (minimal direct sun and integrated blinds).

Thermal comfort is to a large extent determined by office requirements, for example meeting rooms operating on individual systems for varied control and efficiency when the rooms aren't in use. The studio space is however controlled on a single system; accordingly users have a different experience depending on their position within the office. The office can be an unpleasant environment for users on the east side of the

building during morning hours. It is difficult to please a larger workforce with a homogenous system. Thermal stability should be improved.

There is little ability for natural ventilation within the building. However Durban's climatic conditions make for difficult variable to control thermal comfort, were natural ventilation alone employed. In the case of power outages, the air circulation is inefficient and the studio space quickly heats or cools, depending on the season. The new building regulations (Part XA) would help to combat this in terms of glazing requirements.

- 2. The building utilises the same solar shading device that wraps around the buildings glass facade even though solar protection should vary depending on the facade. Does this have an effect on your well-being? (Please justify)**

The building employs large overhangs to all facades, responding to its exposed position on the hillside and controls the cleanliness of the primary facade material - glass. The roof overhang and projecting 'Filigree' screens on the north facade successfully omit direct sunlight in summer and allow adequate sunlight in winter, as not to disturb working conditions. Internal blinds were incorporated into the design for individual user control in this regard. The north, south and west (minimal glazing and low level strip windows) facades respond successfully to orientation and screening. The east facade (despite the hillside vegetation which does limit the building's exposure) does not respond to early morning east light. Vertical blinds would remove the harsh morning light, however they would also minimise the building's primary views and architectural branding. Often homeowners and developers are more concerned with capturing site and value than building layering. It's a dialectical debate

- 3. The current environment is mechanically ventilated and does not allow for individual occupant control. Do you think interiors that allow occupants to control their own environments will have a positive impact on well-being? (access to operable windows, personal fan, desk lamps and blinds)**

Yes, natural ventilation would have a positive impact. Individual control is the ideal (from the individual's perspective) and should be provided for as standard. It would also increase the sense of ownership; however openable windows in this building's case would only be successful as a secondary system of ventilation (wind would disturb papers). As soon as mechanical ventilation is incorporated, the system

should be as efficient as possible. Perhaps a mixture of passive systems could be engaged with, in order to reduce costs. Generally speaking, desk lamps would improve an individual's well-being as well as minimising out-of-working-hours electricity costs. Blinds would also improve well-being; however they are also generated from an architectural ideology. Either the building is designed with external solar shading, requiring a secondary (and perhaps tertiary) structural system and thus reducing solar radiation from the external materials or the building internalises screens which can animate facades and increase individual control.

4. In your opinion how could the internal environment improve your well-being needs?

For an office environment, most of a person's day is spent within this space; therefore they should be designed for comfort and efficiency. Space should respond directly to their function and allow for faster and slower environments, in the same way that public/semi-public/semi-private/private space does. Access to internal / external environments and volumetric variations (to manipulate and harness lighting, heating and cooling, air quality and view) is important. The ability to choose will improve well-being, constrictive environments would decrease motivation (I would be predisposed against it immediately). Provision of adequate insulation is paramount. Systems which can be integrated into the building's skin, which don't affect perception, architectural language and combat energy inefficiency will improve well-being. Perhaps consider the notion that people aspire to air-conditioning? Changing perception will be through experience and contextual precedent. Implementing / demonstrating passive systems, whilst achieving high quality space.

5. Does the environment affect your health in any way? (symptoms of Sick Building Syndrome)

No. Plentiful natural lighting, visibility and volume which combats the potential for the mechanical ventilation to circulate sickness, is experienced.

Thank you for your time and assistance (" ,)

APPENDIX 2: PROFESSIONAL SURVEY / QUESTIONNAIRE:

COVER LETTER:

16 April 2012

Good Day

Introduction:

I am a student from the University of KwaZulu-Natal, currently writing my dissertation for my Masters in Architecture. Part of my study requires a survey based on my studies. I understand that everyone is very busy, but I kindly ask if you can spare a few minutes of your time to answer a few questions. Your assistance will help me immensely in my research.

I am studying how social interaction and well-being is impacted by the built environment, and how one can through architecture create such environments that enhance social interaction and well-being. Research is just a process to attain answers to a number of questions and you may have information that would help me to get to such answers. In this study I want to learn about the effect that the architectural environment has on social interaction and well-being and how designers can create healthy environments that will ultimately enhance social interaction and well-being.

What is involved in the study?

I have provided a link to an online survey where I ask a number of questions. If you agree to take part I hope that the information that I obtain will be used to improve architects understanding of how important it is to create architectural environments that enhance social interaction and well-being.

Confidentiality: Please note that the survey / questionnaire is completely anonymous.

Deadline: To assist me in meeting my research deadlines kindly complete the online survey by 30 April 2012. I thank you in advance for your kind assistance and I remain most appreciative.

Kind Regards

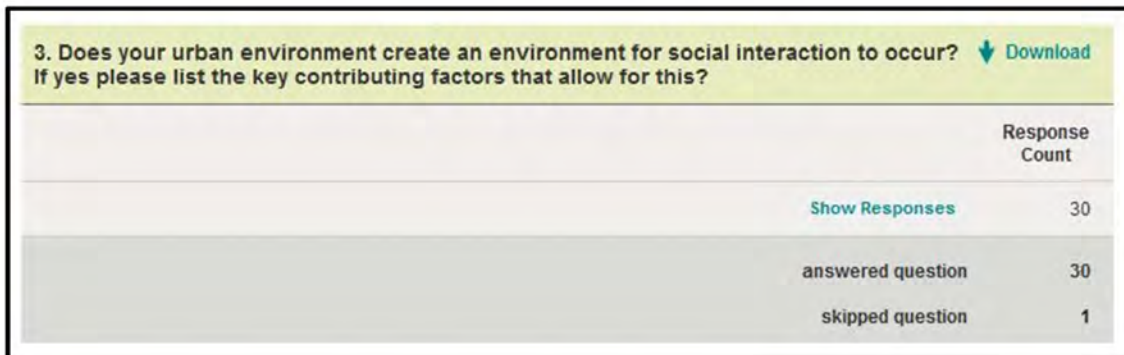
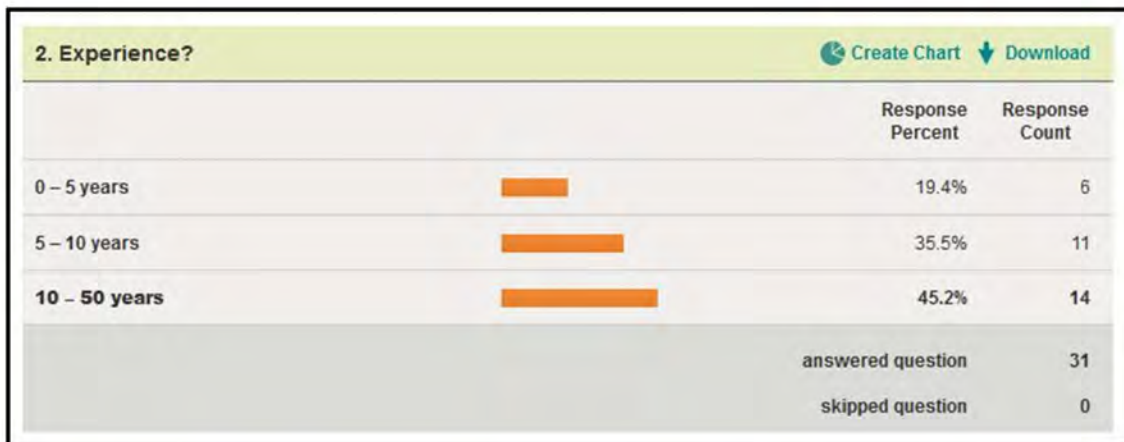
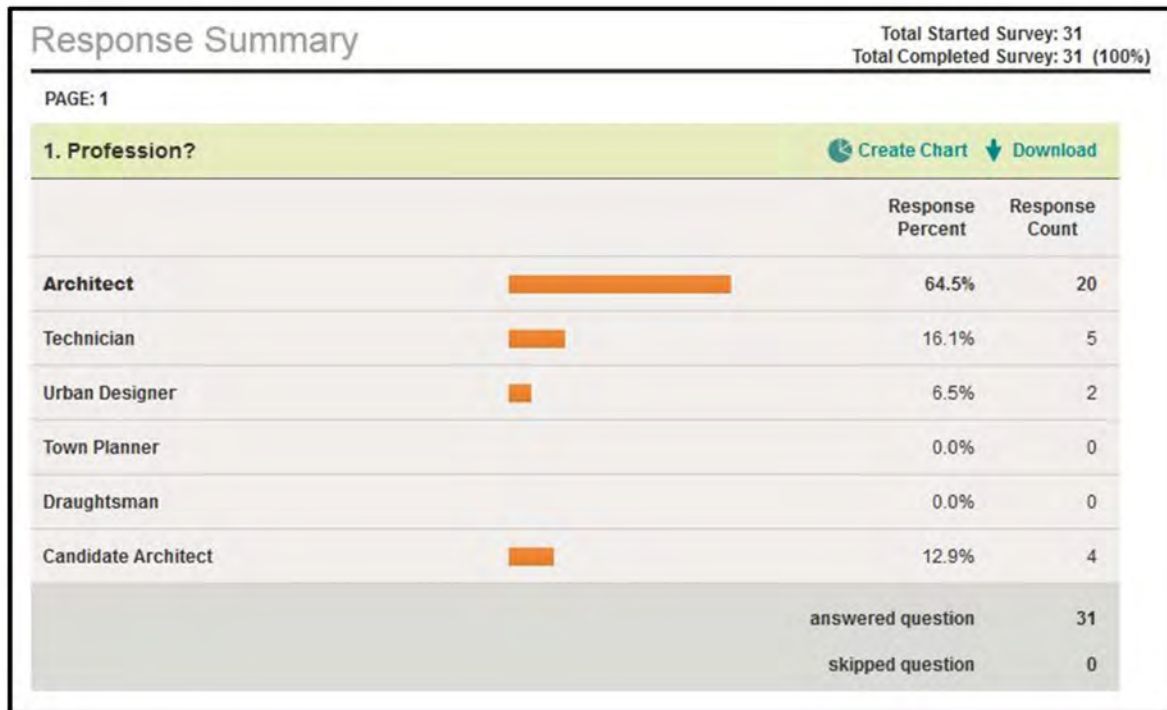
David Sharkey

Contact details of researcher – for further information please contact:

Student: David Sharkey: davidsharkey@cybersmart.co.za

Supervisor: Juan Ignacio Solis-Arias: solis@ukzn.ac.za

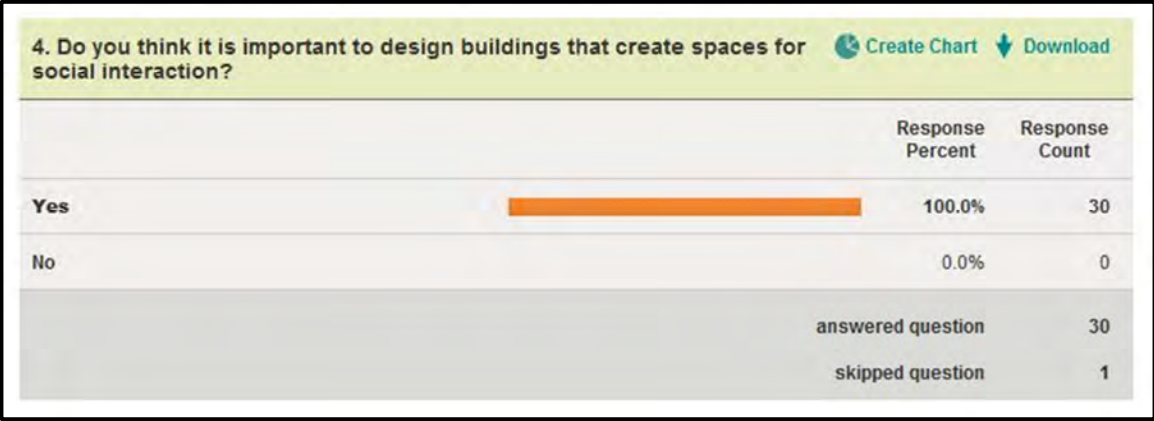
Please follow this link to complete the survey: <http://www.surveymonkey.com/s/PNMYF2T>



RESULTS:

Yes: 16 53%

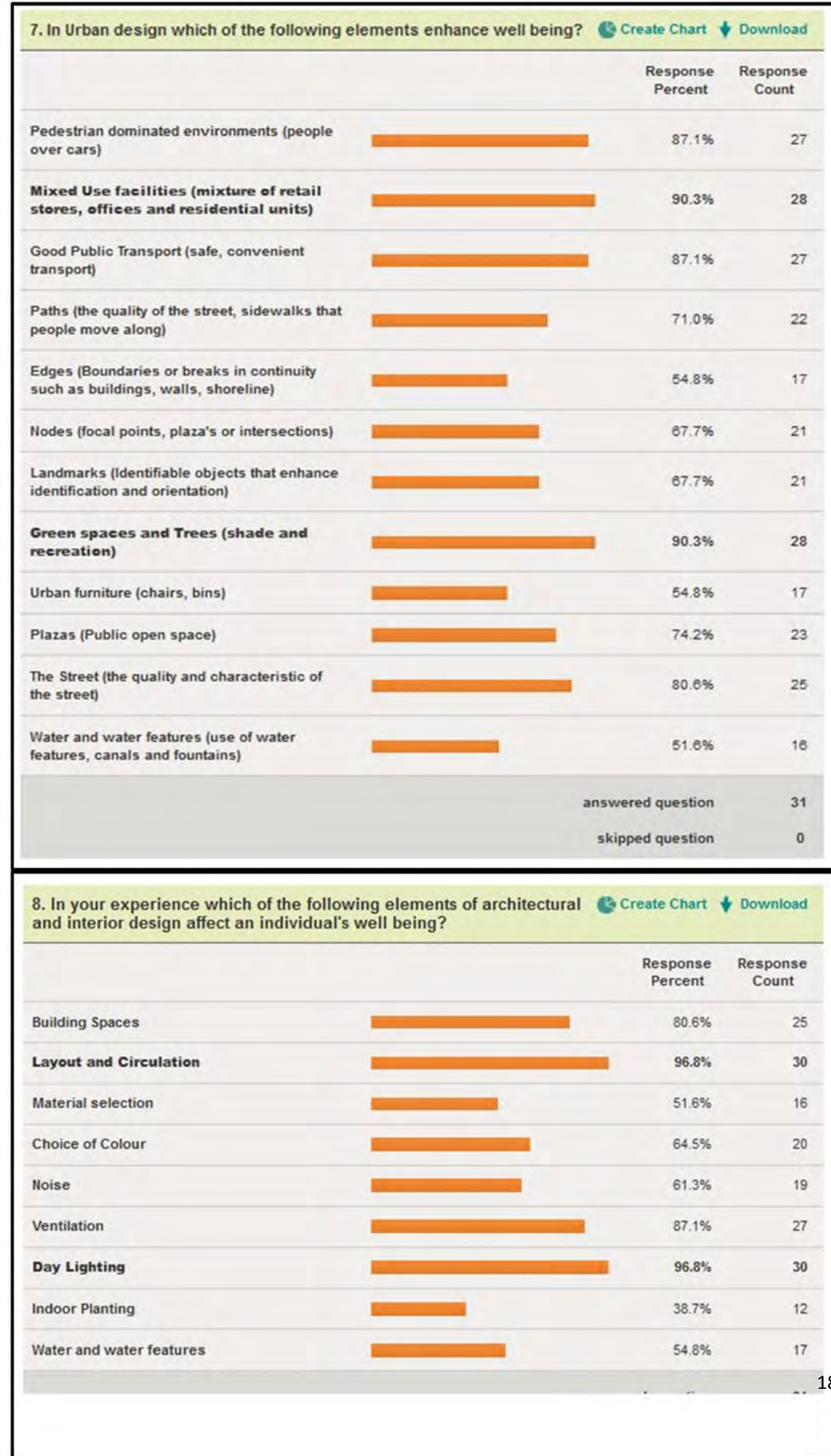
No : 14 47

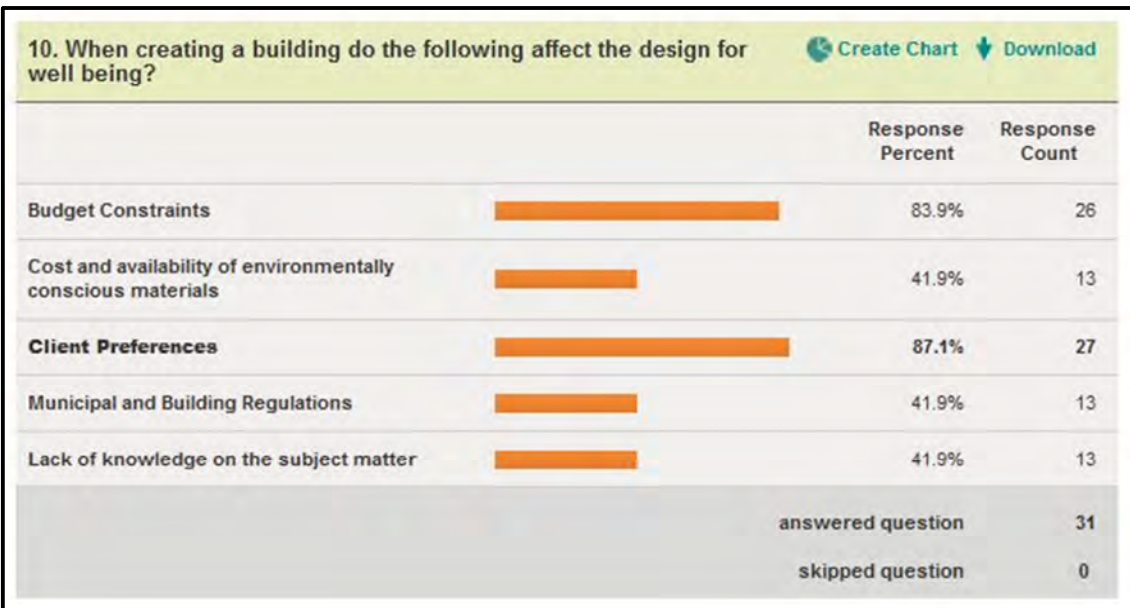


Yes : 12 41.28%

No : 17 58.72%







APPENDIX 3: ARCHITECTURAL TOOLS FOR WELL-BEING:

3.1 DAY LIGHTING TOOLS FOR ARCHITECTURE:

3.1.1 Side Lighting:

Side lighting is the most common method used currently to allow daylight into buildings. Side lighting allows light in, provides views, connectivity to the outdoors and allows ventilation into the building.

3.1.2 Single, Bilateral and Multilateral Lighting:

The most common methods of side lighting include single, bilateral and multilateral lighting. This is basically the number of openings on each facade in a particular room. However the more sides that are exposed to windows the greater the distribution of light.

3.1.3 Clerestory Lighting:

Clerestory lighting is used whereby windows are placed high in a room in the form of long windows with minimal depth (Bouberki 2008, p. 112 - 113).

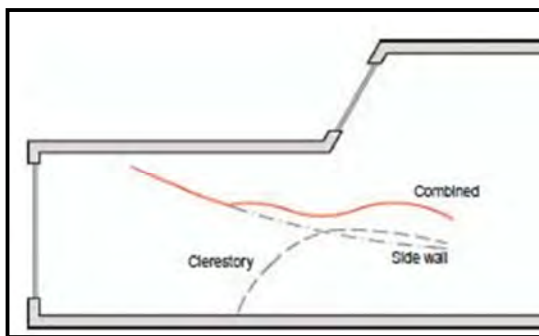


Figure 1: Daylight penetration in a room from a combination of both side window and clerestory lighting (Bouberki 2008, p. 116).

3.1.4 Light Shelves:

This is a system that is designed to capture daylight and redirect it towards the back of a room reflecting it off the ceiling. This creates a more even distribution of light. Light shelves divide the window into two, the lower part providing a view and the upper window allows the light to be captured and redirected into the space of the ceiling. Light shelves can also provide shade and protect occupants from direct sunlight (Bouberki 2008, p. 110 - 111).

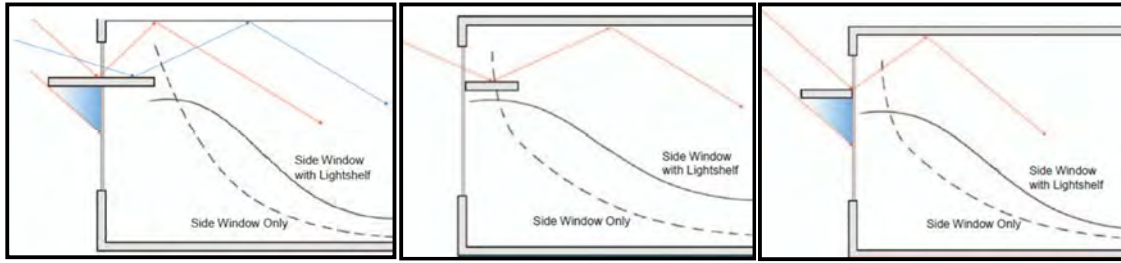


Figure 2 (left): Daylight penetration in a room from a combined light shelf system indicates the shade created by the light shelf in blue (Bouberki 2008, p. 116).

Figure 3 (middle): Daylight penetration in a room with an exterior light shelf (Bouberki 2008, p. 117).

Figure 4 (right): Daylight penetration in a room with an interior light shelf (Bouberki 2008, p. 117).

3.1.5 Top Lighting:

This is when daylight penetrates a building from the roof above the ceiling plane. There are numerous methods that the architect can use to capture natural light which will be mentioned below.

3.1.6 Skylight Systems:

Designed to capture natural lighting when the sun is high in the sky and diffuse the light into the room under the skylight. There are a variety of different methods and types of skylights that the architect can use. A few examples have been illustrated below.

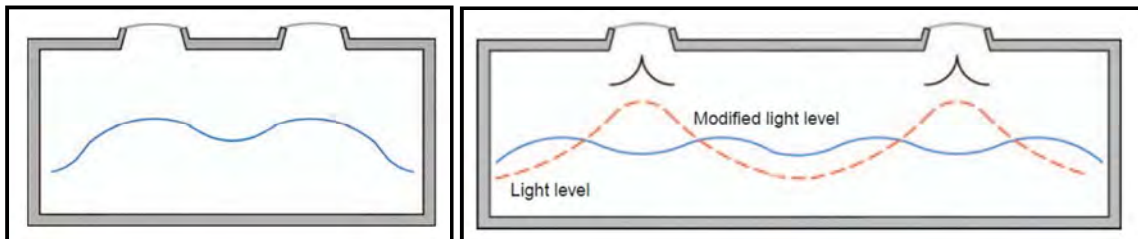


Figure 5 (left): Daylight penetration from skylights (Bouberki 2008, p. 122).

Figure 6 (right): Light deflecting device beneath skylight that allows for a more even distribution of light (Bouberki 2008, p. 122).

3.1.7 Courtyards:

These are outdoor spaces that are completely open to the sky and in many instances are partially or completely enclosed.

3.1.8 Light wells:

These are openings in the floor of a particular room that allows daylight to penetrate into the room below. However light wells are not spaces for occupation, they serve only one purpose and that is to allow natural lighting and ventilation into the buildings interiors.

3.1.9 Atriums:

An atrium is in an interior light space which is enclosed on two or more sides by the walls of a building. They are usually central areas of multi storied buildings open to the sky above. This space is lit from the roof above that is constructed with a material that is transparent or translucent. It also allows light to penetrate into the other interior spaces that open into the atrium. Atriums allow light to enter into deep plan buildings and provides the building occupants with a sense of orientation with regards to time, weather and the outside world. (Phillips 2004, p. 23-24).

3.2 SHADING DEVICES: HORIZONTAL AND VERTICAL LOUVRES

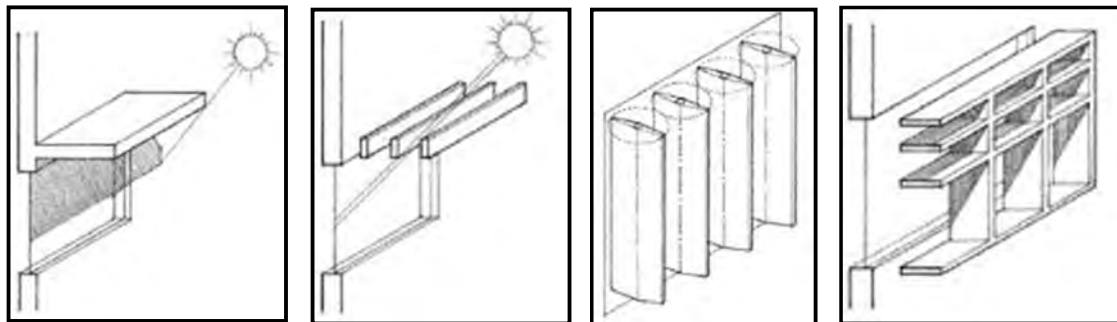


Figure 7 (left): Horizontal overhangs are most effective on northern orientations (Ching 200, p.1.18).

Figure 8 (middle): Horizontal louvers create interesting patterns and reduce heat gain and direct sunlight penetrating into the buildings interiors (Ching 2008, p.1.18).

Figure 9 (right): Vertical louvers are most effective on western and eastern orientations (Ching 2008, p. 1.18).

Figure 10 (far right): Egg crates combine both the characteristics of horizontal and vertical louvers and are highly effective in hot climates (Ching 2008, p.1.18).

3.3 VENTILATION TOOLS FOR ARCHITECTURE:

3.3.1 Wind Variation-Induced Single-Sided Ventilation:

In the simplest terms natural ventilation means opening a window to allow fresh air to circulate in a room, which is otherwise airtight (refer to Figure 1). The airflow into the rooms is due to two factors, wind and buoyancy. Whenever the indoor temperatures are higher than the outdoor temperatures, the buoyancy affect makes the cold air enter at the lower part of the opening and the warmer air exit at the upper part of the opening.

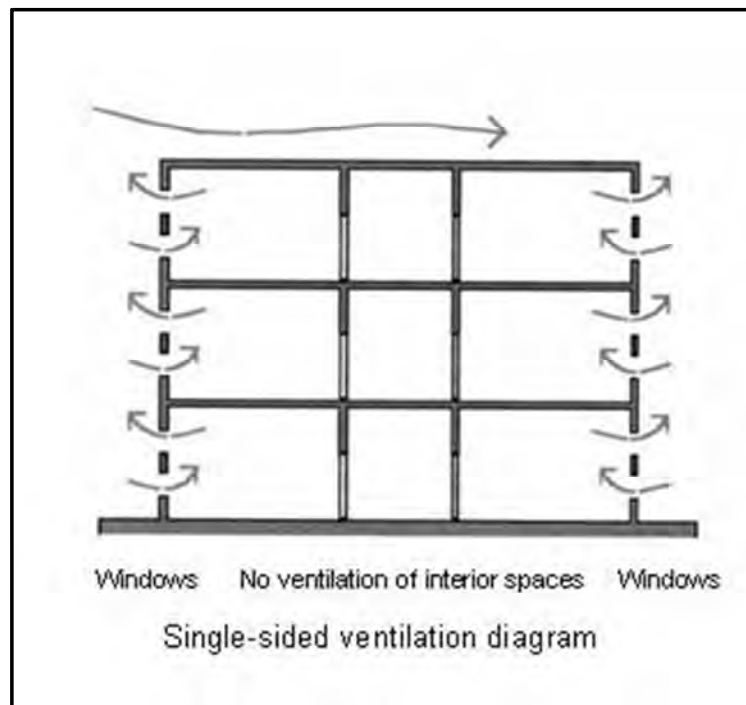


Figure 11: Shows the single sided ventilation system (<http://wiki.aia.org>).

3.3.2 Wind Driven Cross Ventilation:

The wind in cross ventilation creates a high pressure zone where it impacts upon the building and a low pressure zone on the leeward side, channelling air through the building. It is advised to locate windows in the middle of walls as this is where the pressure is the highest (Allard 2005, p. 138).

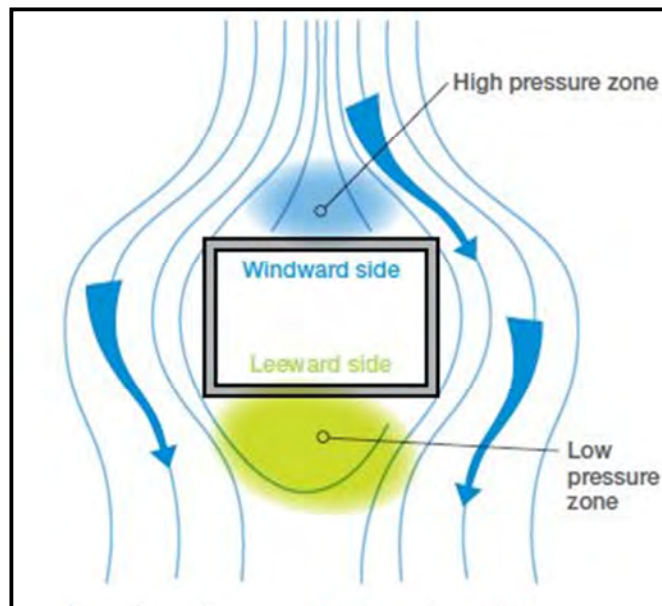


Figure 12: Shows the pressure effect caused from wind (www.archenergy.com).

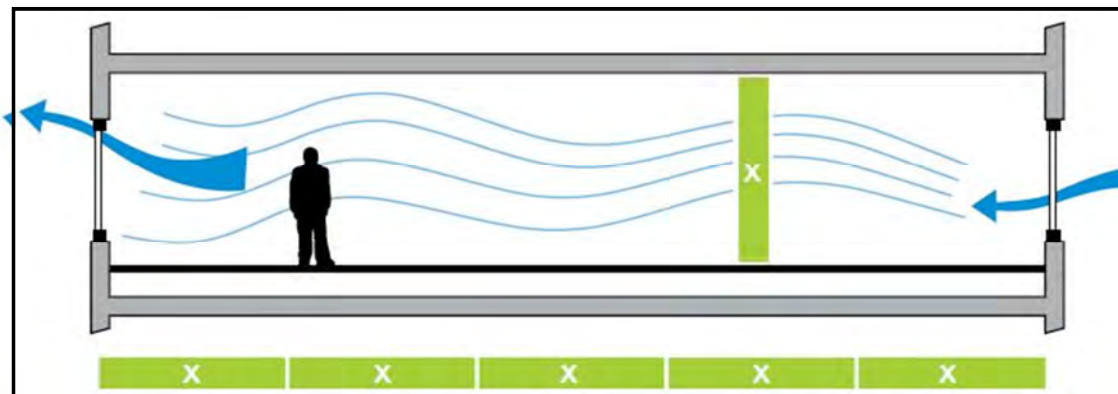


Figure 13: Shows cross ventilation and portrays that it is only effective when the depth of the interior is less than five times the height of the ceiling (www.archenergy.com)

3.3.3 Buoyancy Pressure - Driven Stack Ventilation:

Stack ventilation is characterized by cool air being drawn in from a low down opening that replaces the warmer air which naturally rises as it is lighter (refer to Figure 14). The air eventually rises out of the top opening. For cooling to be effective the air coming in must be cooler than the internal temperature (Allard 2005, p. 142).

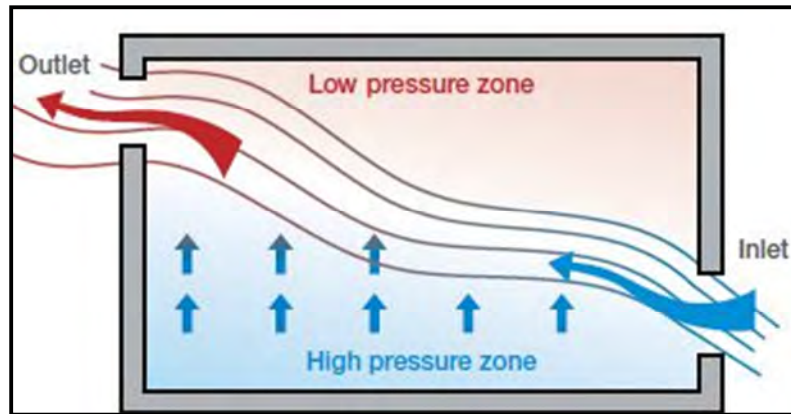


Figure 14: Shows the pressure effect from stack ventilation. It is important to make sure that the height difference between the openings is maximised (www.archenergy.com).

Stack ventilation can be enhanced by using solar chimneys (refer to figure 15). The solar chimney effect increases the air pressure. The top of chimneys should be designed to capture sunlight to increase the heat of the air at the top of the chimney as this increases updraft and helps draw all the air out of the building.

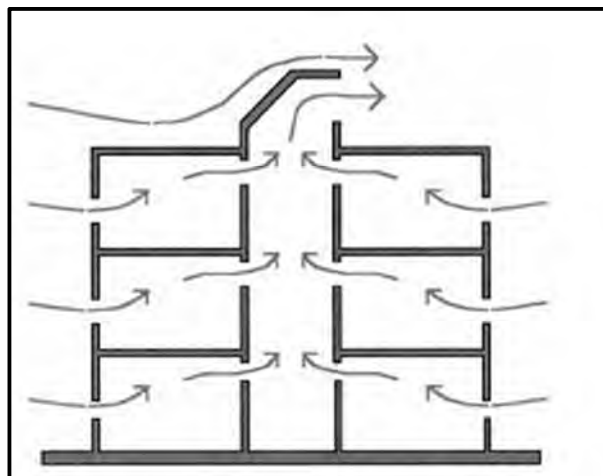


Figure 15: Shows the atrium or wind chimney in the centre, illustrating how the stack ventilation system works (<http://wiki.aia.com>).

3.3.4 Wind Scoops:

Wind scoops can work as natural or mechanical systems whereby air is taken in or extracted above the roofs of buildings. Wind scoops are location on the roof as this is where the strongest and most consistent wind is. However the use of wind scoops have a significant influence on the architectural expression of the building. They are designed to catch the wind and direct this fresh air into the building's interior spaces. They are most effective in

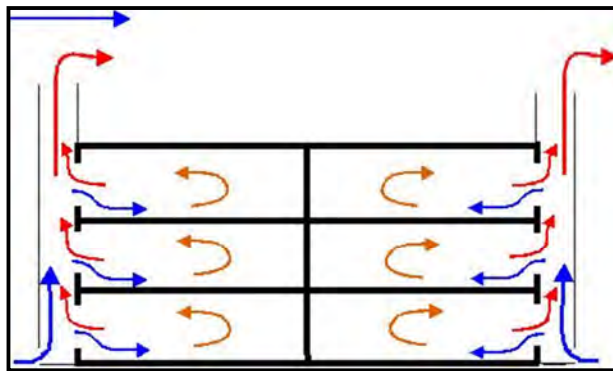


buildings that contain large enclosed areas or great volumes such as in atriums. Wind scoops are utilised in buildings where the facade is unsuitable for ventilation methods due to noise, pollution and low air movement Kleiven (2003, p. 53-54).

Figure 16: The Bed ZED building in Sutton, England, utilizes wind scoops for passive ventilation which are placed on the roof and allow fresh air to be extracted into the spaces within the building (<http://www.solaripedia.com>).

3.3.5 Double Facades:

A double facade is a system that makes use of a second glazed envelope which can create great opportunities for capturing both natural lighting and ventilation. The only negative



thing about this system is that the cavity between the double facades does not offer space for utilisation or occupation. This system can be used as an inlet or an outlet path that makes use of any of the three ventilation principles mentioned earlier Kleiven (2003, p. 59).

Figure 17: The image shows natural ventilation being achieved through the use of a double facade. Wind and stack air drive the air up through the cavity created by the double facade. Single sided ventilation occurs between the occupied spaces and in the facade cavity (<http://www.edsl.net/main/Software/Designer/Evaluating.aspx>).

3.3.6 Chimneys:



Chimneys are another form of roof ventilation element that allows air to be extracted out of buildings as well as to allow fresh air into buildings. Chimneys make use of both thermal buoyancy and the wind Kleiven (2003, p. 58).

Figure 18: The BRE building in Garston, Liverpool with chimneys extending above the roof to increase the stack effect and to achieve stable wind induced suction (<http://www.flickr.com>).

3.3.7 Wind Towers:

Wind towers are actual building elements that are designed to take full advantage of the wind and can be designed in any shape. These elements are usually placed on top of a building's roof. They can be used to extract air out of the building or to bring fresh air into the building and in some instances they can do both.



Figure 19: The Africa Centre is located in northern Kwa-Zulu-Natal and makes use of a wind tower. In this instance the wind tower is centrally placed. Air enters through the sides of the building facades and through the stack effect the tower extracts the hot air out cooling the interior spaces (East Coast Architects).

3.3.8 Atriums:

An atrium is a space with a glazed roof and possibly a glazed facade. In an atrium used for natural ventilation thermal buoyancy and wind are the two driving forces. The higher indoor air temperatures compared to the outdoor temperatures induces a significant buoyancy effect.

As mentioned earlier both wind scoops or wind towers can be connected to atriums in order to utilise the wind. Wind pressure differences around the building and on opposite sides of an atrium can also be used by placing windows or openings. Atriums can act as air supply units or air extract units and in some instance they can act as both.

3.3.9 Ventilation Openings in the Facade:

Ventilation openings on the facade are designed to provide both inlets and outlets of air. They are separated from windows which serve as other purposes to provide day lighting and views. These elements impact on the architectural expression of the facade and when designed with thought they can be highly effective.

PART TWO

DESIGN REPORT

PART TWO

DESIGN REPORT TABLE OF CONTENTS

CHAPTER ONE	1
INTRODUCTION AND BACKGROUND	1
1.1 INTRODUCTION	1
1.2 DESIGN BACKGROUND	2
1.2.1 The Problem Statement	2
1.2.2 Issues in the Architectural Environment	2
1.2.3 The Working Hypothesis	2
1.2.4 Project Description	3
1.2.5 Key Question	3
1.3 THE ARCHITECT	4
1.3.1 The Role of the Architect	4
1.3.2 The Vision	5
1.4 THE NOTINAL CLIENT	5
1.4.1 The Clients Organisation	5
1.4.2 Clients Background	5
1.4.3 The Clients Requirements and Brief	6
1.4.4 Accommodation Schedule	7
1.4.5 Urban Area Selection Criteria	11
1.5 CONCLUSION	12
 CHAPTER TWO	 13
URBAN AREA AND SITE SELECTION, SURVEY AND ANALYSIS	13
2.1 INTRODUCTION	13
2.1.1 Geographic position	14
2.1.2 Historical Context	14
2.1.3 Demographic Context	15
2.1.4 Geography and Climate	15
2.1.4 Durban Central Business District	16
2.2 URBAN ANALYSIS OF DURBANS CENTRAL BUSINESS DISTRICT	17

2.3	SITE AREA SELECTION AND DISCUSSIONS.	18
2.3.1	The Workshop and Central Park Precinct	19
2.3.2	The Victoria Embankment Precinct	21
2.3.3	The City Hall, Beachfront area	24
2.3.4	Urban Area Selection:	27
2.4	LOCATION, OF URBAN AREA AND SITE:	28
2.5	ANALYSIS OF SELECTED URBAN AREA AND SITE:	29
CHAPTER THREE: THE DESIGN BACKGROUND AND PROPOSAL:		34
3.1	THEORIES:	34
3.1.1	Image of The City:	34
3.1.2	Biophilia:	34
3.1.3	New Urbanism:	35
3.2	SUBSIDORY DESIGN CONCEPTS AND PRINCIPLES:	35
3.3	PRECEDENT STUDIES.	38
3.3.1	60 Richmond, Toronto, Canada:	38
3.3.2	Genzyme Centre in Cambridge	39
3.3.3	Sabic Europe Head Office	40
3.3.4	It Building in New Delhi, India	41
3.3.5	Glasgow school of art:	42
3.3.6	West Hollywood USA	42
3.4	CASE STUDIES:	43
3.4.1	Munich Reinsurance Building, JHB :	43
3.4.2	Melrose Arch, JHB:	44
3.5	URBAN DESIGN PROPOSALS: (MACRO)	45
3.6	THE DESIGN PROPOSAL: (MICRO)	51
CHAPTER FOUR		56
CONCLUSION.		56
REFERENCES		57
APPENDIX 1: THE DESIGN		59

CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION:

From the theoretical study of social interaction and well-being in architectural environments, one is made aware of a variety of additional unnecessary stresses that the architectural environment places on the well-being and social interaction needs of its users. The research recognises the benefits and design tools of a more appropriate approach to the built environment through the exploration of the theories of Biophilia, Image Of The City and New Urbanism. The theories seek to provide architects and the designers of the built environment with tools that can be used to create architectural environments that enhance social interaction and the well-being of building users. The design of built environments that consider the social interaction and well-being needs of the people will convert architectural environments into spaces that have physical and physiological benefits to its users.

However, through the literature review, it can be said that many built environments do not contribute to the social interaction and well-being needs of its users. Therefore the aim is to utilize the information obtained from the literature reviewed; empirical data acquired to aid in the derivation of a design brief, selection of an urban area and an appropriate site. Finally, the tools that were recognised in the literature review will be applied in the design of a Multi – Use – Facility in Durban, Kwa-Zulu-Natal to demonstrate how an architectural environment can enhance the well-being and social interaction needs of its users.

This chapter briefly describes the background, intentions, vision, client and their requirements and subsequently a brief is developed for the project, in keeping with the framework set up in the theoretical discussion. The area of Durban is analysed and three potential urban areas are selected for the project. These areas are then individually investigated to identify the most appropriate for the proposed urban design and Multi – Use – Facility. Once the urban area is selected an appropriate site is selected within the urban area for the proposed design of an urban design framework in which the site for the Multi – Use – Facility will be identified and motivated for.

1.2 DESIGN BACKGROUND:

1.2.1 The Problem Statement:

Present day life is filled with a variety of stresses such as family, work and personal pressures which all place a considerable amount of stress upon people. All these stresses create a demanding lifestyle. Why should the architectural environment add extra stress on the people that use it and adversely affect their well-being and social interaction needs?

1.2.2 Issues in the Architectural Environment:

The stressors on a macro scale are: Urban sprawl, traffic congestion, vehicle dominated contexts, lack of social spaces, parks, green spaces, plazas and the general street quality, zoning laws, deteriorating downtowns, environmental degradation, tarmac parking areas and treeless streets.

The stressors on a micro scale are: Sick Building syndrome caused from artificial environments that rely on an airtight shell with the use of mechanical ventilation and artificial lighting with a lack of occupant control and connection to the outside world. Further the uses of synthetic materials which contain high concentrations of VOCs pollute the indoor air quality. Lighting and ventilation is a major concern in modern society. From the macro perspective of global warming, climate change, burning of fossil fuels, right down to the micro level, with concerns and issues of glare, thermal comfort and both health and well-being (Bouberki 2008, p. 47). Further the choice of colour has the ability to adversely affect ones well-being. A lack of connection to nature in the architectural environment plays an important part.

1.2.3 The Working Hypothesis:

Humans are constantly placed under huge demands and an abundance of stresses in the urban environment. It is important for the healthy functioning and well-being of the physical body that humans are at peace mentally. Approaching the built environment with a focus on creating environments that have a positive impact on human well-being and creating opportunities for people to interact with one another will convert architectural environments into spaces that have physical and psychological benefits for the users. These benefits can

promote well-being, a sense of place within the user, encourage productivity and provide a meaningful journey and experience through architectural environments in both a macro and a micro context regardless of culture and age.

1.2.4 Project Description:

A Multi - Use - Facility has been proposed as this building typology is well suited to express the theoretical discourse appropriately. The Multi - Use - Facility is a hybrid building typology that consists of retail and residential units, restaurants and offices. Justifying this type of typology is the fact that most people spend most of their lives at work, home and at the shops. The building is to create an architectural environment that enhances social interaction and well-being in the work, home and retail environment and is to use the design tools as discussed in the literature reviewed. In doing so the project is to practically demonstrate through architectural design the findings from the literature review and empirical data obtained.

The aim of the proposed Multi - Use - Facility is to demonstrate the relevance and importance of social interaction and well-being in the architectural environment as well as the benefits of such an approach. The proposed design is to create a dramatic contrast against other existing architectural environments in Kwa-Zulu Natal where the social interaction and well-being needs of the users are often compromised. The proposed design is to be grounded in the theoretical and conceptual framework established from the outset right up to completion.

The project is to improve the quality of life by enhancing the architectural environment through greater consideration of people's social interaction and well-being needs. Essentially creating an architectural environment that people want to experience, work and live within, with the numerous benefits such an environment has for the users.

1.2.5 Key Question:

What is the role of the architect in creating architectural environments that enhance social interaction and well-being and reduce the additional stress these environments place upon people?

1.3 THE ARCHITECT:

1.3.1 The Role of the Architect:

A poorly designed architectural environment affects the well-being of people and places a considerable amount of stress upon the users. According to Day (2002, p. 7), “*Stress breeds illness*”, the architectural environment therefore has the ability to create stress in a number of ways just as well as it has the potential to reduce it. The spirit of a particular place is fed by the attitudes and the many actions of the people responsible for the built environment (Day 2002, p. 7). The research recognises the important need to design for social interaction and well-being with the many benefits it offers. The findings from the research can be used as architectural tools and guidelines to create architectural environments that enhance both social interaction and well-being. Therefore the architect plays an important part in creating these types of environments. Below numerous points are mentioned that the researcher and the architect should consider in the design of architectural environments

- Design architectural environments that make use of New Urbanism principles as well as Biophilic design attributes.
- Design architectural environments that do not contribute to urban sprawl.
- Design sustainable architectural environments that have higher densities that support public transport and address easy access to employment and social facilities.
- Design architectural environments that increase legibility of the overall environmental image, allowing users to identify and orientate with their surroundings.
- Design spaces for social interaction through good urban and architectural design.
- Design green spaces that connect people to nature and soften the harsh urban spaces that enhance heat build-up.
- Design water features that introduce tranquillity.
- Design healthy buildings with natural ventilation and day lighting strategies.
- Design buildings that allow for occupant control.
- Design buildings that connect people to the natural world, through planting and good ventilation and lighting strategies.
- Design buildings with a conscious for natural materials over synthetic materials.

- Design interior spaces through the correct choice of colours, materials, as well as natural lighting and ventilation requirements that support human well-being.

1.3.2 The Vision:

The creation of an architectural environment that enhances both social interaction and well-being of its users and occupants and that places less stress on people's already demanding lifestyles.

1.4 THE NOTINAL CLIENT:

1.4.1 The Clients Organisation:

In 2012, the eThekweni Municipality of Durban commissioned AMDEC property developers to generate an urban development framework plan to provide an integrated urban design vision for the rejuvenation of Durban's central business district. The Multi –Use – Facility is to be part of the development scheme in which AMDEC property developers would act as the client.

The clients involved in the proposed urban design will be a joint venture between the Durban eThekwini Municipality and AMDEC property developers. The Durban eThekwini Municipality will be the client and those responsible for the proposed urban design project in order to reach their current goal that Durban will be the most liveable city in Africa by the year 2020. The eThekwini municipality will be responsible for the funds for the implementation of all the new proposed public spaces, roads and sidewalks. However AMDEC property developers will fund the development of the urban design new mixed use precinct with the approval of Durban's eThekweni Municipality.

1.4.2 Clients Background:

The eThekweni Municipality of Durban is responsible for the maintenance, care, running and laws of the city as well as the future plans of Durban. **Their current vision is that by the year 2020** Durban city will enjoy the reputation of being Africa's most caring and liveable City where all citizens live in harmony. Their core values are sustainability, economical success, the creation of a caring and smart city.

Amdec is one of South Africa's leading property development, investment and project management specialist firms. With almost 20 years of industry experience and a current development portfolio in excess of R4, 5 billion, Amdec ranks as one of the country's biggest private property developers. Amdec regards green development, social interaction and human well-being as a central component in their developments. They have invested in and created numerous green developments from eco estates and new urban precincts.

Amdec applies relevant green building principles and technologies in its new residential and commercial developments and is seeking opportunities to enhance the energy efficiency of its properties. It further aims at creating spaces that encourage social interaction to occur as well as creating architectural environments that encourage human well-being. Amdec is involved in the construction of Melrose Arch in Johannesburg and are the co-owners of the development. With their strong belief in New Urbanism principles as evident in their Melrose Arch development, they strive to create healthy environments. Their mission is the creation of new urban environments through the use of mixed use developments that use less energy due to trip generation, as well as leveraging off existing bulk infrastructure reducing urban sprawl.

1.4.3 Clients Requirements and Brief:

The eThekweni Municipality requires an urban design that would act as a catalyst for Durban rejuvenation. This proposal is to enhance the social interaction and well-being needs of its inhabitants, creating the ideal city to live in Africa by the year 2020. The eThekweni Municipality has asked Amdec property developers to create an urban design framework that would act as a catalyst for Durban rejuvenation.

AMDEC have invested large amounts of money in the design of a proposed urban design development in the Durban CBD having the same vision as the Durban eThekweni Municipality. Amdec requires an urban development that is to act as a catalyst and kick start the process of linking the city to the promenade / beachfront through mixed use environments and public spaces. They have requested for the first building to be designed as a Multi-Use Facility that must incorporate their new office headquarters and the expansion of their business. The design is to represent their company image and beliefs and should act as a show piece for what their company stands for.

Both the eThekwni Municipality and Amdec property developers' main requirement is the creation of an architectural environment that enhances both social interaction and well-being.

1.4.4 Accommodation Schedule:

The accommodation schedule came from the type of building typology that the building is as well as from the client. The idea of creating a mixed use environment was the starting point of the accommodation schedule. The building typology was thought of and it was concluded that the multi-use-facility would be a hybrid building consisting of mainly three components. These three components being retail, office and residential. Further the client Amdec stated that a major component of the design brief which should form a major part of the accommodation schedule was to be their new office headquarters. It was from this background that an accommodation schedule was created.

The accommodation schedule for the ground floor plan was to consist mainly of public places to serve the general public that would use the area. It was decided that the retail component would best be suited for the ground floor.

The first floor was to consist of offices as this is more private and away from the public realm. The last component being residential would then be considered from the second floor to the fifth floor. It was decided that the new office headquarters would be housed in its own building. Taking into account the clients requirements the office headquarters was to rise from ground floor to a staggering eighth floor.

Due to the nature of the building a further requirement was to provide for basement parking. The following should briefly illustrate the proposed accommodation schedule.

- SITE AREA: 9150m²

1.4.4.1 BASEMENT: 8120m²

- UNDER GROUND PARKING: 6000m²
Consisting of normal parking and parking's for disabled.
- WATER STORAGE: 2000m²

Collection of rain water from roofs to re-use for watering the plants within the building

- GUARD HOUSE: 20m2
- VENTILATION :
To receive 10 percent natural ventilation
- LIFT LOBBY: 100m2
2 x lifts for Amdec headquarters,
2 x for general offices
2 x for residential units.

Basement total: 8120m2

1.4.4.2 GROUND FLOOR: 8000 m2

- URBAN DESIGN: 2200m2
The urban green movement spine
- COURTYARD: 800m2
Seating area for general public, water features and trees.
- 10% CIRCULATION: 800m2
2 x lift lobby for Amdec headquarters
2 x lift lobby for general offices
2 x lift lobby for residential units
- ABLUTIONS: 200m2
Ablutions for general public
Ablutions for restaurants
- RESTARAUNTS: 500m2
3 x restaurants
Seating area for customers
Kitchen and storage facilities
Administration
- RETAIL OUTLETS: 1000m2
Variety of different size shops
- ANCHOR TENANT SHOPS 1000m2
Variety of different size shops with storage

- ENTRANCE TO BASEMENT: 100m2
- AMDEC: 1400m2
Atrium, entrance, reception, waiting area, conference and audio visual room, kitchen, customer services, shop front display and general space for office workers and administration.

Ground floor total: 8000m2

1.4.4.3 FIRST FLOOR: 5500m2

- 10% CIRCULATION: 500m2
2 x lift lobby for Amdec headquarters
2 x lift lobby for general offices
2 x lift lobby for residential units
- 5% ABLUTIONS : 250m2
- LIVE WORK UNITS : 250m2
- OFFICES: 4000m2
Reception, storage, office space, kitchenette
- ATRIUM AND INDOOR AND OUTDOOR BALCONIES: 500m2

First floor total: 5500m2

1.4.4.4 SECOND FLOOR: 7000m2

- 10% CIRCULATION: 700m2
2 x lift lobby for Amdec headquarters
2 x lift lobby for general offices
2 x lift lobby for residential units
- ABLUTIONS : 250m2
For individual units and for Amdec headquarters
- LIVE WORK UNITS : 250m2

- 8 x live and work units
- AMDEC HEADQUARTERS OFFICES: 2000m2
Offices, meeting room, kitchenette, reception and waiting area
- ATRIUM AND INDOOR AND OUTDOOR BALCONIES: 500m2
- RESIDENTIAL UNITS: 2500m2
Consisting of 1 – 3 bedroom units.
- COMMUNAL OUTDOOR SPACE: 750m2
Children's playground, braai area, pause and resting areas as well as green outdoor space.

Second floor total: 7000m2

1.4.4.5 THIRD TO FIFTH FLOOR: 11 250m2

Each floor is to contain the following:

- 10% CIRCULATION: 500m2
2 x lift lobby for Amdec headquarters
2 x lift lobby for general offices
2 x lift lobby for residential units
- AMDEC HEADQUARTERS OFFICES: 1500m2
Offices, meeting room, kitchenette, reception and waiting area
- ATRIUM AND INDOOR AND OUTDOOR BALCONIES: 250m2
- RESIDENTIAL UNITS : 1500m2
Consisting of 1 – 3 bedroom units.

Third, Fourth and Fifth floor total: 11 250m2

1.4.4.6 FIFTH TO EIGHTH FLOOR: 6000m2

Each floor is to contain the following:

- 10% CIRCULATION: 1250m2
2 x lift lobby for Amdec headquarters
- AMDEC HEADQUARTERS OFFICES: 4500m2
Offices, meeting room, kitchenette, reception and waiting area
- ATRIUM AND INDOOR AND OUTDOOR BALCONIES: 250m2

Third, Fourth and Fifth floor total: 6000m2

TOTAL SQUARE METRES FOR ACCOMODATION SCHEDULE: 45 870m2

1.4.5 Urban Area Selection Criteria:

The urban area is selected based on various criteria which is informed by the proceeding literature review. In order to select an urban area the following vital criteria was used to make the best possible choice for an urban design and multi-purpose-facility.

- **Green areas, plazas and public spaces:** Areas that contain existing public spaces so that the proposed urban design and building can connect and link to these important spaces.
- **Accessibility:** The urban area is to be easily accessible to people coming to the urban area as well as linking to other important public spaces and areas within the immediate context. The urban area should also be close to existing public transport to ensure that the urban area is accessible to all socio economic classes.
- **Connectivity:** the site area should have good connectivity to the site as well as the immediate context.
- **Linkages:** The urban area should be able to provide linkages to important spaces and buildings within the immediate context. Further the site should be centrally located within its immediate context to provide numerous links to the site area as well as linking the site area to numerous areas within its immediate context.

- **Vistas:** The urban area should display the opportunities of maximising upon existing vistas.
- **General:** Anything that the urban area can offer to enhance its selection such as views over the surrounding context. Further the negative impact that the urban area has on its selection is also considered in the final urban area selection.

1.5 CONCLUSION:

The previous discussion has identified the important criteria of selecting an appropriate urban area if the proposed urban design and building is to have the biggest possible positive impact and success on its inhabitants. Keeping in mind the theoretical discourse, development of the brief and urban area selection criteria, the following chapter looks into Durban's CBD as a possible area for the urban areas to be selected and analysed. Once the most appropriate urban area is selected a more detailed analysis of that particular urban area will be analysed in terms of where the most appropriate place within that urban area would be for the proposed urban design and Multi - Use - Facility.

CHAPTER TWO: URBAN AREA AND SITE SELECTION, SURVEY AND ANALYSIS

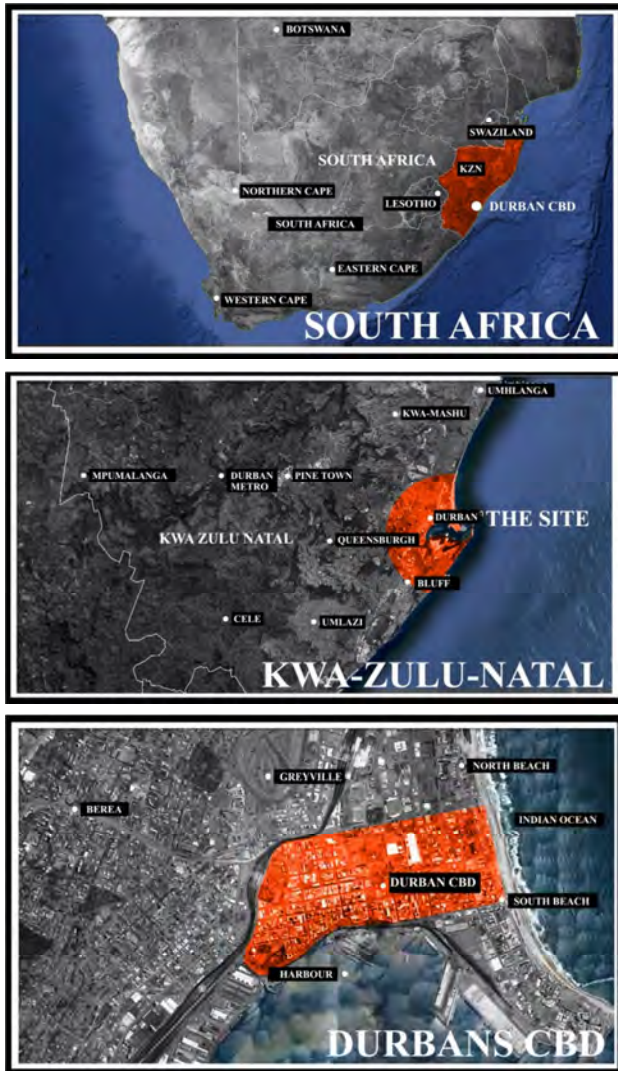
2.1 INTRODUCTION:

The Durban Central Business District in Kwa-Zulu Natal, South Africa has been selected as the appropriate location for the proposed urban design and Multi - Purpose - Facility. This decision has been made for various reasons which has been guided by the theoretical discourse.

- The site area should be in an urban context so it can have the biggest possible impact on the citizens and a large population is required.
- The site area should be selected in the CBD so that it does not contribute to sprawl and can bring life back to the heart of deteriorating cities.
- The site area should be along well known roads and have access to public transport.
- The site area should have a variety of public spaces within the near context to provide linkages to them.
- The site area should have a busy active street so that through urban and architectural design one can encourage social interaction to occur.
- The site area that has a good public transport system enables city inhabitants to reduce their dependency on private cars without sacrificing mobility. Such a move potentially allows for higher living densities without the roads becoming blocked up and mobility suffering.
- The site areas that are near recreation spaces to offer its inhabitants opportunities for active and passive exercise.
- The site areas that are not contributing to the well-being of its cities inhabitants, so that these places can be transformed into new environments that enhance both social interaction and well-being.

The following subchapter documents the relevant information regarding Durban necessary to understand its geographical position, historical and demographic context as well as its geography and climate. Understanding of such aspects of the selected area will aid the proposed urban design and Multi-Use-Facility in the area.

2.1.1 Geographic Position:



Durban is situated on the eastern coastline of Kwa-Zulu Natal within the South Africa. It is situated adjacent to the Indian Ocean on the east coast and stretches to the east along its harbour to the south.

The city's main position as a port of entry onto the southern African continent has led to a development of national roads around it. On the western side the N3 Western Freeway links Gauteng to the city and the N2 outer ring road links the Eastern and South Coast to the South and Mpumalanga on the North to Durban (<http://en.wikipedia.org/wiki/Durban>).

Figure 1: Location of site (Author 2012).

2.1.2 Historical Context:

The area known as Durban was first discovered in the year 1497 on Christmas day by a Portuguese explorer Vasco da Gama. Da Gama named the bay which is now Durban's harbour the "Bay of Natal" which is the Portuguese word for Christmas.

Very little activity took place until 1842 when British Lieutenant F. G. Farewell arrived from the Cape Colony with a group of men who established a small settlement. It was Henry Flynn who accompanied Farewell and famously befriended King Shaka of the Zulus by helping him to recover from a battle wound. In return Shaka gave Flynn a 25-mile piece of the coastline in

gratitude. In 1835 it was decided to build a capital which was named "Durban" after the Cape Governor Sir Benjamin D'Urban.

The republic of Natalia was formed in the year 1838 by the Afrikaans Voortrekkers who had travelled eastwards from the Cape. However, the Voortrekkers has many conflicts with the Zulus and British settlers before being forced to accept British rule in 1844.

This allowed the British Empire to take full advantage of the natural harbour bay making it one of the most important seaports under their control. The boom of the sugarcane industry in Natal towards the end of the 19th century helped ensure that Durban's seaport became the largest sugar terminal in the world. The strategic position of the natural bay is what caused the development of what is now known as the Durban Central Business District along its nearby edges (<http://www.tripadvisor.com/Travel-g293740-c3852/South-Africa:Brief.History.Of.Durban.html>).

2.1.3 Demographic Context:

Durban is the largest city in Kwa-Zulu Natal and the third largest in South Africa with an estimated population of 3.5 million inhabitants. Data shows that 68% of the population are of working age and the remaining 3% are under the age of 19 years.

Durban is ethnically diverse, with a variety of cultures, mixed beliefs and traditions. The majority of the population are black (56%), then the Indians (27%) with the minority white community accounting for 14%. The last 3% are coloured (www.durbanmetro.com).

2.1.4 Geography and Climate:

Durban and its suburbs are relatively hilly with very limited flat areas. However the Central Business District of Durban and the harbour are one of these limited areas that are predominantly flat (<http://en.wikipedia.org/wiki/Durban>).

Durban is known to have a subtropical climate with very hot and humid rainy summers and short warm winters. The annual rainfall recorded in Durban is approximately 1009 millimetres with the average temperatures in summer ranging from 28 to 35 degrees celsius. In contrast to this the winter temperatures average between 20 and 23 degrees celsius. Sunrise in Durban on the summer solstice occurs at 04h45 and sunset at 19h00, on winter solstice

sunrise is at 06h30 and sunset at 17h20. The summer season starts in November and ends in April with the winters being from June to August (<http://en.wikipedia.org/wiki/Durban>).

Climate data for Durban													[hide]
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C (°F)	36 (97)	34 (93)	35 (95)	36 (97)	34 (93)	36 (97)	34 (93)	36 (97)	37 (99)	40 (104)	34 (93)	36 (97)	40 (104)
Average high °C (°F)	28 (82)	28 (82)	28 (82)	26 (79)	25 (77)	23 (73)	23 (73)	23 (73)	23 (73)	24 (75)	25 (77)	27 (81)	26 (77)
Average low °C (°F)	21 (70)	21 (70)	20 (68)	17 (63)	14 (57)	11 (52)	11 (52)	13 (55)	15 (59)	17 (63)	18 (64)	20 (68)	17 (63)
Record low °C (°F)	14 (57)	13 (55)	12 (54)	9 (48)	5 (41)	4 (39)	3 (37)	3 (37)	5 (41)	8 (46)	10 (50)	12 (54)	3 (37)
Rainfall mm (inches)	134 (5.28)	113 (4.45)	120 (4.72)	73 (2.87)	59 (2.32)	28 (1.1)	39 (1.54)	62 (2.44)	73 (2.87)	98 (3.86)	108 (4.25)	102 (4.02)	1,009 (39.72)
Avg. rainy days	15	13	13	9	7	5	5	7	11	15	16	15	130
Mean monthly sunshine hours	182.9	180.8	201.5	207.0	223.2	226.0	229.4	217.0	174.0	170.5	166.0	169.1	2,366.4
Source #1: SAWS ^[16]													
Source #2: Hong Kong Observatory (sun only 1961-1990). ^[17]													

Figure 2: Climate data for Durban (<http://en.wikipedia.org/wiki/Durban>).

2.1.5 Durban Central Business District:

The Durban Central Business District has been selected as the main area of interest. Durban is well known for its deteriorating CBD environment and its cause of urban sprawl which does not contribute to the well-being of its inhabitants. Further, Durban does not contribute towards a 24 hour city and is left lifeless at night. Most of the Central Business District is zoned as commercial with limited open public spaces which does not contribute to the social interaction and well-being.

The main objective of the client, the eThekweni municipality which is the local municipality of Durban is for Durban to become the most liveable city in Africa by the year 2020. Therefore the creation of a new mixed use urban design in the Durban CBD can uplift and rejuvenate the area through spaces that encourage social interaction. Further, the design of environments that enhance the well-being of its inhabitants and create a pedestrian friendly 24 hour environment would create an abundance of jobs, places to live as well as places for recreation and leisure. The proposed design can further act as a catalyst for future mixed use developments to ensure that Durban does become one of Africa's most liveable cities.

2.2 URBAN ANALYSIS OF DURBANS CENTRAL BUSINESS DISTRICT:



Figure 3: Aerial map of Durban (www.googleearth.com).

The image to the left shows Durban's Central Business District and its more immediate context. From this map one can clearly see the CBD as it is bounded by the Indian Ocean to the east, the train lines to the west and the harbour to the south. Due to urban sprawl other suburbs can clearly be seen surrounding Durban's CBD. Major road transport leading to the area is highlighted in yellow. The area of interest in Durban's Central Business district is highlighted in orange.

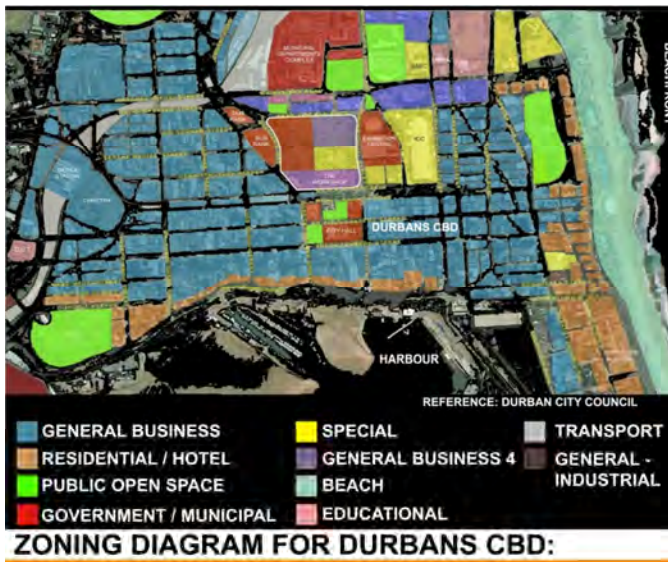


Figure 4: Zoning diagram of Durban (www.googleearth.com).

The figure on the left illustrates the zoning for Durban's CBD. One can see that the city is zoned as mostly commercial which is not contributing to activity after working hours. The land use does not encourage social interaction or 24 hour activity. Further it is evident that there is a lack of social and green spaces.

2.3 SITE AREA SELECTION AND DISCUSSIONS:

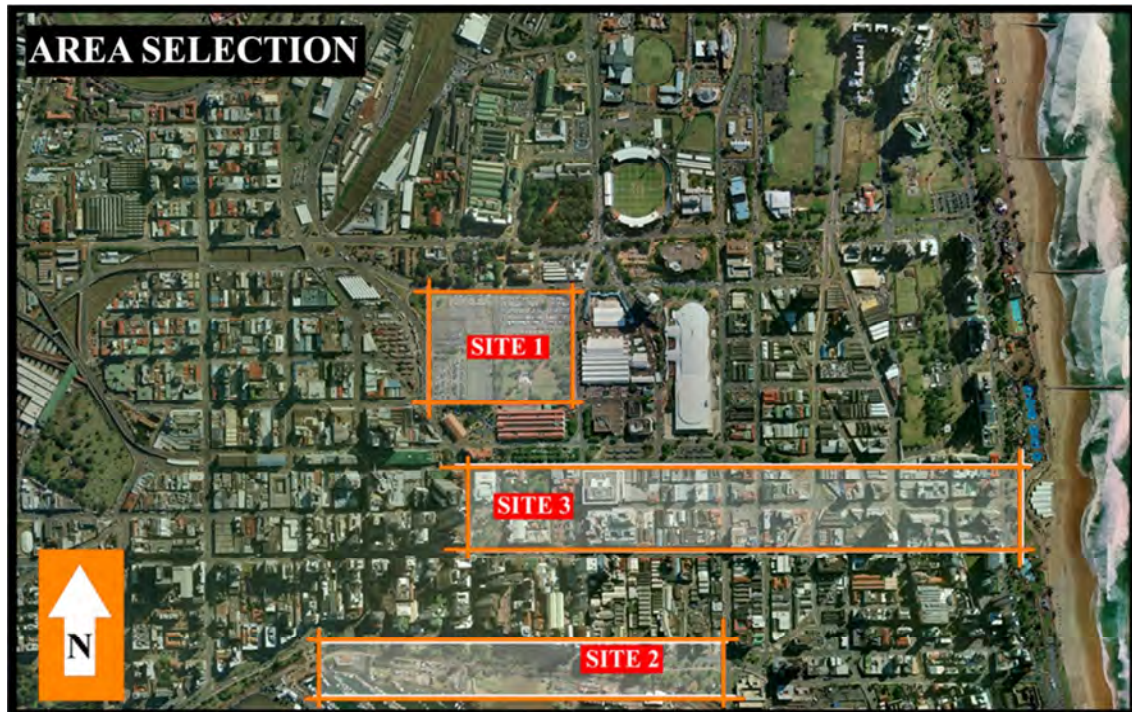


Figure 5: Site locations (www.googleearth.com).

The figure above illustrates the three proposed urban areas that have been selected in the Durban CBD, in which one will be selected according to the urban area selection criteria.

2.3.1 SITE AREA OPTION 1: The Workshop and Central Park Precinct



Figure 6: Workshop site location (www.googleearth.com).

The Workshop and Central park precinct was selected as a possible site selection as it is currently a large vacant site that has many possibilities. The existing site and sea of car parking lots does not contribute to well-being and social interaction amongst Durban's inhabitants. Rather it creates spaces that promote social isolation. Therefore a new proposal is in need to combat this issue.

1. **GREEN AREAS, PLAZAS AND PUBLIC SPACES:** Besides central park itself the nearest green spaces are Farewell Square and Medwood Gardens. The site is right next to Workshop Square and is relatively close to Farewell Square. This allows the inhabitants ease of access to these other important social public spaces. However the beach front is far away and the links are not direct.

2. **ACCESSIBILITY:** Both public transport and an abundance of parking is already available on this site. There is both parking on ground level and underground by the Workshop. The site is fairly well utilised with many people moving through the site from surrounding streets and transport areas. The site is in walking distance to many existing facilities, public spaces and social needs.
3. **CONNECTIVITY:** The site has good connectivity, a range of public facilities and spaces are relatively close by. The site is not isolated or difficult to get to.
4. **LINKAGES:** The site does not allow for the opportunity of many main linkages that can have a positive impact upon the people. However it does offer a possibility of a linkage to Victoria Embankment and one to the ICC.
5. **VISTAS:** The site does not offer any exciting vistas.

6. **GENERAL:**

PROS:

- The site offers spectacular views and is very open.
- The site is perfectly positioned to maximise on north light.
- No vehicular activity within the site.
- The site is well utilised by the public.
- Public transport is in place.
- Good connectivity.

CONS:

- Site is very isolated from the rest of the city and does not provide opportunities to create strong links to these spaces.
- Existing underground parking places a problem on the structure of proposed designs.
- If the site was to be designed and the large seas of parking's were to be removed they would have to be replaced as they currently serve a purpose.
- ICC blocks beach front vistas and linkages.
- No exciting vistas.

2.3.2 SITE AREA OPTION 2: The Victoria Embankment Precinct



Figure 7: Victoria Embankment site location (www.googleearth.com).

The Victoria Embankment is isolated from the Durban CBD. It is currently lost space that has no real sense of place although it has tremendous opportunities being located on the water's edge. The area is much neglected due to the perception of safety and crime and the lack of facilities that would ensure a safe and vibrant area. The existing site does not contribute to well-being and social interaction amongst Durban's inhabitants. Rather it creates spaces that promote social isolation, fear of crime and lack of safety. Therefore a new proposal is in need to combat these issues and turn it into a place that benefits its inhabitants.

1. GREEN AREAS, PLAZAS AND PUBLIC SPACES:

The site includes large green areas for the use of parks readily available for the inhabitants of the city. However these green spaces are not used because of the barrier created by the busy road and railway and people will not go out of their way to use this space.

1. ACCESSIBILITY:

- An abundance of on street parking adjacent to the site.
- Site is located on a main road which aids accessibility to the site for private car users.
- No defined public transport linkages which justifies its lack of use from the perspective of those who rely on public transport.
- From a pedestrian point of view the site is not easy to access as there are no designated pedestrian routes that cross the busy road to bring people to the site.

2. CONNECTIVITY:

- Limited connectivity to the site as the busy road and train tracks divide the site from the rest of the city.
- Site has poor connectivity.

3. LINKAGES:

- The site allows for linkages to Wilsons wharf and along the harbour's edge.
- Pedestrian friendly links to the beach front are not existent.
- Linkages can be made to the central CBD if a solution can be made to the barrier that blocks the site from the CBD.

4. VISTAS:

The site does not offer any exciting vistas.

5. GENERAL:

PROS:

- The site offers spectacular views over the harbour and has huge potential.
- Limited vehicular activity on site.
- The site has readily available green space.
- Opportunity to create a waterfront environment that celebrates the harbour and contributes to the inhabitant's well-being. It also offers many opportunities for social interaction to occur by such an edge.

CONS:

- Noise levels are high.
- Neighbouring buildings block north light.
- Barrier (road and railway) create a lack of connectivity to the site and accessibility for pedestrians as well as people who rely on private transport.
- Site is isolated from the rest of the city.

- The barrier created makes linkages difficult to achieve to the rest of the city.
- No exciting Vistas.
- Underutilised by the general public.
- Fear of crime and lack of safety.
- Poor public transport.

2.3.3 SITE AREA OPTION 3: The City Hall, Beachfront area



Figure 8: City Hall / Beachfront site location (www.googleearth.com).

The existing site area does not contribute to the inhabitant's well-being and although it does offer some opportunities for social interaction it is not sufficient. The large expanse of tarmac, car dominated environments, lack of trees, green spaces and urban furniture justify this. Most of the area is zoned as commercial (business) which allows for activity in the day but at night this part of the city is dead contributing to the decay of the city, creating areas that are unsafe and undesirable. Many unused and dilapidated buildings are evident.

1. GREEN AREAS , PLAZAS AND PUBLIC SPACES:

The site includes the well-known Farewell Square and Medwood Gardens which is one of the few green sites found within the Durban CBD.

2. ACCESSIBILITY:

- An abundance of on street parking adjacent to the site and on the site.
- The site is readily accessible to the people around the area.
- There is a bus drop off zone adjacent to the site with taxis and other modes of transport regularly servicing this area.
- The site is within walking distance to the main shopping and commercial heart of the CBD
- Walking distance to numerous important landmarks, public facilities and places.
- The site is centrally located in the CBD and can have a big impact on it.
- The site is located on a main road which aids accessibility to the site for private car users.

3. CONNECTIVITY:

- The site has excellent connectivity
- The site connects many different activity nodes that are important to Durban's heritage (Workshop, ICC, Playhouse, Royal Hotel, Old Court House, Durban City Hall, Post Office, Department of Public Works, etc.).

4. LINKAGES:

- Although the site does not link too many important areas it does however offer opportunities to do so.
- East / West link to the Victoria Embankment is possible.
- Linking CBD with the harbour.
- North / South link to the Beachfront, Promenade.
- Opportunity for surrounding streets to link to the site as it is centrally located making it easily accessible.

5. VISTAS:

- The site has various exciting vistas that can be seen as opportunities. Both the Victoria Embankment and the Beachfront promenade offer exciting vistas.

6. GENERAL:

PROS:

- The site offers numerous opportunities.
- Centre of city, can revitalise the area and combat urban sprawl.
- Large section of society to create an impact upon.
- Central to the CBD area.
- Potential links to Victoria Embankment.
- Strip development that would change the public life and experience of the street.
- Opportunity to link Yusuf Dado Street to the Beach.

- Close to existing transport routes.
- Close to squares and parks.
- On people movers bus routes.
- Opportunity to connect the city to the beach front encouraging a healthier lifestyle.
- Existing green areas, squares and the beachfront are readily available.
- The site is readily accessible to the people around the area.
- Existing public transport is good.
- Walking distance to numerous important landmarks, facilities and public spaces.
- Located on main roads, good for accessibility.
- The site is centrally located.
- Excellent connectivity.
- Excellent orientation for north light.
- Surrounding buildings do not block north light.
- Opportunity to create important linkages to the beachfront and Victoria Embankment.
- Offers exciting vistas.

CONS:

- Large tarmac surfaces, concrete jungle.
- Commercially zoned encouraging activity in day but lifeless at night.
- Vehicle dominated.
- No shade or trees and a lack of urban furniture along pedestrian paths. (Unfriendly pedestrian environment).
- Dilapidated buildings.
- Lack of urban green areas and public social places.

SUMMARY OF SITE OPTIONS:

SITE SELECTION CRITERIA	SITE 1	SITE 2	SITE 3
1.Green areas, plazas and public spaces	3	2	3
2.Accessibility	5	2	5
3.Connectivity	3	1	5
4.Linkages	2	3	5
5.Vistas	1	1	5
6.General	1	3	3
TOTAL SCORE	15 / 30	12 / 30	26 /30

(5 – Excellent, 3 – good, 2 – fair, 1 – poor)

2.3.4 Urban Area Selection:

After applying the urban area criteria, site 3 received the highest overall rating and has therefore been selected as the preferred urban area. Site 3 has the greatest potential of creating the biggest possible impact upon Durban’s inhabitants. Its central location and deteriorating environment justify its selection to rejuvenate this area to bring life back to the city and create a city environment that is more conducive to both social interaction and well-being.



2.4 LOCATION, OF URBAN AREA AND SITE:

Site 3 is the urban area selected for the urban design and design of the multi – use – facility. The site area as discussed previously is located in Durban from the City hall towards the beachfront.

The images on the left illustrate the macro and the micro location of the selected urban area.



Figure 9: The above image shows the selected urban area in red with the surrounding context of Durban (Author 2012).

Figure 10: The image on the left depicts the urban area location (Author 2012).

2.5 ANALYSIS OF SELECTED URBAN AREA AND SITE:

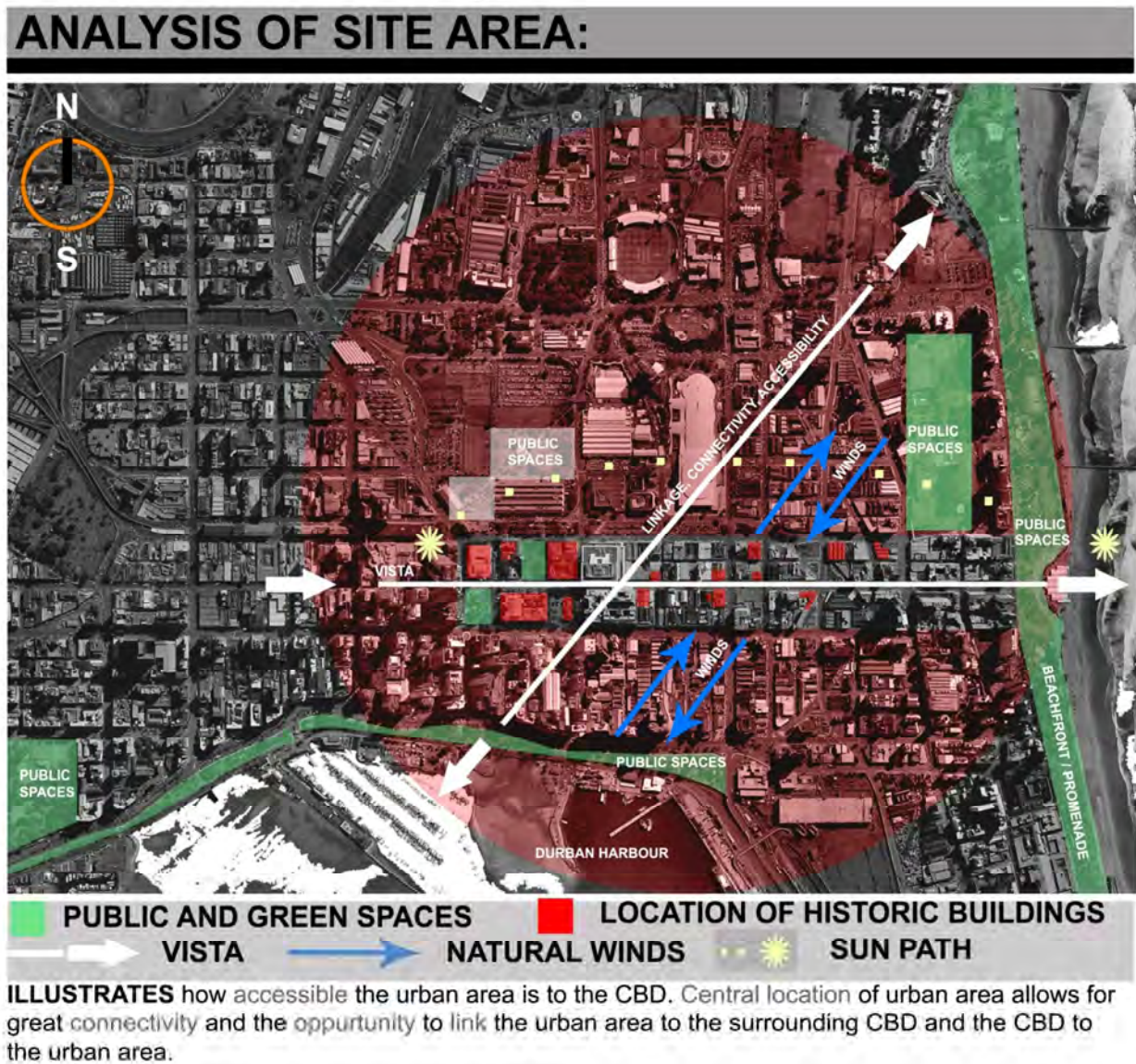


Figure 11: The above image illustrates a basic analysis of the selected urban area (Author 2012).

After the final selection of the urban area it was then necessary to do an urban analysis of this area to best determine where the appropriate site would be for the urban design proposal as well as the multi-use-facility.



Figure 12: The above image illustrates the urban area analysis (Author 2012).

The urban area as illustrated above was broken down into three sections in terms of analysis. As one can see in the first section the land use is predominantly used for public facilities. The atmosphere here is one that is vibrant and full of activity. This part of the city is known as Durban's oasis. There are numerous activities as well as social spaces for the people of the city to use and enjoy. Section one can be said to have wide pavements to accommodate pedestrian life as well as lots of trees and urban furniture for seating and rest. The well-being of the city's inhabitants has been considered here as well as creating spaces that give people the opportunity to interact. The buildings here are in good condition with many being historical and well preserved and maintained.

However in contrast to the vibrancy, good condition of buildings and the consideration for the pedestrian section two is a complete contrast to that of section one. In section two the area is mainly used for commercial activity with the motor industry dominating this sector. The pavements here are narrow, no trees, urban furniture or social spaces are evident. The atmosphere created here is stark and unpleasant and does not encourage pedestrian activity or life. The condition of the buildings here are also in a poor state with many being run down and derelict.

Lastly as one progress further down the urban area to section three, the area here is mainly used for retail and residential purposes. The street life here is dull with limited activity. Once again this section is characterised by narrow pavements, lack of trees, urban furniture and social spaces.

After analysis the three sections within the urban area it can be concluded that people do not use the whole site area as much of it does not take into account the well-being and social interaction needs of the users. Further the land use does not encourage activity. It was analysed that at night this area was un-used with many of the businesses closing resulting in a substantial part of the city becoming lifeless and dangerous to be in at night.

After much consideration the final site area was selected for the urban design proposal and the multi-use-facility. Section 2 was selected for the urban site and proposal. After selecting this site a further analysis was required to create a better understanding of the site, in order to come up with a proposal that would ultimately enhance and improve the existing conditions that are currently evident. The following will illustrate the reasons for the selection of the site area number two as well as a brief analysis.



Figure 13: The above image shows an aerial view of the selected site area.

(www.googleearth.co.za, adapted by Author).

After analysing the site one of the major concerns was that many of the roads in Durban form a grid, however the road in the middle rather creates confusion and a lack of identification and orientation within the built environment as it does not follow the city's grid. Further one can see the large expanse of buildings do not encourage walkability. Only one link has been

created for people to use to get to certain parts of the site. The link created is also insufficient as the experience through it is not pleasant. One can describe it as being tight, unpleasant with no interest or termination with a focus on vehicles rather than the pedestrians.



Figure 14: The above image shows the link through the site (Author 2012).

It was also through walking around the site that it was noticed that many of the buildings were run down and derelict.



Figure 15: The above image shows various photos of the existing buildings on site and the poor state that they are in (Author 2012).

After analysing the site it can be concluded that the following reasons provide substantial justification for its selection.

- The whole site is zoned as general business; therefor it does not contribute to the life of the city at night or during the day.
- Many vacant and rundown buildings.
- Does not contribute to the user's well-being.
- Large block sizes in comparison to the rest of the urban area do not encourage walkability.
- Poor linkages, connectivity and accessibility.

The site is located next to the Durban city hall area as mentioned in section one of the urban area which is full of activity and use. By proposing an urban design for this site one would encourage people to use it. The proposal is to act as a catalyst for future mixed use environments to be created towards the beachfront. This would ultimately link the city to the beachfront encouraging people to use it. It is through mixed use environments that one creates places that best serve the general public. By having retail, office and residential areas within the city people are able to live, work and play within one area. Thus further combats the issue of the city being lifeless at night.

Taking into account the EThekweni clients objective to make Durban the most liveable city in Africa by 2020, bold moves have to be taken to ensure the realisation of this. Therefor it is proposed that all of the buildings except the historic ones are to be demolished and a new urban design framework would be proposed to start the rejuvenation process for the city. Thus ultimately would be the first step towards achieving the client's objective by the year 2012. The creation of a mixed use urban design framework will bring life back to the city and better suit the user's needs.

CHAPTER THREE: THE DESIGN BACKGROUND AND PROPOSAL:

The urban area has been selected as well as the site and reasons have been given for the justification of this. Before proceeding onto the urban design as well as the multi-use facility proposal it is important to briefly mention the key theories used as well as the necessary concepts and principles that have been used to inform the design process. The relevant precedent and case studies will also be discussed in terms of how they have informed the design process. The precedents, case studies, key theories as well as the subsidiary concepts and principles will be briefly discussed as follows.

3.1 THEORIES:

The design is based on three key theories namely being Kevin Lynch's Image of the City, Biophilia and lastly New Urbanism. These theories will be briefly discussed in more detail below.

3.1.1 KEVIN LYNCH'S IMAGE OF THE CITY:

This theory explores how individuals are able to identify and orientate themselves within the architectural environment.

An architectural environment that is legible becomes an important factor to consider that needs to be taken into consideration in urban design and architecture.

Lynch's five elements, paths, edges, districts, nodes and landmarks allow urban designers and architects to create legible environments that can enhance both identification and orientation within an environment.

3.1.2 BIOPHILIA:

The theory of Biophilia in architectural design recognizes the inherent need for nature together with universal and sustainable design strategies to create environments that truly enhance life (Pollack 2006, p. 38). The essential need for humans to interact and affiliate with nature through Biophilic design attributes is essential (Pollack 2006, p. 37). Biophilic

design attributes are the elements and qualities of the physical natural environment that connect humans to the physical, psychological and cognitive benefits derived from direct experiences with nature. Biophilic attributes bring buildings to life physically through the use of design strategies and materials and strives to reconnect the built environment with nature through these attributes.

Biophilic design attributes of natural light, natural ventilation, water, planting, selection of natural materials, colours, frequent, spontaneous and repeated contact with nature should be given recognition throughout the architectural environment. Such an approach in architectural design can create architectural environments that restore and maintain human health, well-being, reduces stress, increase concentration, productivity, decrease absenteeism and enhance learning.

3.1.3 NEW URBANSIM:

New Urbanism is a theory which began in 1980 as a revolt against urban sprawl and modernist planning methods and building approach. Through the application of their principles in urban design one can create environments that have a higher quality of life, ideal places to live, work and play. The theory and their principles focus on creating communities that recognises the importance of both social interaction and well-being in the architectural environment with a focus on the creation of mixed use environments.

3.2 SUBSIDIARY DESIGN CONCEPTS AND PRINCIPLES:

- 3.2.1 MOVEMENT:** Both vehicular and pedestrian/people through the site and the building.
- 3.2.2 URBAN GREEN SPACE:** Macro: The creation of an urban green park extending from the city centre to the beach. Micro: Interweaving green spaces with the urban structure improving the micro climate and therefore achieving a better quality of life.
- 3.2.3 PUBLIC SPACE:** The creation of successful public spaces to enhance recreation and social interaction. Public spaces will be used both externally

and internally to link the various functions of the building. These spaces will inform the planning of the building as well as the forms created. By using public spaces both internally and externally these spaces link and connect the various functions of the building together allowing for the opportunity for people to connect and interact.

- 3.2.4 **SOCIAL INTERACTION:** Between public spaces and people, as well as between people and building and people and people.

- 3.2.5 **ACCESS AND LINKAGES:** Access and linkages play an important part in the overall success of a public space. If access and linkages are not clear confusing spaces can often be dead, sterile and cold. Therefore a public space/place has to be easily accessible to all, including the disabled people. This means that the place has to be well connected to its surroundings both physically and visually. A successful public space is visible, easy to get to and around.

- 3.2.6 **CIRCULATION:** Circulation to be interesting and is to link and connect public spaces for social interaction.

- 3.2.7 **MATERIALS SELECTION:** Interior and exterior materials are to have a tactile and natural appearance.

- 3.2.8 **COLOUR SELECTION:** Appropriate colour selection depending on the function of the space and the intended ambience and mood intended for such a space.

- 3.2.9 **FLEXIBILITY:** Consideration of flexible spaces, so that spaces can be used for a variety of functions.

- 3.2.10 **ADAPTION:** The ability for the architecture created to be able to adapt as time goes by to suit the needs of the building occupants.

- 3.2.11 **TYOLOGICAL VARIETY:** A variety of different retail, office and residential units so that people of all different socio economic backgrounds can live, work and play together.

- 3.2.12 **OCCUPANT CONTROL:** The architecture is to consider the need for building occupants and users to be able to control their internal environment where possible.

- 3.2.13 **FLEXIBLE FURNITURE:** Some units are to be designed to utilize fixed furniture (foldable) to transform the space for day and night use according to the needs and demands of the users. This allows users to transform the space

to suite a variety of specific functions. Flexible furniture allows for spaces to be flexible and able to adapt to specific needs.

- 3.2.14 **BUILDING FORM:** Manipulate the buildings form to create spaces for private and communal spaces. Allows for efficient cross ventilation and natural lighting.
- 3.2.15 **ORIENTATION:** Perfect condition for urban gardening and natural light.
- 3.2.16 **ARRANGEMENT:** Close distances between buildings in order to create cost efficient bridge connections and to provide ample shade to the spaces below.
- 3.2.17 **CONNECTIVE SOCIAL NETWORK:** Walkways connecting communal facilities and public spaces. Urban farms are offset from walkways to allow for social interaction to occur.
- 3.2.18 **SUSTAINABILITY:** The use of renewable energy strategies as well as rainwater capture and use. Recycling rubbish and using it to make compost for the gardens. Sustainable ventilation and day lighting strategies.

3.3 PRECEDENT STUDIES:

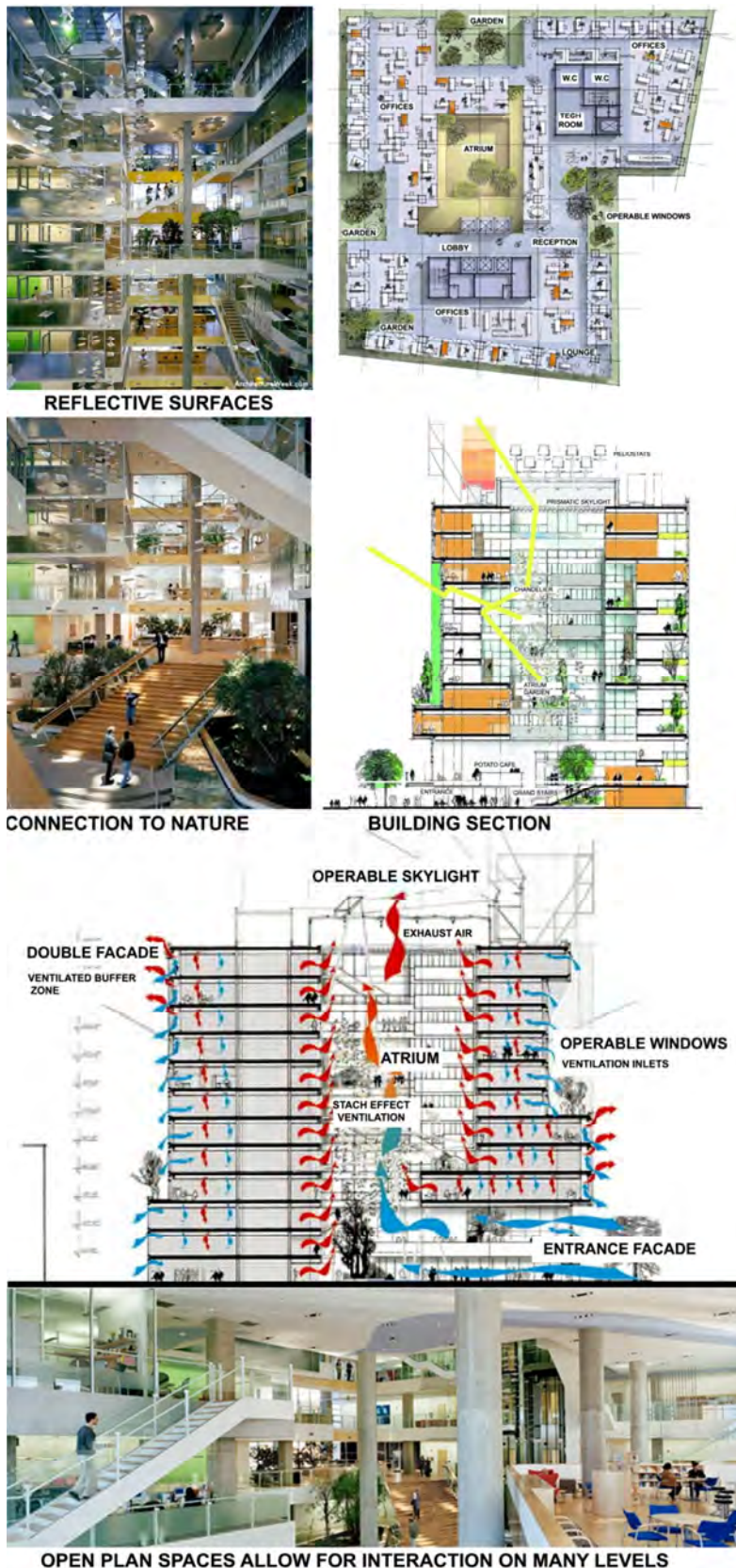


3.3.1 60 RICHMOND, TORONTO, CANADA:

The precedent demonstrates how the architect has manipulated the form and massing of the building to create voids in the building mass to create internal courtyards and garden terraces. This allows for an abundance of natural light and ventilation to enter into spaces within the building which would not have been possible if the building was left as a solid mass.

Figure 16: Images of the Richmond building (Author 2012).

3.3.2 GENZYME CENTER IN CAMBRIDGE:



The precedent deals with the issue of having a large floor plate. This issue was resolved by a pattern of deep cut outs, terraced internal openings and a central atrium. The building's central atrium acts as a light shaft as well as a return air duct that allows sufficient natural ventilation to the entire building. Lighting is further enhanced by reflecting light of internal reflective surfaces and the prism chandeliers. Eighteen interior gardens and seven accessible outdoor garden terraces increase the workers connection to nature and enhance social interaction in the workplace.

Figure 17: Images of the Genzyme building (Author 2012).

3.3.3 SABIC EUROPE HEAD OFFICE:



Figure 18: Images of the Sabic building (Author 2012).

The central atrium was created in response to spatial context and functional requirements such as climate control. The six work storeys are placed as galleries round this atrium and as the level increases each work level is recessed back to allow more light into building spaces. Since there are no individual offices, each floor is divided into a variety of different working zones all being open plan. Collaboration amongst workers is made efficient by the open plan layout as well as all the floors which surround the central atrium.

3.3.4 IT BUILDING IN NEW DELHI INDIA:

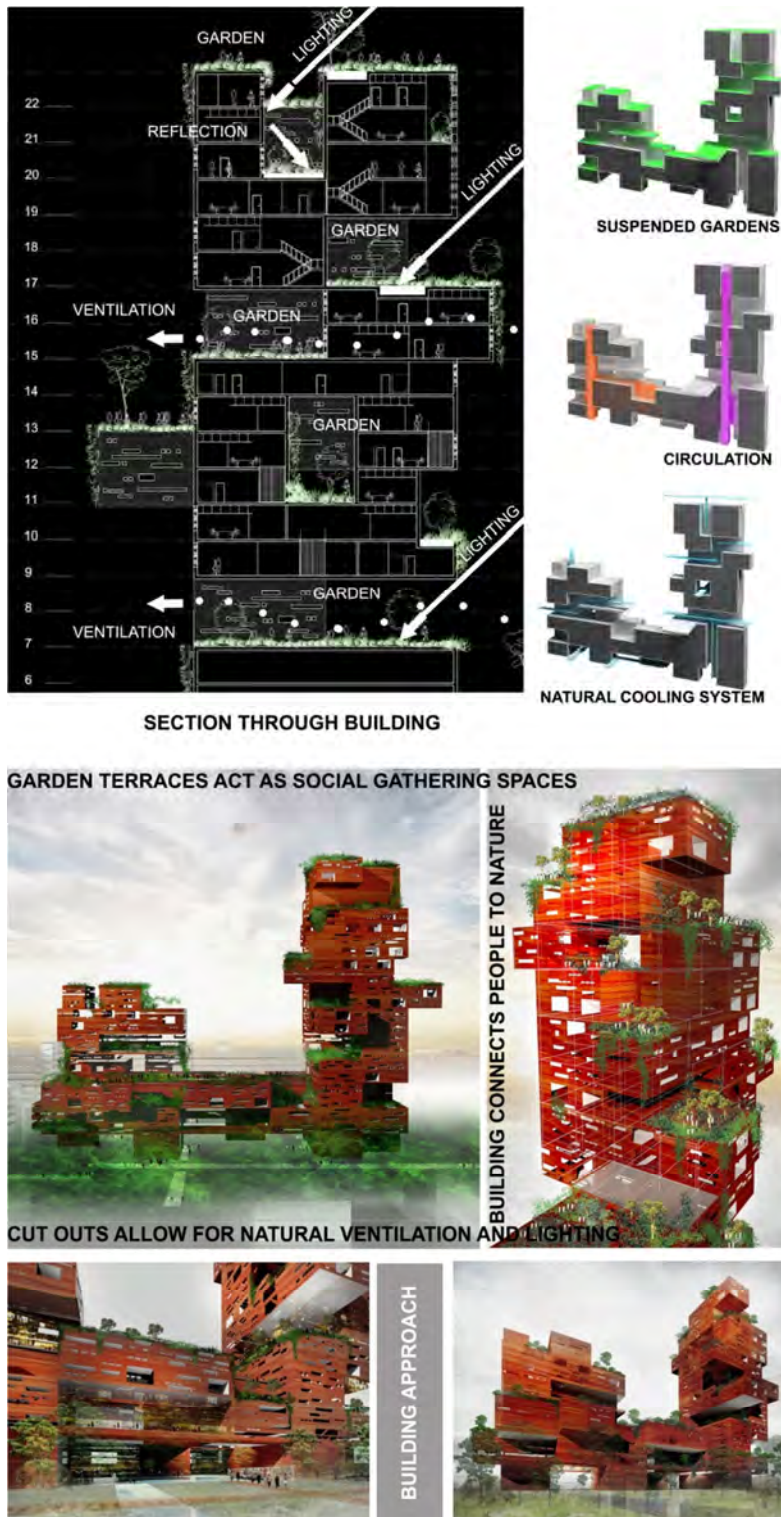


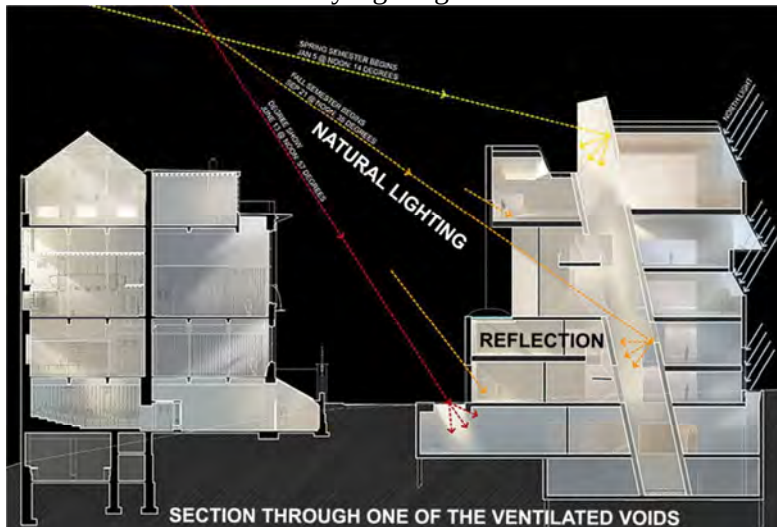
Figure 19: Images of the IT building (Author 2012).

The walls and openings in the facades are adapted to the building's solar orientation. The incorporation of green areas in the building structure which does not limit to green roofs or walls can be a response to the loss of spaces and green environments due to rapid urban population growth and spatial constraints.

The building design connects the building users and occupants to nature in many ways. By breaking up the building mass and creating cut outs for gardens the architect has been able to enhance both natural ventilation and day light into the majority of all spaces within the building. Not only do the cut out gardens provide an abundance of fresh air and natural day light but they act as spaces where social interaction can occur amongst the building users.

3.3.5 GLASGOW SCHOOL OF ART, GLASGOW:

The precedent demonstrates that through the use of a series of ventilated voids the architect is able to achieve natural day lighting and ventilation into the building interiors. The voids are



orientated to the south so that the direct rays of the sun can reflect off the internal walls and light up spaces that are deeper and less likely to receive natural lighting without this innovative day lighting strategy.

Figure 20: Section of the Glasglow building (Author 2012).

3.3.6 WEST HOLLYWOOD, USA:

The architect has equipped the individual units with a sliding wooden screen that moves along each balcony rail. The screen can be used to modulate the amount of direct sunlight reaching the living area, also creating an enclosed private outdoor space that is sheltered from the busy thoroughfare. The garage doors create an indoor / outdoor feel. Together these two features allow the occupants to have control over their own units; therefor they can adapt them to their specific needs.



Figure 21: Images of the West Hollywood building (Author 2012).

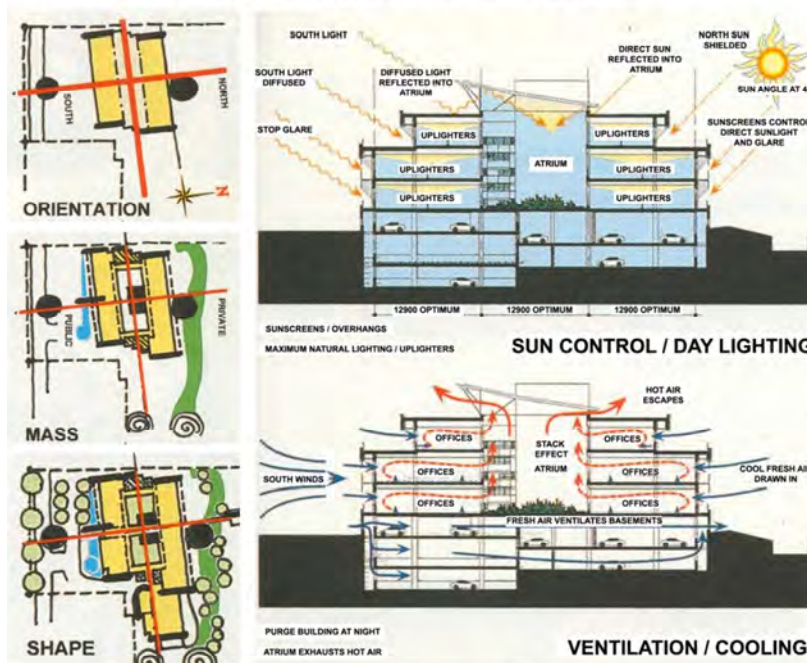
3.4 CASE STUDIES:

3.4.1 MUNICH REINSURANCE BUILDING, JHB:

The entire two storeys of open plan office accommodation are planned around the two



OFFICES SURROUNDING THE CENTRAL ATRIUM



WATER FEATURES CREATE A SENSE OF TRANQUILITY ON APPROACH TO BUILDING

Figure 22: Images of the Munich Reinsurance building (Author 2012).

interconnected atriums allowing workers to experience it. The office wing has depths of 13m combined with the atrium which enables the building to achieve effective and sufficient natural lighting and ventilation. The building's long narrow form allows it to take full advantage of natural ventilation methods. With atriums being centrally located, air is drawn in on the north and is entered on the south side by the south winds. The air then circulates through the office space and the atrium acts as a natural heat exhaust stack which allows the hot air to escape out the roof eaves at the top. The building takes full advantage of natural ventilation ensuring that a constant fresh supply of air is available.

3.4.2 MELROSE ARCH, JHB, GAUTENG:

Melrose Arch precinct was based on the principles of New Urbanism, which is based on



medieval town planning principles that contain mixed use pedestrian friendly environments with a clear definition of both public and private domains.

The Melrose Arch precinct is internally ordered by two main roads and is orientated around two public squares. High street is surrounded by mixed use buildings that encourage movement along the retail sides.

However the main intention of the design of Melrose Arch was to create and encourage pedestrian movement as well as to create a precinct that promotes activities, public surveillance, social interaction, density and a walkable environment in which people can live work and play within.

Figure 23: Images of the Melrose Arch development (Author 2012).

3.5 URBAN DESIGN PROPOSALS: (MACRO)

The theoretical study of the relevant literature, its application in both local and international building precedents has created a solid foundation on which to base the urban and building design proposals. Every decision made took into account the theoretical background. The following urban design proposal was created as a response to both the client's wishes as well as rejuvenating the current deteriorating and unpleasant site conditions that are apparent in the Durban CBD. It is through this urban design vision that rejuvenation will occur and Durban will become a more liveable city. Not only is this important but it is the start of the rejuvenation process of Durban and the urban design proposal can be seen as a catalyst to kick start this process. The following section will discuss and graphically illustrate the urban design proposal as well as the macro urban interventions for the city of Durban.

The following decisions were made in terms of the urban design proposal as well as the macro urban interventions:

- The creation of an urban green movement spine linking the CBD to the beachfront encouraging recreation, social interaction and as much movement past the site as possible.
- To create ease of movement through the city from one activity node to another through the design of green spaces, squares, mixed use areas as a result of pedestrian friendly interventions.
- Revitalisation of the inner city rather than development on the peripheral areas of the city that contribute to urban sprawl.
- Focus on movement by public transport to reduce carbon emissions, noise pollution, congestion and reducing the use of private transport.
- Provide park and ride facilities to support public transport and eliminate the cost of inner city parking.
- High Density mixed use environments to encourage 24 hour use.
- Create green links from the CBD to the beachfront as well as from the CBD to the Victoria Embankment.
- Public spaces located in front of the building and at the entrances to create links to the building and connect people to it. To also promote recreation and social interaction.
- The use of wide pavements, urban furniture, trees and soft and hard landscaped public spaces will encourage well-being, recreation and social interaction.



Figure 24: The image depicts the existing public transport system as well as the proposal for the new park and ride system. The yellow arrows show main vehicle movement into Durban's CBD. The Blue, green and red dots illustrate the current routes that the people mover bus system operates upon. It is proposed that the pink dots are to form a new route that can better serve the city as well as creating transport from the park and ride facilities to the city. The yellow circles represent the proposed park and ride facilities (Author 2012).

The first proposal was to introduce a park and ride facility for Durban to counteract the problems caused from urban sprawl as well as vehicle dominated contexts. The proposal was also made to create a more pedestrian friendly environment based on the principles of New Urbanism rather than a vehicle dominated context. As mentioned in the theoretical discourse vehicle dominated contexts as evident in the city of Durban create traffic congestion and hinder the well-being of people causing frustration, stress and anxiety.

As illustrated in the above image the park and ride proposal was proposed to focus on creating a good public transport system which can enable the city's inhabitants to reduce their dependency on private car use. This allows for higher living densities without the roads becoming congested or mobility suffering. This will further enable the city to become a far more pedestrian environment.

The second proposal and urban intervention was the creation of an urban green movement spine linking the CBD to the beachfront encouraging recreation, social interaction and as much movement past the site as possible. The aim is to create ease of movement through the city from one activity node to another through the design of green spaces, squares, mixed use areas as a result of pedestrian friendly interventions.



Figure 25: The red circles highlight the main activity nodes within Durban. The red line will become the proposed green movement spine which will connect these nodes together as well as linking the city to the beachfront. Kevin Lynch speaks of how important it is that paths, edges nodes and landmarks are all interrelated and thoughtfully considered when creating legible urban environments that enhance orientation (Author 2012).



Figure 26: The image to the left shows Durban's existing zoning. One can see it is dominantly commercial which does not encourage pedestrian use or twenty four hour activity. The image to the right shows in orange the proposal of changing the existing zoning to a mixed use zoning (Author 2012).

By changing the zoning to mixed use along the site area, the creation of a mixed use environment will ensure that there is twenty four hour activity, bringing life back to the city.

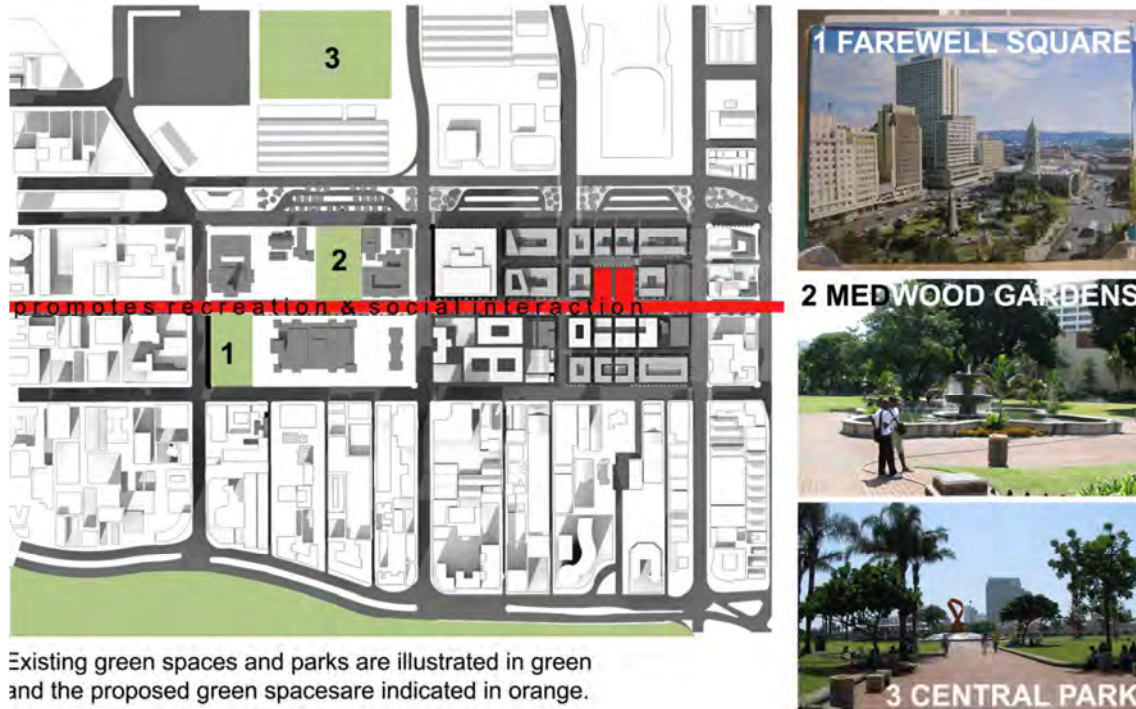
The proposed urban design is to aim in revitalising part of the Durban CBD, with the intention of linking the CBD to the beachfront through the urban green strip movement spine. This will therefor create an environment that enhances ones well-being and gives the inhabitants of Durban more opportunities to socially interact with one another. The urban design framework was created with the following decisions in mind:

- Urban design is to act as a catalyst for future development towards the beachfront.
- Split up the existing city blocks creating walkability.
- Provide for good connectivity to the urban design site area making it accessible.
- Creating a Mixed - Use environment.
- Increasing the density in the urban area.
- Focus on pedestrian friendly walkways over vehicle dominated contexts.
- Close to public transport.
- Connect the site to nature and consider Biophilic design attributes such as planting trees and the creation of water features to instil a sense of tranquillity in the context.
- The creation of a human scaled development that respects the public realm.
- Individual building blocks to incorporate atriums and courtyards to allow for more opportunities and to connect the buildings to nature.
- The creation of public spaces to encourage social interaction.
- Create strong links to the site.



Figure 27: The image shows the proposed urban design. The light grey represents the existing buildings. The dark grey are the proposed mixed use buildings and the red building is the site for

The creation of a node was proposed in the form of a park in the urban design. This node links with the other existing nodes of the city enhancing the journey along the movement spine. Durban lacks public and social spaces so the park addresses this issue and reconnects the city back with nature.



Existing green spaces and parks are illustrated in green and the proposed green spaces are indicated in orange.

Figure 28: The image shows the existing nodes as well as the proposed green movement strip and the park (Author 2012).



Figure 29: The image shows the urban design in relation to the context as well as the entire green movement spine which is to link the city to the beach through mixed use developments along the path (Author 2012).

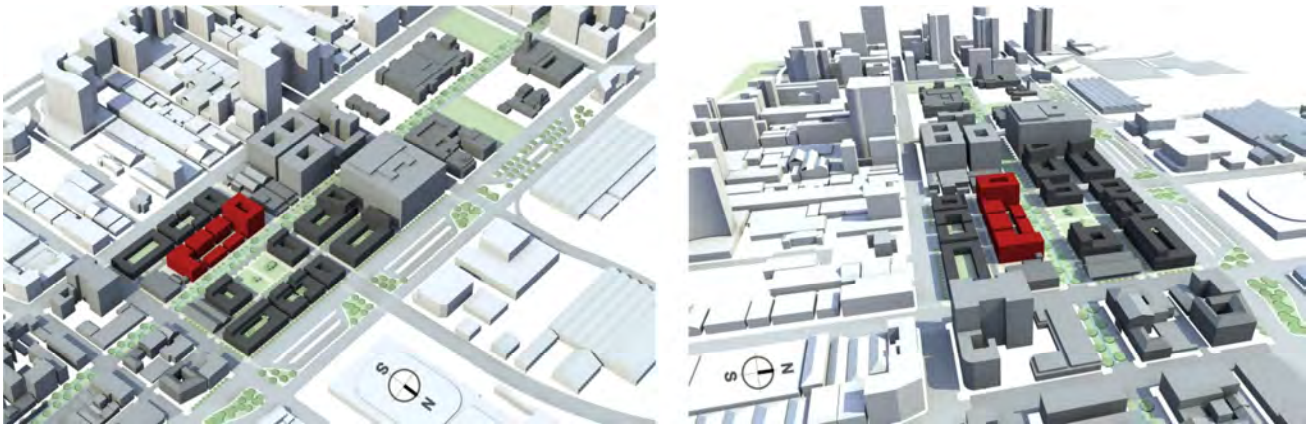


Figure 30: Three dimensional images showing the urban design proposal in its context (Author 2012).

3.6 THE DESIGN PROPOSAL: (MICRO)

- Design is focused on functionality, comfort and a connection to the natural environment.
- Human scaled building form on public façade.
- Public spaces through the use of courtyards.
- The use of Biophilic elements to create a connection to the natural world and enhance well-being and the experience of social interaction in public spaces.
- Interior and exterior materials to be natural and tactile.
- Colours to be appropriate for the specific function of spaces.
- The use of natural lighting, ventilation and the use of planting and water features.
- Small floor plates and the careful manipulation of building form to encourage natural ventilation and lighting and to create spaces for social interaction.
- A building that enhances ones well-being and encourages social interaction to occur on many levels.



Figure 31: Perspective of northern façade (Author 2012).

The concept for the building is to connect people and nature through architecture. Essentially the architecture must create opportunities for people to socially interact. It must also connect people to nature by using Biophilic design strategies such as natural lighting and ventilation, planting, water, material selection as well as spontaneous and repeated contact with nature. Architecture that is designed with the users best interest in mind is important in achieving well-being in the architectural environment.

The urban framework has created a pedestrian friendly mixed use environment. Walkability is achieved by splitting up the building blocks and through the use of public spaces and the urban green movement spine a considerable amount of places are created which give people the opportunity to socially interact. The Building design was created with an emphasis of acknowledging the urban design intentions of creating a walkable environment. The large site was split up into three creating linkages through the site encouraging walkability to occur. The main consideration in the design process was to avoid the design of a large block that prohibited walkability, natural light and ventilation into spaces.



Figure 32: Ground floor plan showing the atrium on the left and the courtyard on the right. The three linkages promoting walkability are also evident (Author 2012).

The main theory used in the design of the building was the theory of Biophilia. The theoretical framework has proved that through using Biophilic design attributes architects are able to design buildings that enhance human well-being. It was therefore imperative in the

design process that the building was designed to best achieve each of the Biophilic attributes in order to create an architectural environment that enhances well-being. These attributes are namely natural lighting and ventilation, planting, water features, selection of non-toxic materials and finishes to enhance well-being and to connect people to nature.

The form of the proposed building was carefully manipulated in such a way that it created spaces for social interaction to occur as well as allowing for effective natural lighting and ventilation into all spaces. The design of the building is further enhanced by the use of water features and trees both within the building and on the buildings exteriors. It was through the creation of a large public courtyard and an atrium that the building was effectively split up to allow for all the Biophilic attributes to be incorporated into the design.

The atrium block was designed to ensure that effective natural ventilation and lighting was achieved into the building spaces. Therefore the building was designed in section to see how one could maximise natural lighting.



Figure 33: Sectional perspective showing the Biophilic attributes and sustainable design strategies (Author 2012).

The architectural language of the building was created bearing in mind the Biophilic attributes. The use of trees on all levels is evident of this as well as the manipulation of the buildings form to achieve natural lighting and ventilation. However an important factor to consider is that when designing for natural lighting it is important that adequate solar shading devices are used so that one can reduce glare and direct sunlight into building interiors, as this can have negative effects on people's well-being. It was from this that horizontal louvres as well as planter boxes were placed on the buildings facades to provide solar protection. The use of light shelves became another important method in terms of reflecting natural light deeper into building interiors. The architecture created is therefore a response to the natural elements in terms of how one can best utilise these elements in the design to enhance well-being. Sustainable design strategies were used to ensure the maximum benefit from the natural elements and to cut down costs on artificial lighting and air conditioning. The building is designed for occupant control so that the building occupants can have control over their internal environments. The use of pivot windows along every façade provides people with the opportunity to control their thermal levels. A building that uses natural ventilation strategies allows an abundance of fresh air into building interiors which improves human well-being.

In terms of ventilation strategies the building was broken up with the use of a courtyard and an atrium. This ensures that the floor plates are kept to a minimal so that the spaces created can achieve maximum ventilation and lighting. Shallow floor plates allow for effective natural ventilation. The incorporation of the atrium also allows for the stack effect to occur whereby the cool air is drawn in the building through the pivot windows and the hot air escapes through the louvres at the top of the atrium.

Building materials and finishes were selected carefully in terms of how that can characterise a building in terms of how different materials and colours can affect ones moods and emotions as well as the effects they can have on the indoor air quality.



Figure 34: Render of the atrium showing the open plan design which allows for staff interaction. The use of trees and Biophilic design attributes further create an environment which is conducive to well-being (Author 2012).

Flat grass and landscaped concrete roofs were used as the dominant roofing application due to their numerous benefits which are listed below:

- A vegetated roof, has a much lower surface temperature than that of normal roofs. This helps reduce the heat island effect in urban areas.
- The increased insulation value of a vegetated roofing system can also help stabilize indoor air temperatures and humidity and reduce the heating and cooling cost for a building.
- Allows for usable outdoor space and views.
- Green roofs also improve the quality of water and although the amount of water is reduced it is possible to harvest rainfall from roofs that have been greened.
- The combination of soil, plants and trapped layers of air within green roof systems can act as a sound insulation barrier. Sound waves are absorbed, reflected or deflected. The growing medium tends to block lower sound frequencies whilst the plants block higher frequencies.

- In dense urban environments there is often a lack of green space for residents. Roof Gardens and roof top parks provide important green spaces to improve the quality of life for urban residents.
- Depending on the design, a green roof can typically reduce storm water run-off by 50 to 90%. Additionally, the peak flow volume is greatly reduced and the peak flow period is delayed by as much as 4 hours, minimizing the impact on existing sewer systems.
- Green roofs have a much lower burning heat load (the heat generated when a substance burns) than do conventional roofs.

CHAPTER 4:

CONCLUSION

The design proposal demonstrates clearly how one can design for social interaction and well-being. The literature and the theoretical framework has successfully been applied to the design proposal and as a result an architectural environment has been created that enhances both social interaction and well-being. As architects it is important that we design for people and always keep their best interests in mind. Designing architectural environments that enhance well-being should be our ultimate goal. Although there are budget constraints it should always be considered and applied were possible.

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APPENDIX 1: THE DESIGN:

The following pages document the architectural design drawings of the multi-use-facility and urban design for Durban. It also includes the technical resolution as well as images of the final model.

design background:

PROBLEM STATEMENT:

Present day life is filled with a variety of stresses such as family, work and personal pressures which all place a considerable amount of stress upon people. All these stresses create a demanding lifestyle. Why should the architectural environment add extra stress on the people that use it and adversely affect their well-being and social interaction needs?



DEMANDING LIFESTYLE



WORK STRESS



TRAFFIC STRESS



PERSONAL STRESS



ILLNESS



WORK STRESS
FAMILY STRESS

ISSUES IN THE ARCHITECTURAL ENVIRONMENT:

THE STRESSORS ON A MACRO SCALE:

Urban sprawl, traffic congestion, vehicle dominated contexts, lack of social spaces, parks, green spaces, plazas and the general street quality, zoning laws, deteriorating downtowns, environmental degradation, tarmac parking areas and treeless streets.



THE STRESSORS ON A MICRO SCALE:

Sick Building syndrome caused from artificial environments that rely on an airtight shell with the use of mechanical ventilation and artificial lighting with a lack of occupant control and connection to the outside world. Further the use of synthetic materials which contain high concentrations of VOCs pollute the indoor air quality. Lighting and ventilation is a major concern in modern society. From the macro perspective of global warming, climate change, burning of fossil fuels, right down to the micro level, with concerns and issues of glare, thermal comfort and both health and well-being (Bouberki 2008, p. 47). Further the choice of colour has the ability to adversely affect ones well-being. A lack of connection to nature in the architectural environment plays an important part.



KEY QUESTION:

What is the role of the architect in creating architectural environments that enhance social interaction and well-being and reduce the additional stress these environments place upon people?

THE ROLE OF THE ARCHITECT:

- Design architectural environments that do not contribute to urban sprawl.
- Design sustainable architectural environments that have higher densities, that support public transport and address easy access to employment and social facilities.
- Design architectural environments that increase legibility of the overall environmental image, allowing users to identify and orientate with their surroundings.
- Design spaces for social interaction through good urban and architectural design.
- Design green spaces that connect people to nature and soften the harsh urban spaces that enhance heat build-up.
- Design water features that introduce tranquillity.
- Design healthy buildings with natural ventilation and day lighting strategies.
- Design buildings that allow for occupant control.
- Design buildings that connect people to the natural world, through planting and good ventilation and lighting strategies.
- Design buildings with a conscious for natural materials over synthetic materials.
- Design interior spaces through the correct choice of colours, materials, as well as natural lighting and ventilation requirements that support human well-being.

VISION:

An architectural environment that enhances both social interaction and well-being of its users and occupants that places less stress on peoples already demanding lifestyles.

CONCEPT:

Connecting people and nature through architecture. Through the use of sustainable design strategies, choice of materials and the creative manipulation of the buildings form, an architectural environment will be created that will connect people to nature which will ultimately enhance there well-being and experience.

THE CLIENTS AND THEIR REQUIREMENTS:

The clients involved will be a joint venture between the Durban eThekweni Municipality and AMDEC property developers.

The client's requirements for an urban design that would act as a catalyst for Durban rejuvenation. This proposal is to enhance the social interaction and well-being needs of its inhabitants, creating the ideal city to live in Africa by the year 2020, which is the eThekweni Municipality's current objective. With a similar vision Amdec requires an urban development that is to act as a catalyst and kick start the process of linking the city to the beach through mixed use environments and public spaces. They have requested for the first building to be designed as a multi-use facility that must incorporate their new office headquarters. The Design is to represent their company image and should act as a show piece for what their company stands for.

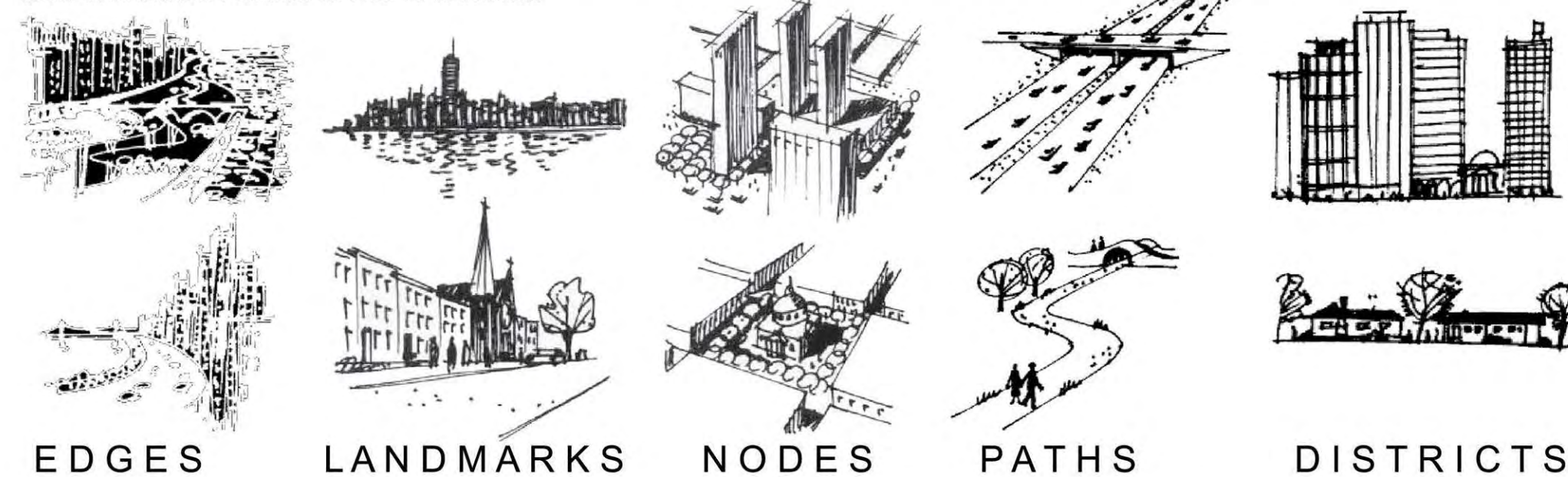


design theories:

1. KEVIN LYNCH'S THEORY: IMAGE OF THE CITY:

This theory explores how individuals are able to identify and orientate themselves within the built environment.

An architectural environment that is legible becomes an important factor to consider that needs to be taken into consideration in urban design and architecture. Lynch's five elements, paths, edges, districts, nodes and landmarks allow urban designers and architects to create legible environments that can enhance both identification and orientation within an environment.



2. BIOPHILIA:

The theory of Biophilia in architectural design recognizes the inherent need for nature together with universal and sustainable design strategies to create environments that truly enhance life (Pollack 2006, p. 38).

The essential need for humans to interact and affiliate with nature through Biophilic design attributes is essential (Pollack 2006, p. 37). Biophilic design attributes of natural light, natural ventilation, water, planting, selection of natural materials, colours, frequent, spontaneous and repeated contact with nature should be given recognition throughout the architectural environment.

Using the Biophilic and New Urbanism theories in architectural design one can create environments that truly enhance both social interaction and well being. Below are a few images illustrating the core ideas of these theories.



3. NEW URBANISM:

New Urbanism is a theory which began in 1980 as a revolt against urban sprawl and modernist planning methods and building approach. Through the application of their principles in urban design one can create environments that have a higher quality of life, ideal places to live, work and play. The theory and their principles focus on creating communities that recognises the importance of both social interaction and well-being in the architectural environment.

New Urbanism Principles:

- 1. Walk ability:** Environments where walking is encouraged and mixed use facilities are close by to avoid the use of cars.
- 2. Connectivity:** High quality pedestrian network and public realm that encourages walking and makes it a pleasurable experience. A simple interconnected grid system which disperses traffic by providing a variety of pedestrian and vehicular routes to any destination.

3. NEW URBANISM CONTINUED:

3. Mixed-Use & Diversity: Creating architecture that encourages a mixed use of functions such as shops, offices, apartments and public facilities that encourage a diversity of people, of ages, income levels, cultures, and races.

4. Mixed Housing: A range of types, sizes and prices in closer proximity that allow for a diversity of users as well as different socio economic classes to live within.

5. Quality Architecture & Urban Design: Beautiful architectural style to be human scaled, to encourage human comfort and create a sense of place.

6. Traditional Neighbourhood Structure: Creating environments that have a definite public space at the centre with dissemble edges. This central space is usually a square or a park. The buildings are to contain a variety of uses and densities and are to be in close walking distance to the rest of the community.

7. Increased Density: Buildings, places of residence, shops and offices to be close together to create a more efficient use of services and resources as well as for ease of walking. Increased densities of buildings and functions allow for a more convenient, enjoyable place to live as everything is easily accessible and available to the users and occupants.

8. Smart Transportation: The streets created are relatively narrow and are shaded by rows of trees. This slows traffic down and creates an environment that is far more conducive for pedestrians and bicycles. In some instances parkings are made available parallel to the streets to create a buffer for the pedestrians from the cars. A pedestrian friendly environment is created to encourage a greater amount of people to use walking as a form of transport which has positive impacts on peoples overall health.

9. Sustainability: Materials and resources that are energy efficient and are less harmful to the environment. Creating environments that encourage people to walk more and drive less.

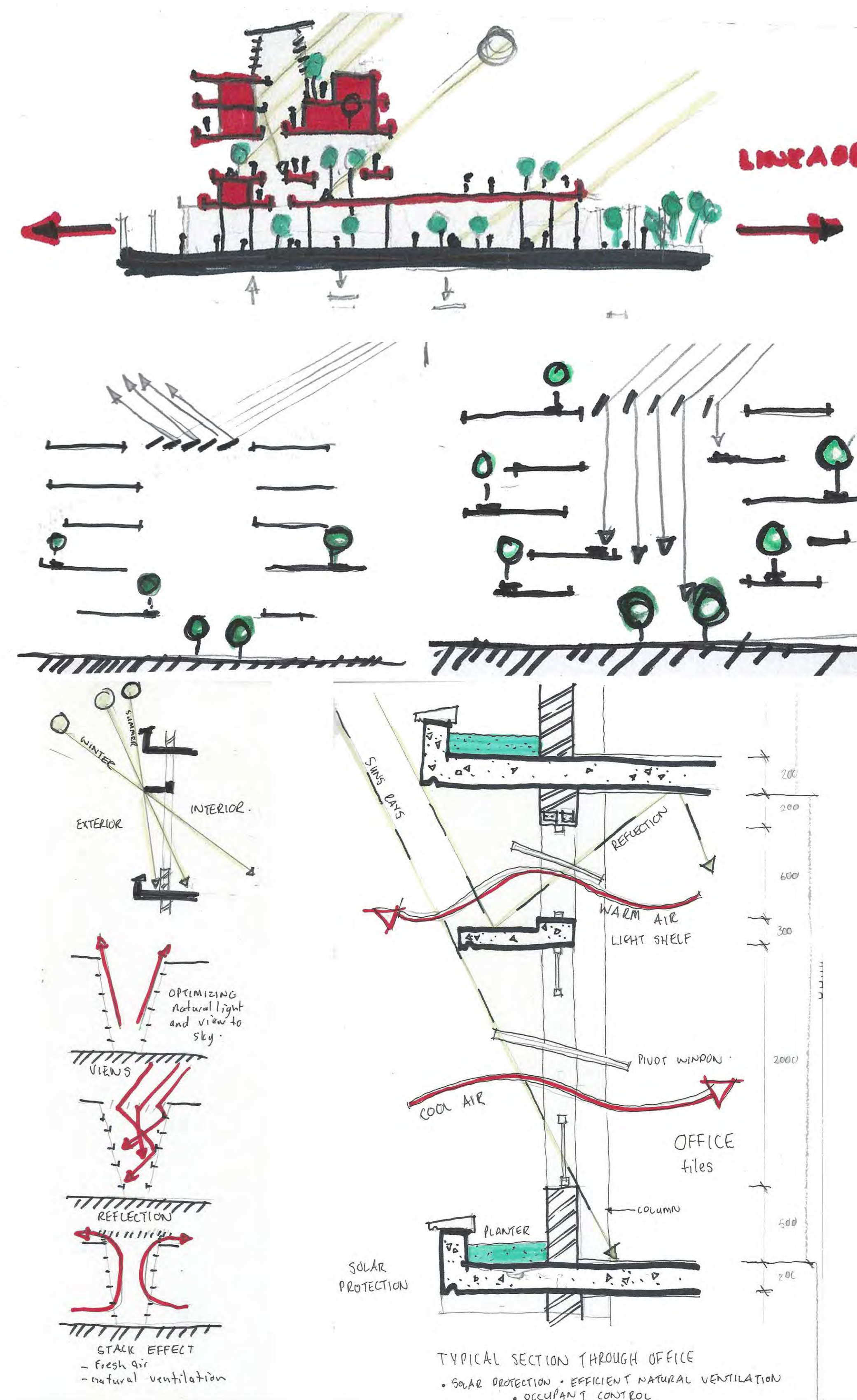
10. Quality of Life: Architectural environments that offer a high quality of life, that enrich, uplift and inspire the human spirit.

DESIGN CONCEPTS AND PRINCIPLES:

- 1. MOVEMENT:** Both vehicular and pedestrian/people through the site and the building.
- 2. URBAN GREEN SPACE:** Macro: The creation of an urban green park extending from the city centre to the beach.
Micro: interweaving green spaces with the urban structure improving the micro climate and therefor achieving a better quality of life.
- 3. SOCIAL INTERACTION:** Between public spaces and people, as well as between people and building and people and people.
- 4. ACCESS AND LINKAGES:** Linking people to the building. The site has to be well connected to its surroundings both physically and visually.
- 5. CIRCULATION:** Circulation to link and connect public spaces for social interaction.
- 6. MATERIALS SELECTION:** Interior and exterior materials are to have a tactile and natural appearance.
- 7. BUILDING FORM:** Manipulate the buildings form to create spaces for private and communal spaces. Allows for efficient cross ventilation and natural lighting.
- 8. ORIENTATION:** Perfect condition for urban gardening and natural light.
- 9. ARRANGEMENT:** Close distances between buildings in order to create cost efficient bridge connections and to provide ample shade to the spaces below.
- 10. CONNECTIVE SOCIAL NETWORK:** Walkways connecting communal facilities and public spaces.
- 11. NATURAL VENTILATION:** Shallow floor plates , atriums and courtyards.
- 12. OCCUPANT CONTROL:** The architecture is to consider the need for building occupants and users to be able to control their internal environment where possible.
- 13. SUSTAINABILITY:** The use of renewable energy strategies as well as rainwater capture and use. Recycling rubbish and using it to make compost for the gardens. Sustainable ventilation and day lighting strategies.
- 14. COLOUR SELECTION:** Appropriate colour selection depending on the function of the space and the intended ambience and mood intended for such a space.
- 9. FLEXIBILITY:** Flexible spaces allow for a variety of functions.
- 10. ADAPTION:** Architecture created to be able to adapt.
- 11. TYPOLOGICAL VARIETY:** A variety of different retail , office and residential units so that people of all different socio economic backgrounds can live, work and play.

13. FLEXIBLE FURNITURE: Some units are to be designed to utilize fixed furniture (foldable) to transform the space for day and night use according to the needs and demands of the users. This allows users to transform the space to suite a variety of specific functions. Flexible furniture allows for spaces to be flexible and able to adapt to specific needs.

EARLY CONCEPT SKETCHES:

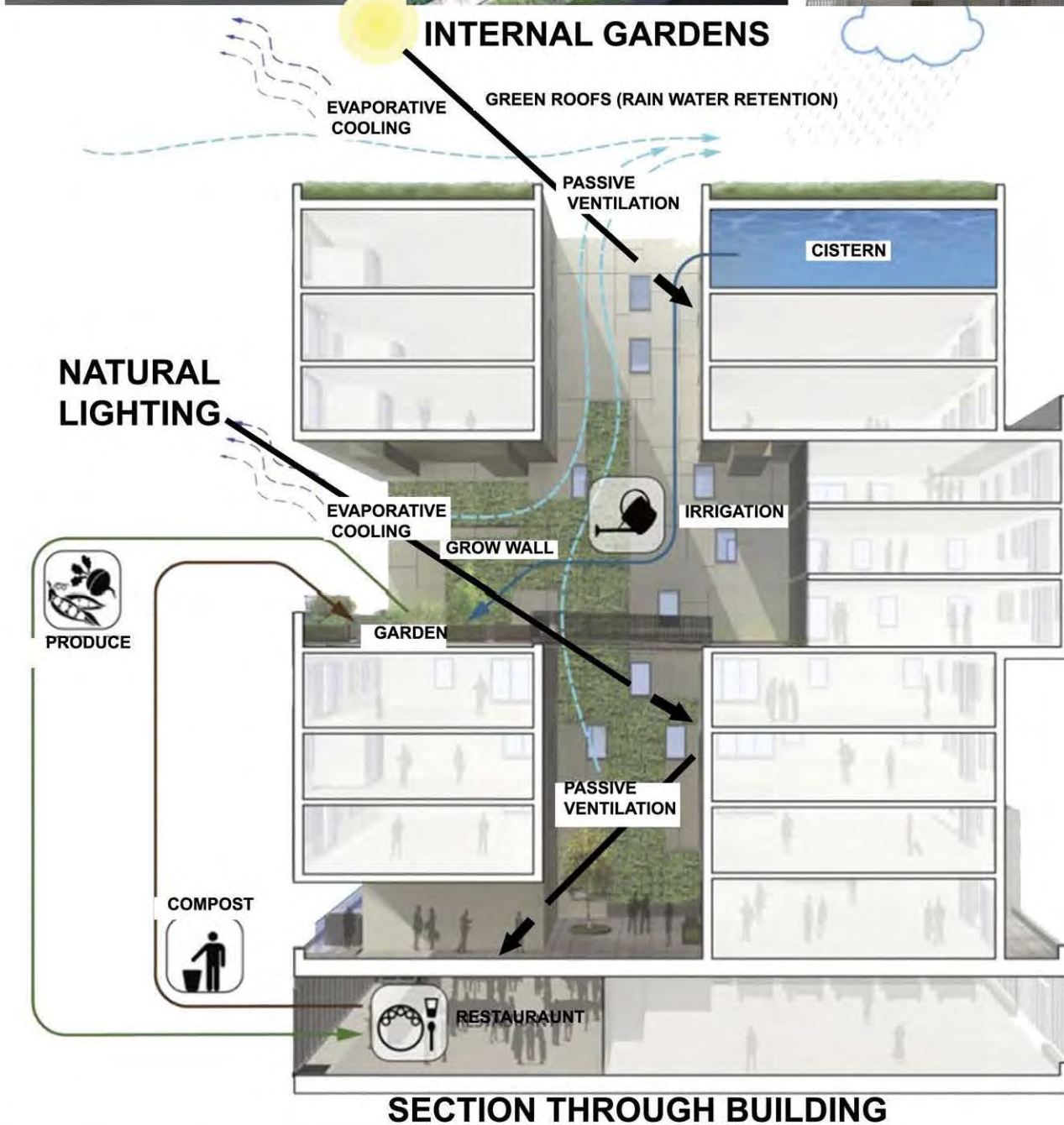
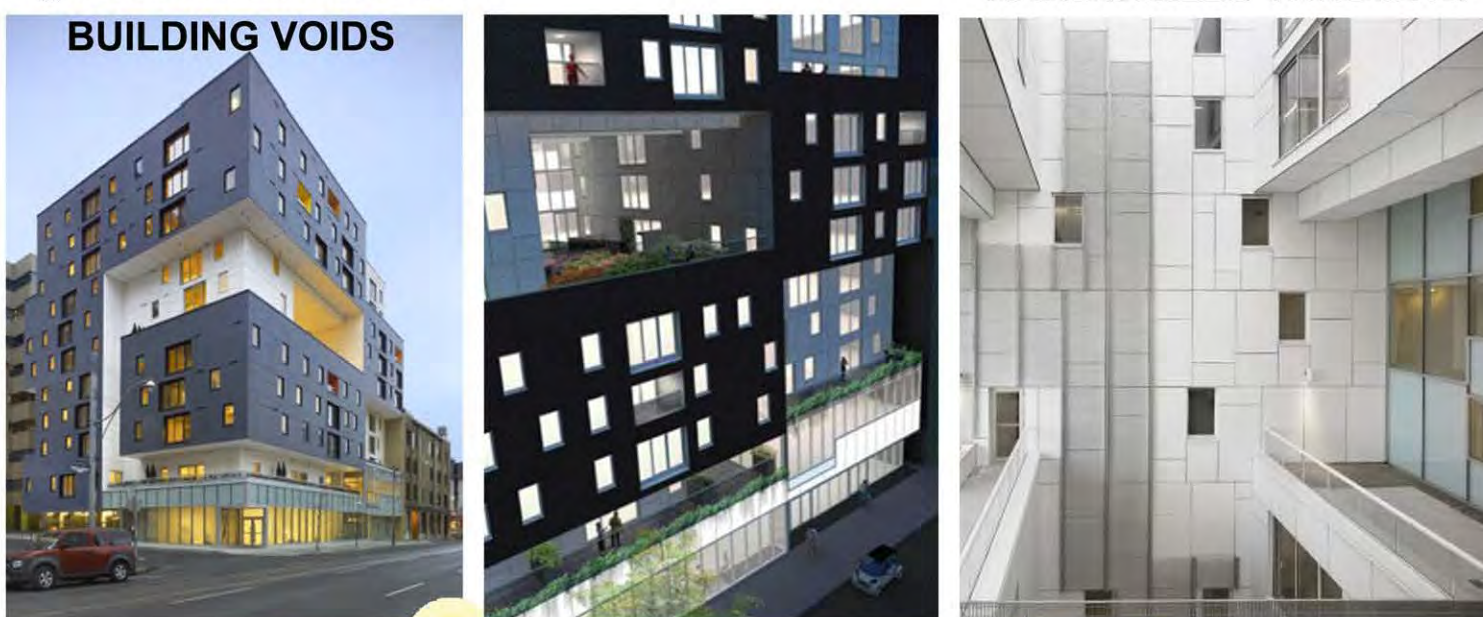


precedent studies:

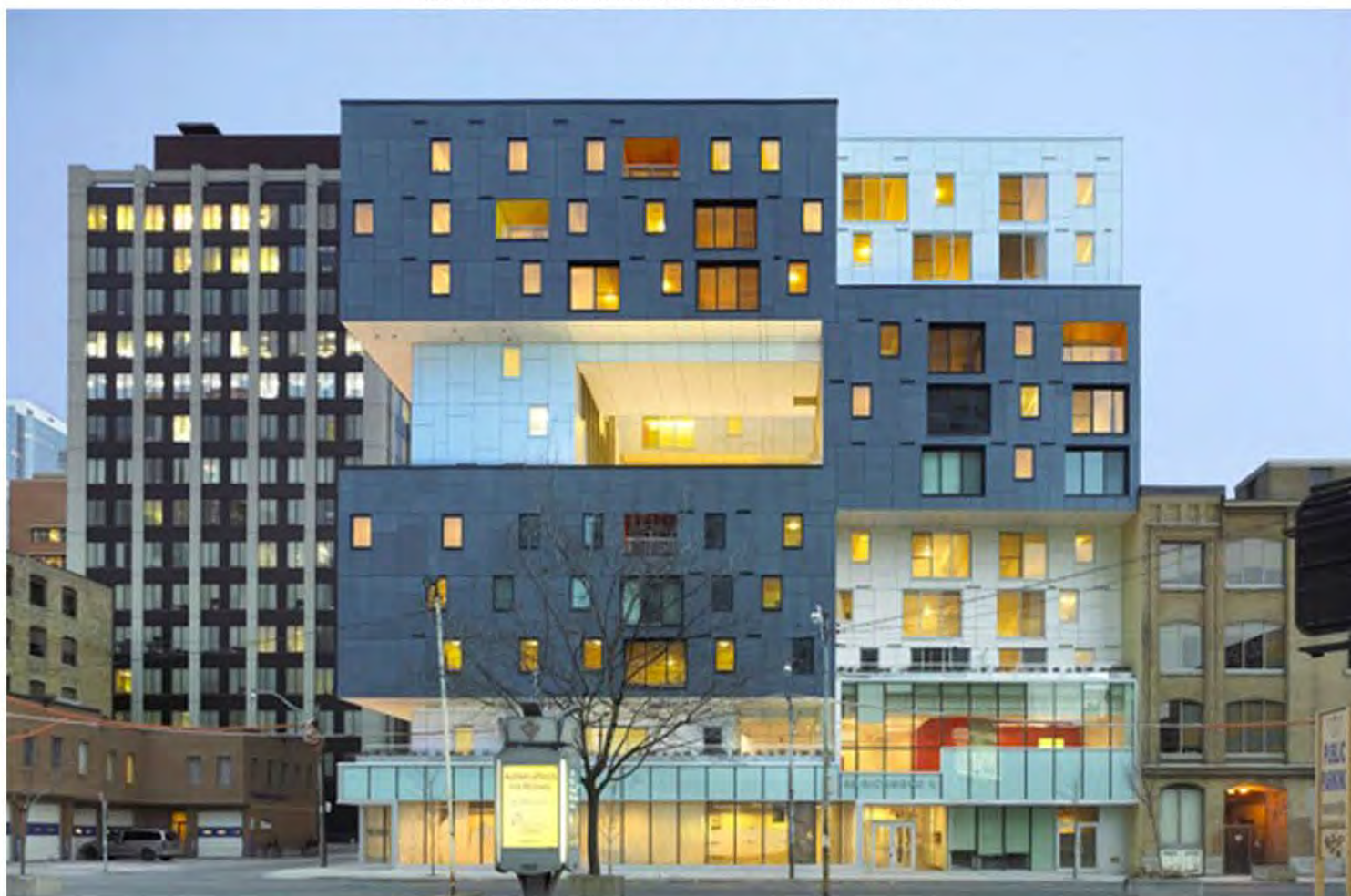
1.0 60 RICHMOND, TORONTO, CANADA:

The precedent demonstrates how the architect has manipulated the form and massing of the building to create voids in the building mass to create internal courtyards and garden terraces. This allows for an abundance of natural light and ventilation to enter into spaces within the building which would not have been possible if the building was left as a solid mass.

RANDOMIZED WINDOWS



SECTION THROUGH BUILDING



BUILDING FORM MANIPULATED TO CREATE VOIDS

2.0 GENZYME CENTER IN CAMBRIDGE:

The precedent deals with the issue of having a large floor plate. This issue was resolved by a pattern of deep cut outs, terraced internal openings and a central atrium. The building's central atrium acts as a light shaft as well as a return air duct that allows sufficient natural ventilation to the entire building. Lighting is further enhanced by reflecting light of internal reflective surfaces and the prism chandeliers. Eighteen interior gardens and seven accessible outdoor garden terraces increase the workers connection to nature and enhance social interaction in the workplace.



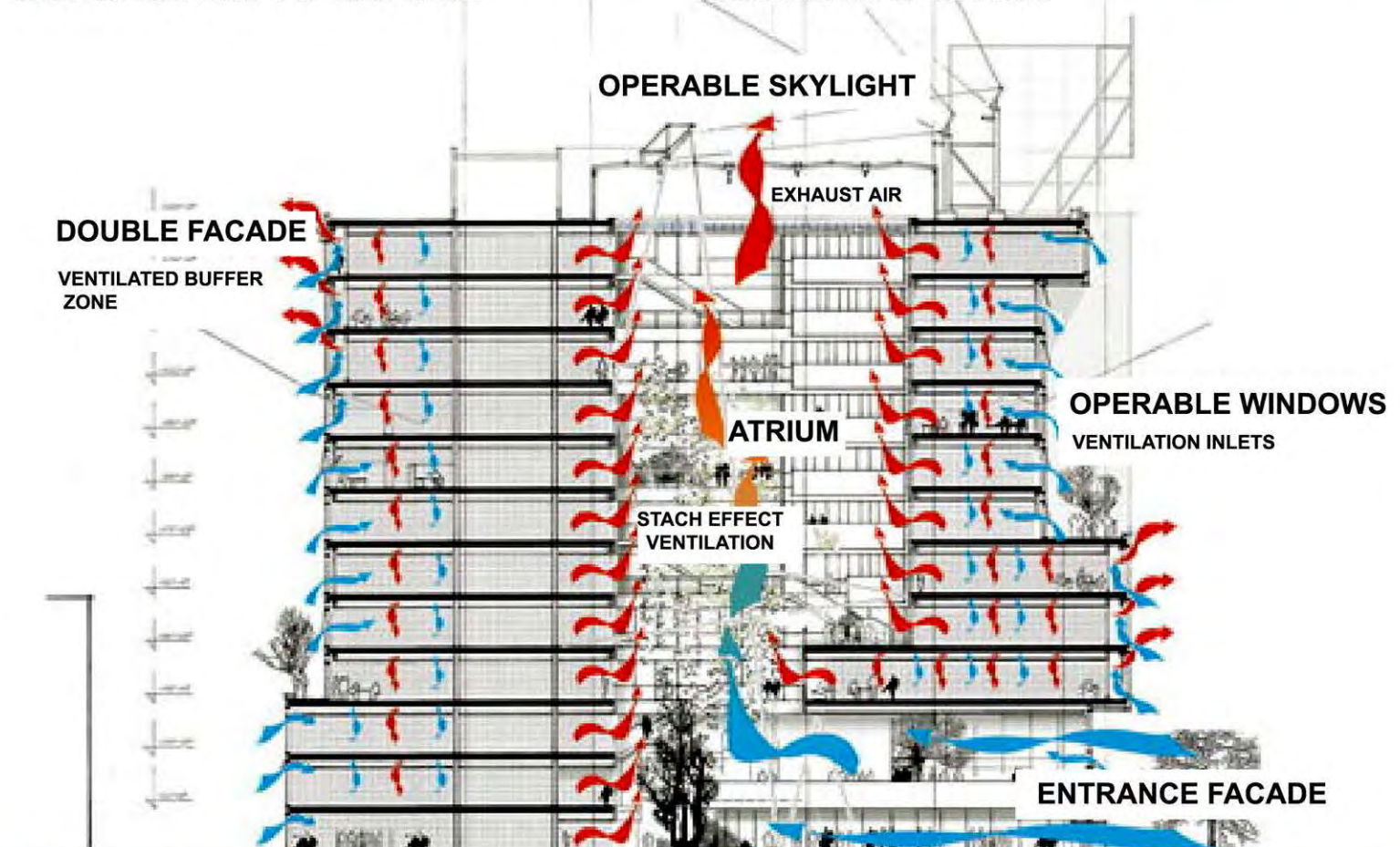
REFLECTIVE SURFACES



CONNECTION TO NATURE



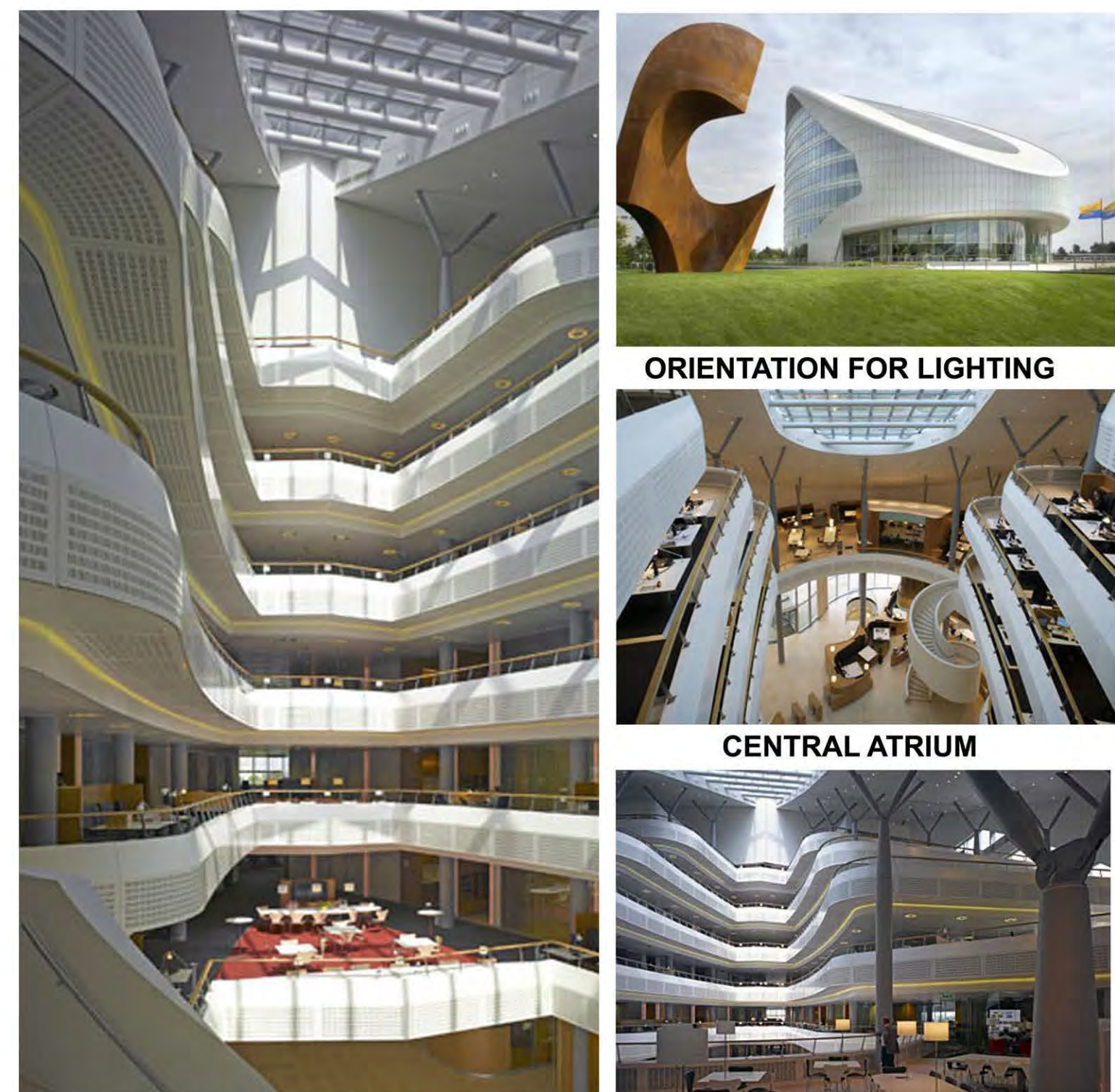
BUILDING SECTION



OPEN PLAN SPACES ALLOW FOR INTERACTION ON MANY LEVELS

3.0 SABIC EUROPE HEAD OFFICE:

The central atrium was created in response to spatial context and functional requirements such as climate control. The six work storeys are placed as galleries round this atrium and as the level increases each work level is recessed back to allow more light into building spaces. Since there are no individual offices, each floor is divided into a variety of different working zones all being open plan. Collaboration amongst workers is made efficient by the open plan layout as well as all the floors which surround the central atrium.



ORIENTATION FOR LIGHTING

CENTRAL ATRIUM

OPEN PLAN OFFICES ENCOURAGE WORKER INTERACTION



GLASS ROOF ALLOWS FOR AN ABUNDANCE OF LIGHT TO ENTER

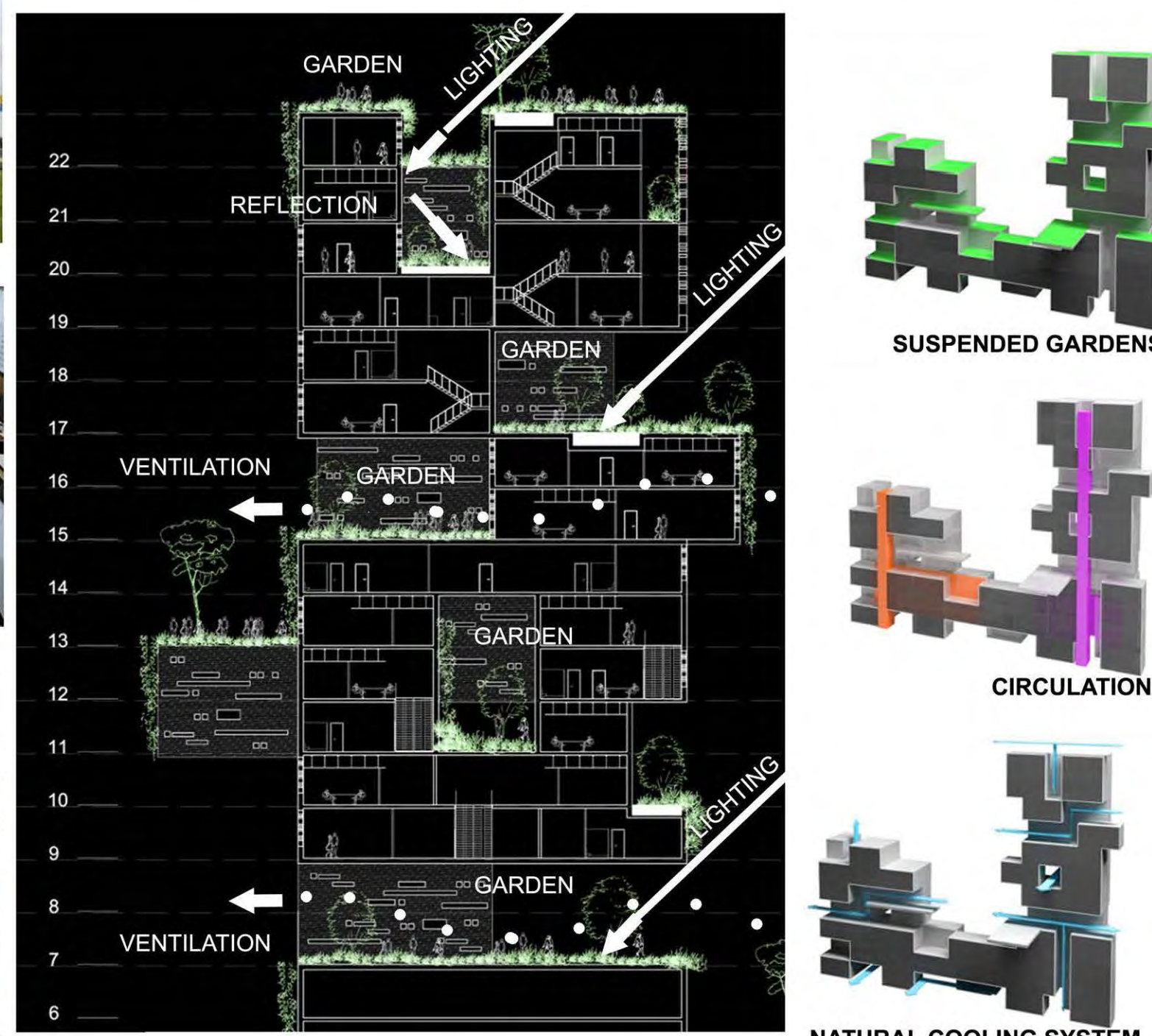


FLOOR PLATES CASCADE TO ALLOW LIGHT TO PENETRATE DEEPER

4.0 IT BUILDING IN NEW DELHI INDIA :

The walls and openings in the facades are adapted to the building's solar orientation. The incorporation of green areas in the building structure which does not limit to green roofs or walls can be a response to the loss of spaces and green environments due to rapid urban population growth and spatial constraints.

The building design connects the building users and occupants to nature in many ways. By breaking up the building mass and creating cut outs for gardens the architect has been able to enhance both natural ventilation and day light into the majority of all spaces within the building. Not only do the cut out gardens provide an abundance of fresh air and natural day light but they act as spaces where social interaction can occur amongst the building users.



SECTION THROUGH BUILDING

GARDEN TERRACES ACT AS SOCIAL GATHERING SPACES



CUT OUTS ALLOW FOR NATURAL VENTILATION AND LIGHTING



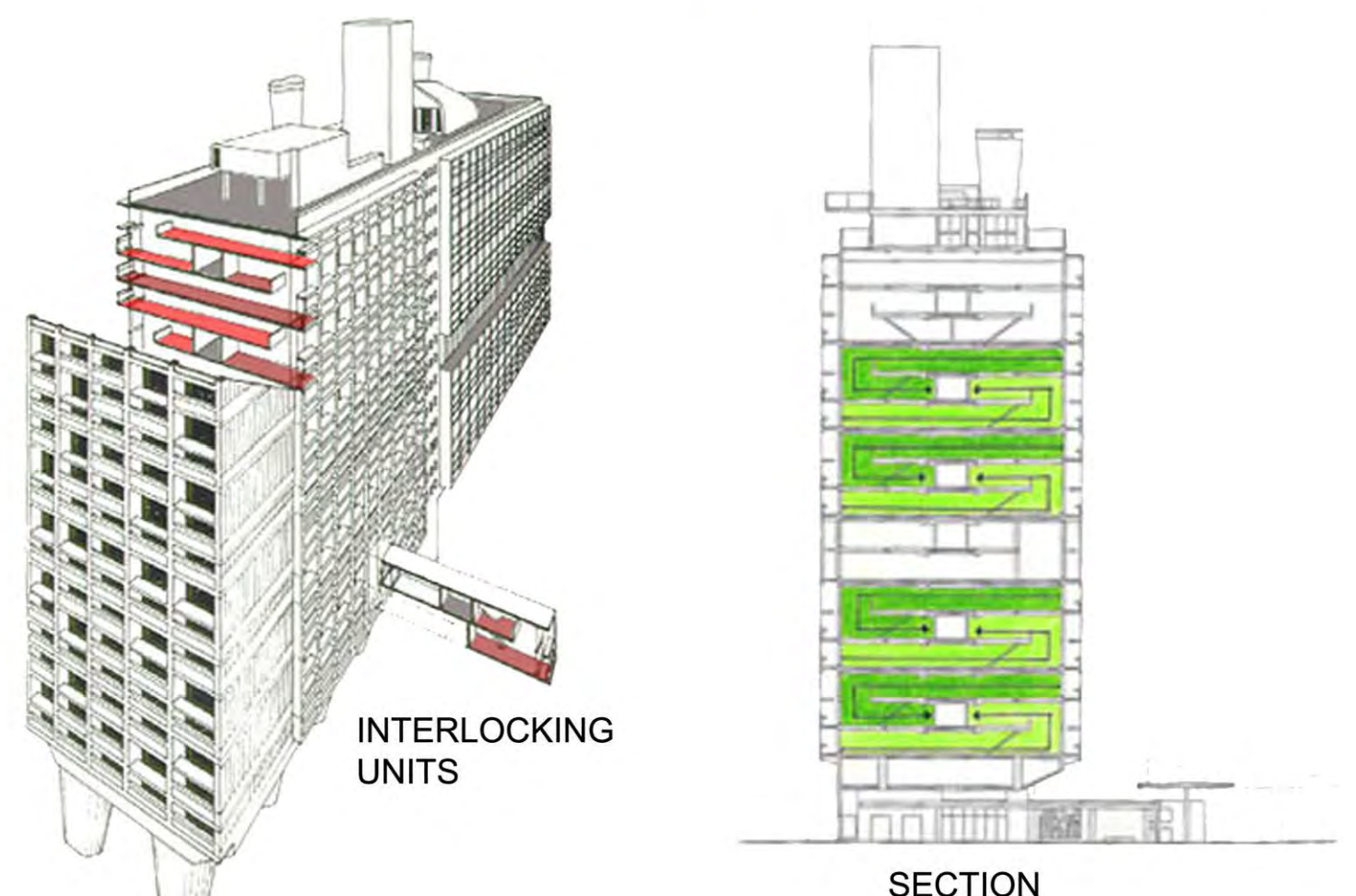
BUILDING APPROACH

precedent studies:

5.0 UNITE D HABITATION, MARSEILLES, FRANCE:

Le Corbusier designed the units to span from each side of the building, as well as having a double height living space reducing the number of required corridors, entrances and elevator stops to one every three floors. By narrowing the units and allowing for a double height space, Corbusier is capable of efficiently placing more units in the building and creating an interlocking system of residential volumes.

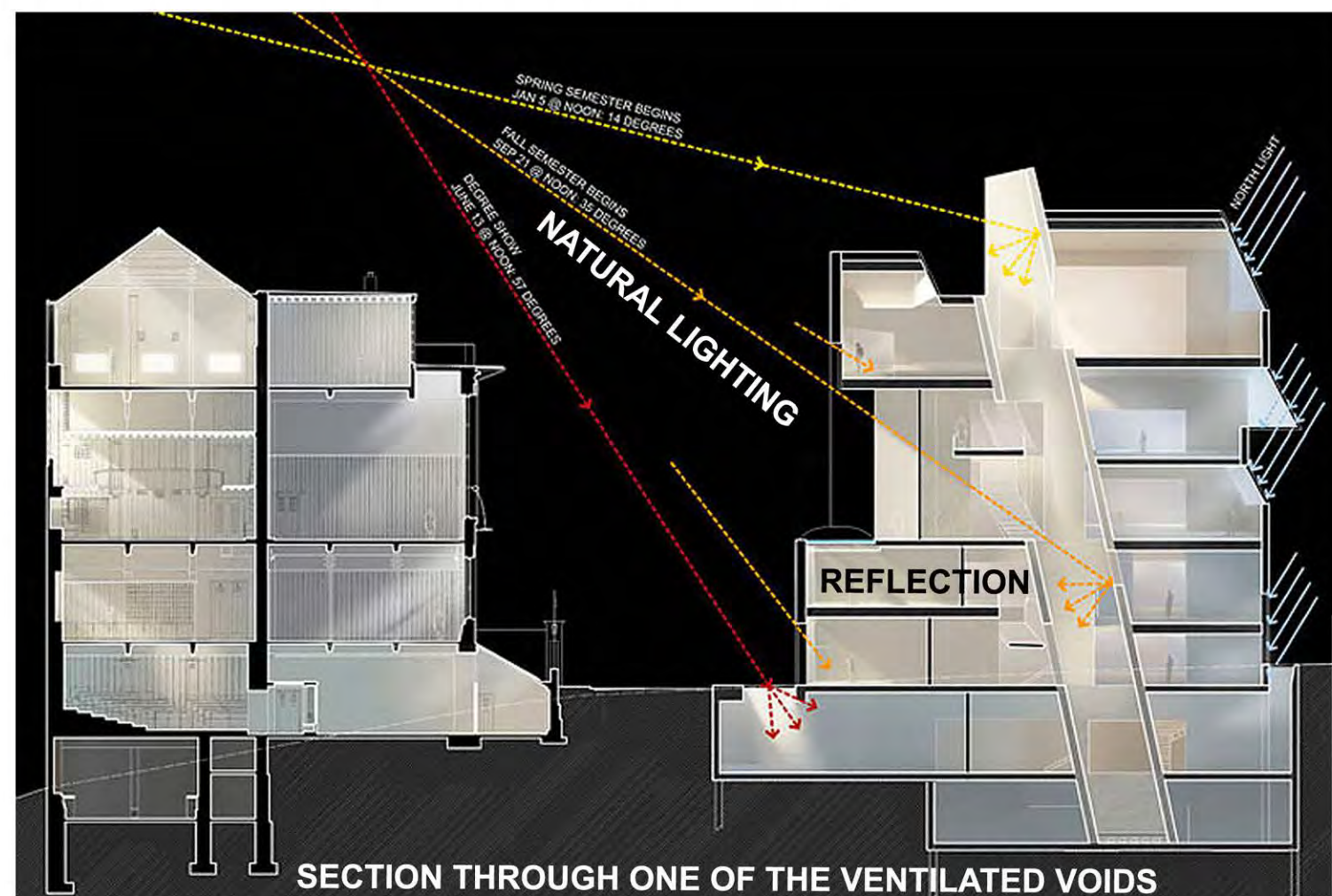
At each end of the unit there is a balcony protected by a brise-soleil that allows for cross ventilation throughout the unit flowing through the narrow bedrooms into the double height space; emphasizing an open volume rather than an open plan. Further the double volume allows the units to receive more natural day lighting.



EXTERNAL VIEW OF THE BUILDING

6.0 GLASGOW SCHOOL OF ART, GLASGOW :

The precedent demonstrates that through the use of a series of ventilated voids the architect is able to achieve natural day lighting and ventilation into the building interiors. The voids are orientated to the south so that the direct rays of the sun can reflect off the internal walls and light up spaces that are deeper and less likely to receive natural lighting without this innovative day lighting strategy.



7.0 HANCOCK, WEST HOLLYWOOD, USA:

The architect has equipped the individual units with a sliding wooden screen that moves along each balcony rail. The screen can be used to modulate the amount of direct sunlight reaching the living area, also creating an enclosed private outdoor space that is sheltered from the busy thoroughfare. The garage doors create an indoor / outdoor feel. Together these two features allow the occupants to have control over their own units, therefore they can adapt them to their specific needs.



8.0 NEXT 21, OSAKA, JAPAN:

Flexibility in this housing project exists due to the concrete frame structure, which allows for buildings parts to move independent of the structure. Wall components are based on a modular system and can be placed anywhere on the predetermined grid. The services form a separate constructional layer. Wiring and piping for gas, water and electricity are located in raised floors or suspended ceilings. When parts have to be exchanged, or when systems have to be renewed, panels in the ceiling or floor plates allow easy access. ROOF GARDENS CREATE OUTDOOR USABLE SPACE



CONCRETE FRAME STRUCTURE ALLOWS FOR FLEXIBILITY OF UNITS.

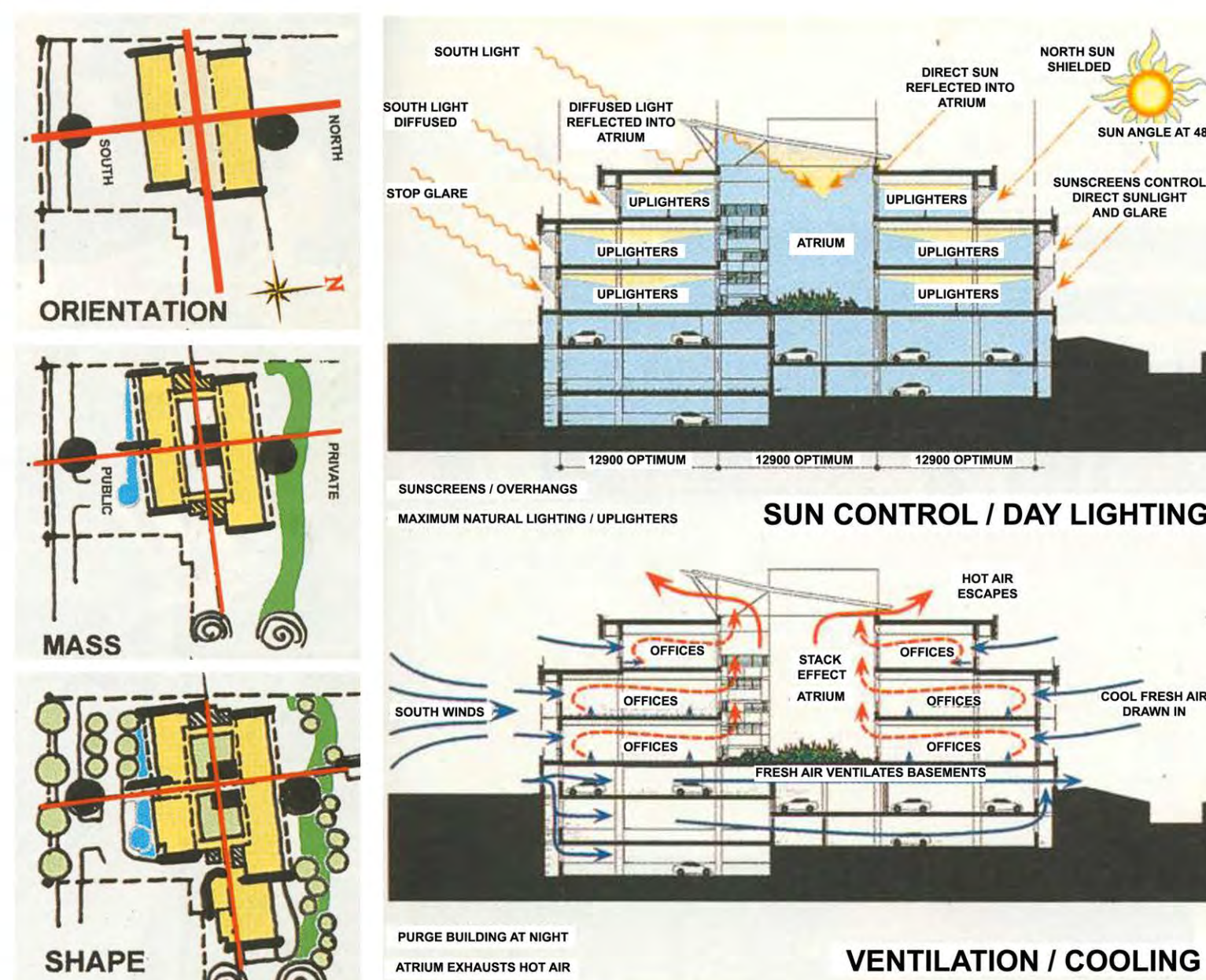
local case studies:

1.0 MUNICH REINSURANCE BUILDING, JHB :

The entire two storeys of open plan office accommodation are planned around the two interconnected atriums allowing workers to experience it. The office wing has depths of 13m combined with the atrium which enables the building to achieve effective and sufficient natural lighting and ventilation. The building's long narrow form allows it to take full advantage of natural ventilation methods. With atriums being centrally located, air is drawn in on the north and is entered on the south side by the south winds. The air then circulates through the office space and the atrium acts as a natural heat exhaust stack which allows the hot air to escape out the roof eaves at the top. The building takes full advantage of natural ventilation ensuring that a constant fresh supply of air is available.



OFFICES SURROUNDING THE CENTRAL ATRIUM



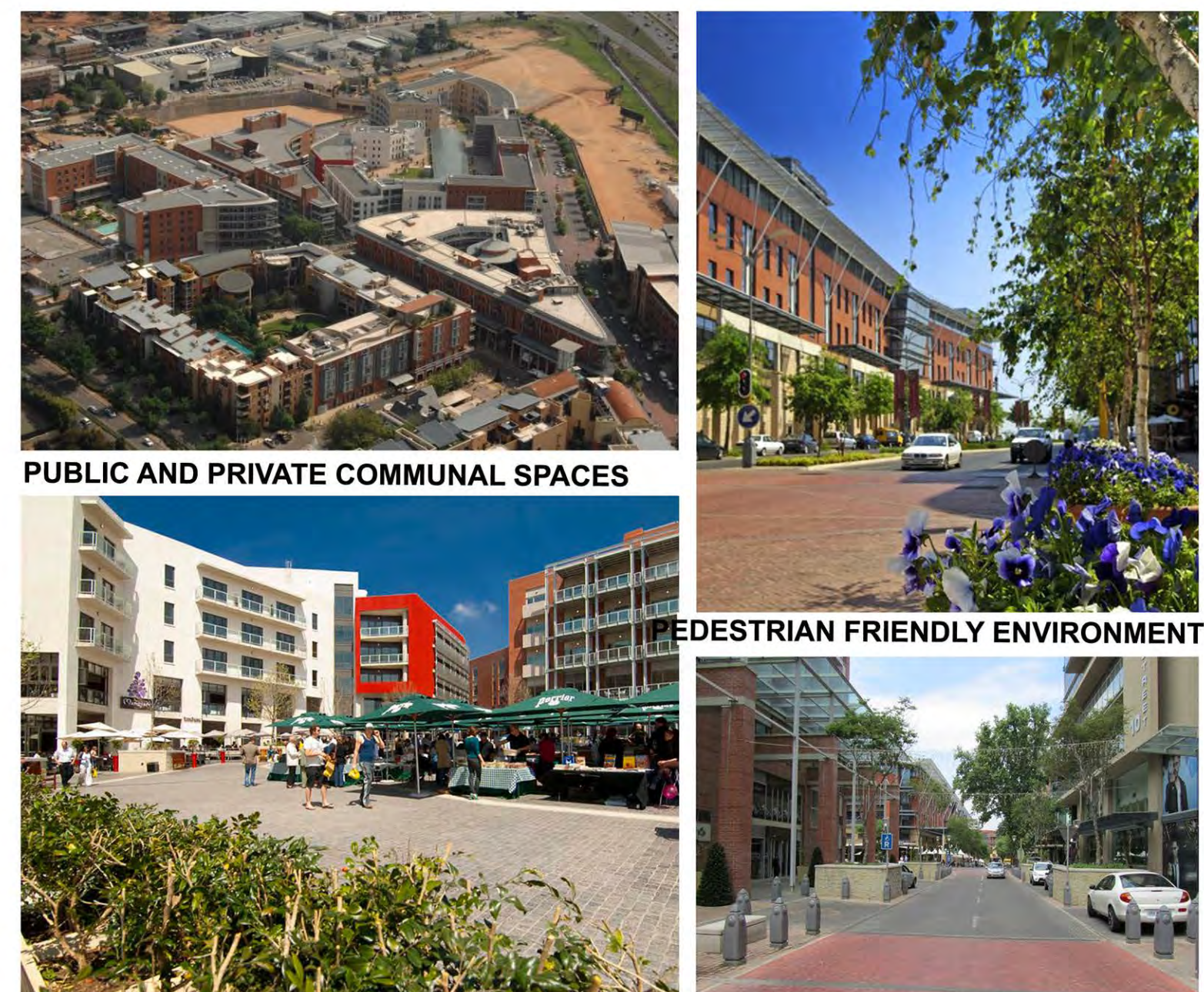
WATER FEATURES CREATE A SENSE OF TRANQUILITY ON APPROACH TO BUILDING

2.0 MELROSE ARCH, JHB, GAUTENG:

Melrose Arch precinct was based on the principles of New Urbanism, which is based on medieval town planning principles that contain mixed use pedestrian friendly environments with a clear definition of both public and private domains.

The Melrose Arch precinct is internally ordered by two main roads and is orientated around two public squares. High street is surrounded by mixed use buildings that encourage movement along the retail sides.

However the main intention of the design of Melrose Arch was to create and encourage pedestrian movement as well as to create a precinct that promotes activities, public surveillance, social interaction, density and a walkable environment in which people can live work and play within.



THE CREATION OF A MIXED USE ENVIRONMENT

By david sharkey

urban location: macro



1.0 SOUTH AFRICA



2.0 KWA - ZULU - NATAL



3.0 DURBANS CBD



4.0 MACRO CONTEXT



5.0 MICRO CONTEXT

urban analysis & selection

the urban area in its context

The urban intervention as well as the building is to be in the Durban CBD as Durban is well known for its deteriorating CBD environment and its cause of urban sprawl. These factors do not contribute to the well-being and the social interaction needs of the city's inhabitants.



URBAN AREA SELECTION CRITERIA: (CITY HALL, BEACHFRONT STRIP)

- 1.0 EXISTING GREEN AREAS, SQUARES AND PUBLIC SPACES:
Farewell square, Medwood gardens (oasis of the city) and the beachfront promenade.
- 2.0 ACCESSIBILITY:
Centrally located, on main road, walking distance to commercial heart of CBD, public transport already available.
- 3.0 CONNECTIVITY:
Provides excellent connectivity to surrounding areas, connects many activity nodes that are important for Durban's heritage.
- 4.0 LINKAGES (TO URBAN AREA AS WELL AS THE REST OF THE CBD):
North / South links To Embankment, East / West links to the beachfront, promenade. Has the potential to link to the rest of Durban's CBD and for the CBD to link to the site.
- 5.0 VISTAS:
Urban area offers exciting vistas to the beachfront and the Victoria embankment.
- 6.0 REVITALISATION:
Concrete Jungle, commercially zoned, no activity in night and motor industries dominate leaving the area unvisited. Lack of shade, trees urban furniture (unfriendly pedestrian environment), Dilapidated buildings and lack of public social spaces. This demonstrates the need for the revitalisation of the urban area

GENERAL BUSINESS	SPECIAL	TRANSPORT
RESIDENTIAL / HOTEL	GENERAL BUSINESS 4	GENERAL - INDUSTRIAL
PUBLIC OPEN SPACE	BEACH	
GOVERNMENT / MUNICIPAL	EDUCATIONAL	

- Land use does not encourage social interaction or 24 hour activity.
- Lack of social and green spaces.

urban area analysis:MACRO

ANALYSIS OF SITE AREA:



- PUBLIC AND GREEN SPACES
- LOCATION OF HISTORIC BUILDINGS
- VISTA
- NATURAL WINDS
- SUN PATH

ILLUSTRATES how accessible the urban area is to the CBD. Central location of urban area allows for great connectivity and the opportunity to link the urban area to the surrounding CBD and the CBD to the urban area.

ZONING DIAGRAM FOR DURBANS CBD:



REFERENCE: DURBAN CITY COUNCIL

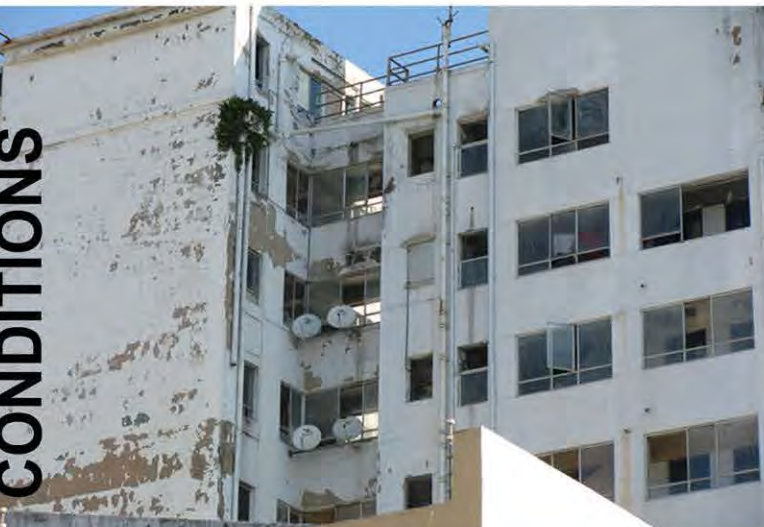
urban area analysis:MICRO

As one progresses from the start of the urban area the street quality deteriorates until the beachfront / promenade.



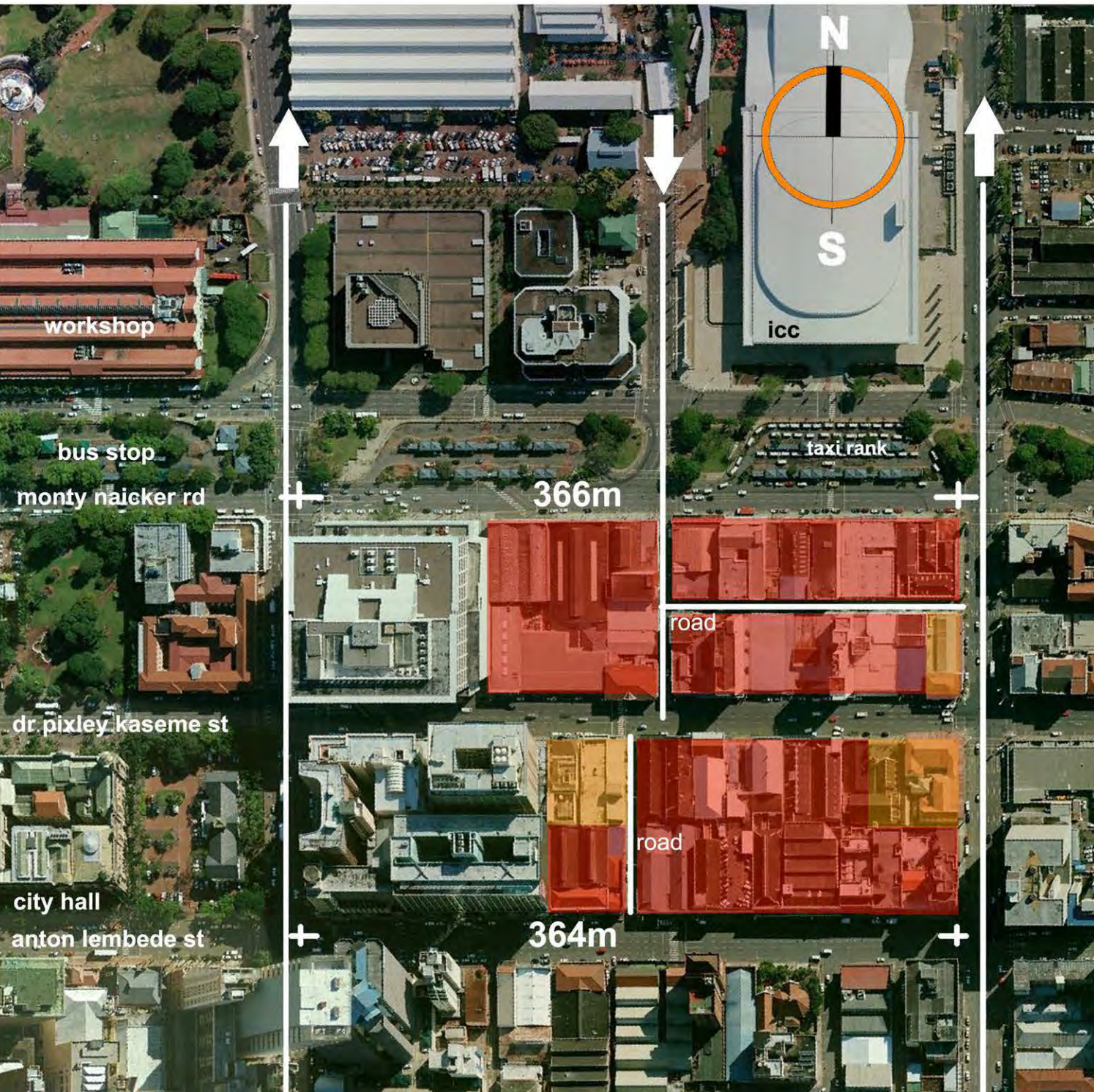
urban design site

REASONS FOR SITE SELECTION:

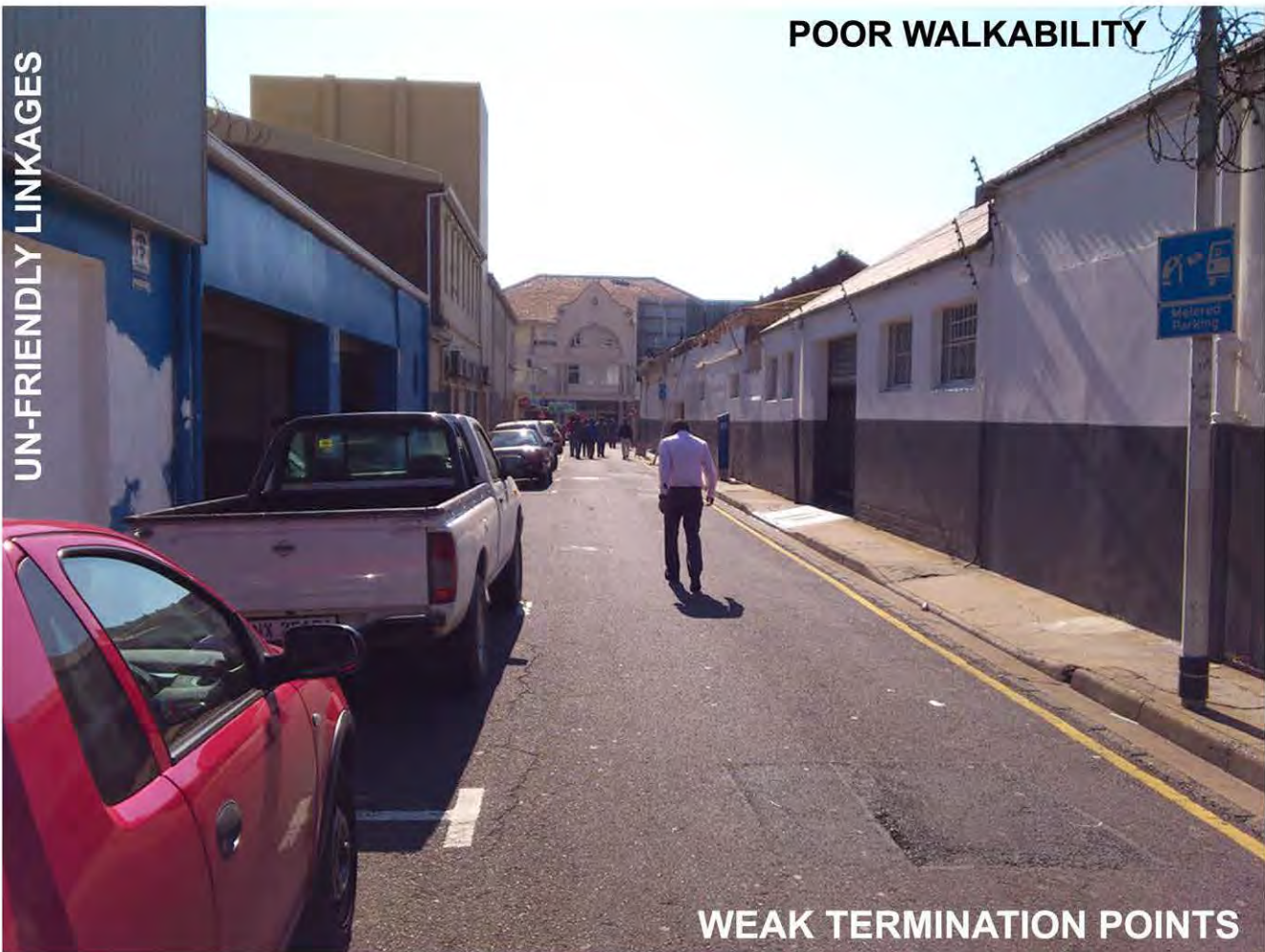


- WHOLE SITE IS ZONED AS GENERAL BUSINESS.
- MANY VACANT BUILDINGS.
- NO PUBLIC SPACES FOR SOCIAL INTERACTION TO OCCUR.
- DOES NOT CONTRIBUTE TO THE USERS WELL-BEING NEEDS.
- LARGE BLOCK SIZES IN COMPARISON TO REST OF THE URBAN AREA.
- MANY BUILDINGS ARE RUN DOWN AND IN APPALING CONDITIONS.
- POOR LINKAGES, CONNECTIVITY, AND ACCESSIBILITY.
- SITE IS CLOSE TO ACTIVITY, THEREFOR THE PROPOSAL WOULD BE WELL USED BY THE CITY'S INHABITANTS.
- THE PROPOSAL IS TO ACT AS A CATALYST FOR FUTURE MIXED USE ENVIRONMENTS TO BE CREATED TOWARDS THE BEACHFRONT. THEREFOR LINKING THE CITY TO THE BEACHFRONT.

BLOCK SIZE AND EXISTING ROADS:



LEGEND : ■ HISTORIC BUILDINGS ■ PROPOSED URBAN DESIGN SITE



THE WAY FORWARD:

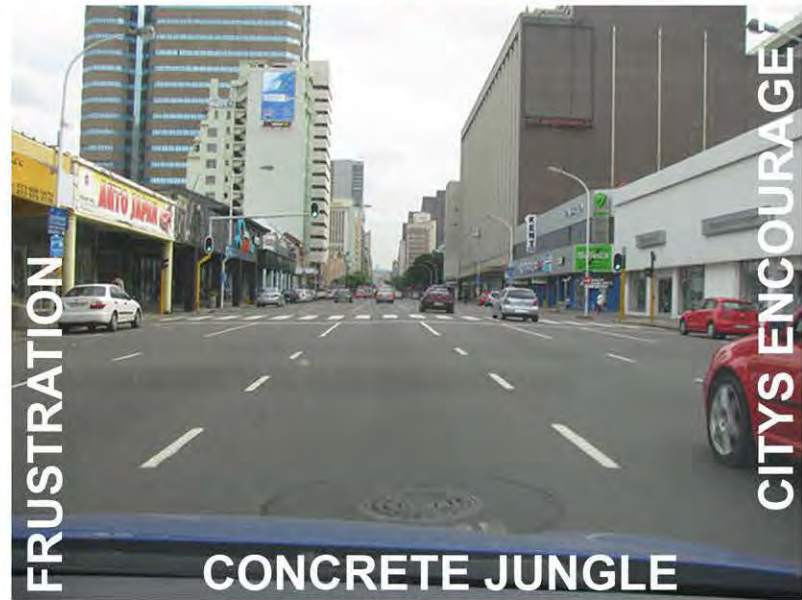
TAKING INTO ACCOUNT THE CLIENTS OBJECTIVE TO MAKE DURBAN THE MOST LIVABLE CITY IN AFICA BY 2020, BOLD MOVES HAVE TO BE TAKEN TO ENSURE THIS. ALL BUILDINGS EXCEPT THE HISTORIC BUILDINGS ARE TO BE DEMOLISHED TO START THE REJUVENATION PROCESS FOR THE CITY. THE CREATION OF A MIXED USE URBAN DEVELOPMENT WILL BRING LIFE BACK TO THE CITY.

proposed park & ride

Focus on creating a good public transport system enables city inhabitants to reduce their dependency on private cars. This allows for higher living densities without the roads becoming blocked or mobility suffering. These cities often contain mixed land uses with jobs, recreation and employment within walking distance, which creates an environment that enhances ones well-being.

PROPOSAL OF COMBATTING URBAN SPRAWL:

- Provision of park and ride facilities provide support for public transport usage through eliminating the cost of inner city parking triggered by private car usage.
- Improving the existing people mover transport system by adding new routes, making the city of Durban highly accessible.



MAP LEGEND:

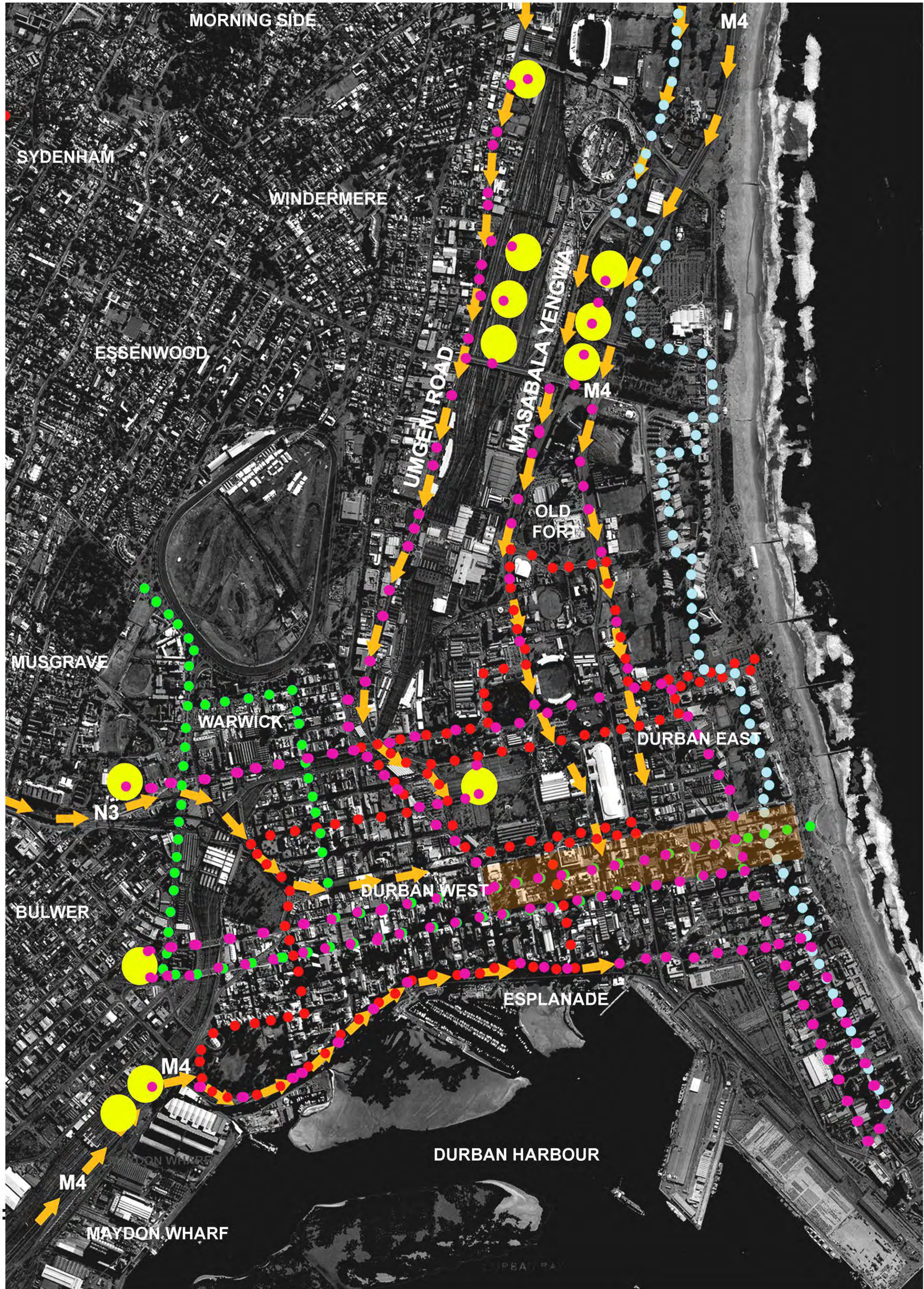
→ MAIN VEHICLE MOVEMENT INTO DURBANS CBD

EXISTING PEOPLE MOVER ROUTES:

- BEACH LINE
- CIRCLE LINE
- CITY LINE

PROPOSED PEOPLE MOVER ROUTES:

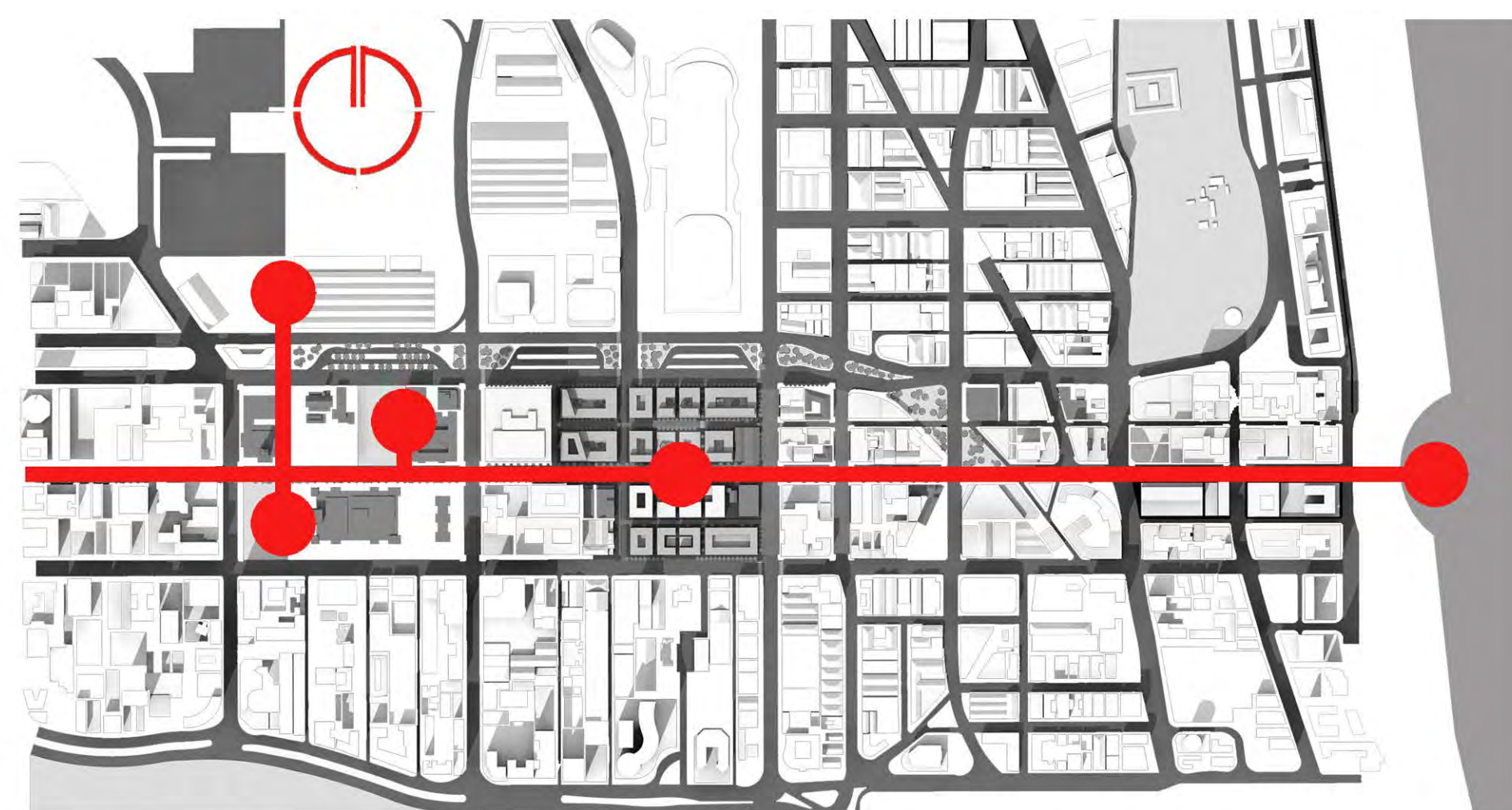
- PROPOSED LINE
- PROPOSED PARK & RIDE



THE GREEN STRIP NODES AND LINKAGES

EXISTING AND PROPOSED GREEN SPACES:

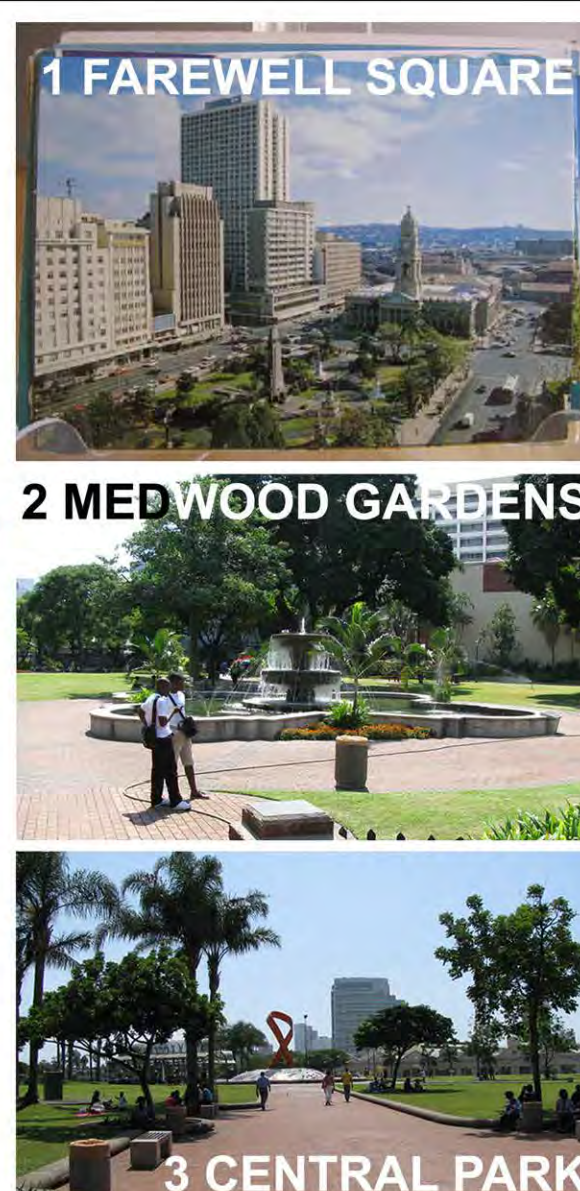
HISTORIC BUILDINGS LOACATED IN THE URBAN AREA



The urban green strip links the CBD to the beachfront / promenade (east - west link). It further links to other social nodes within the city, making it very accessible.



Existing green spaces and parks are illustrated in green and the proposed green spaces are indicated in orange.



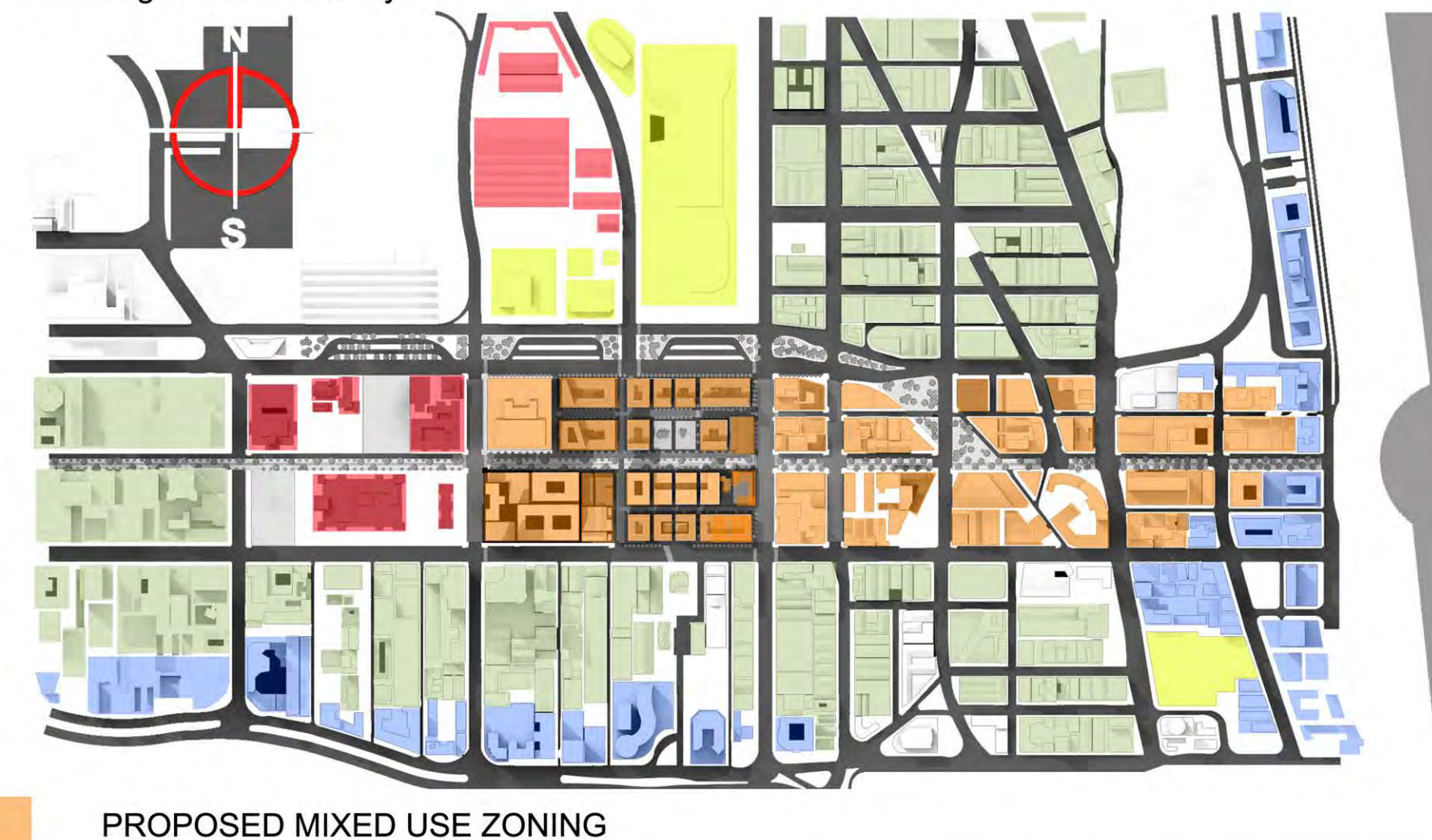
Durban contains many historic buildings especially the urban area selected for the design proposal. However these buildings are to be protected and no demolition of any of them is allowed. The design will take them into account and will be designed around them.

DURBANS EXISTING ZONING:

PROPOSED ZONING FOR INTERVENTION:

Zoning is predominantly aimed at commercial / business and therefore the city is active during the day but is dead at night.

Existing zoning is to be changed to allow for mixed use environments that encourage 24 hour activity.



the urban area:



EXISTING PEDESTRIAN MOVEMENT:

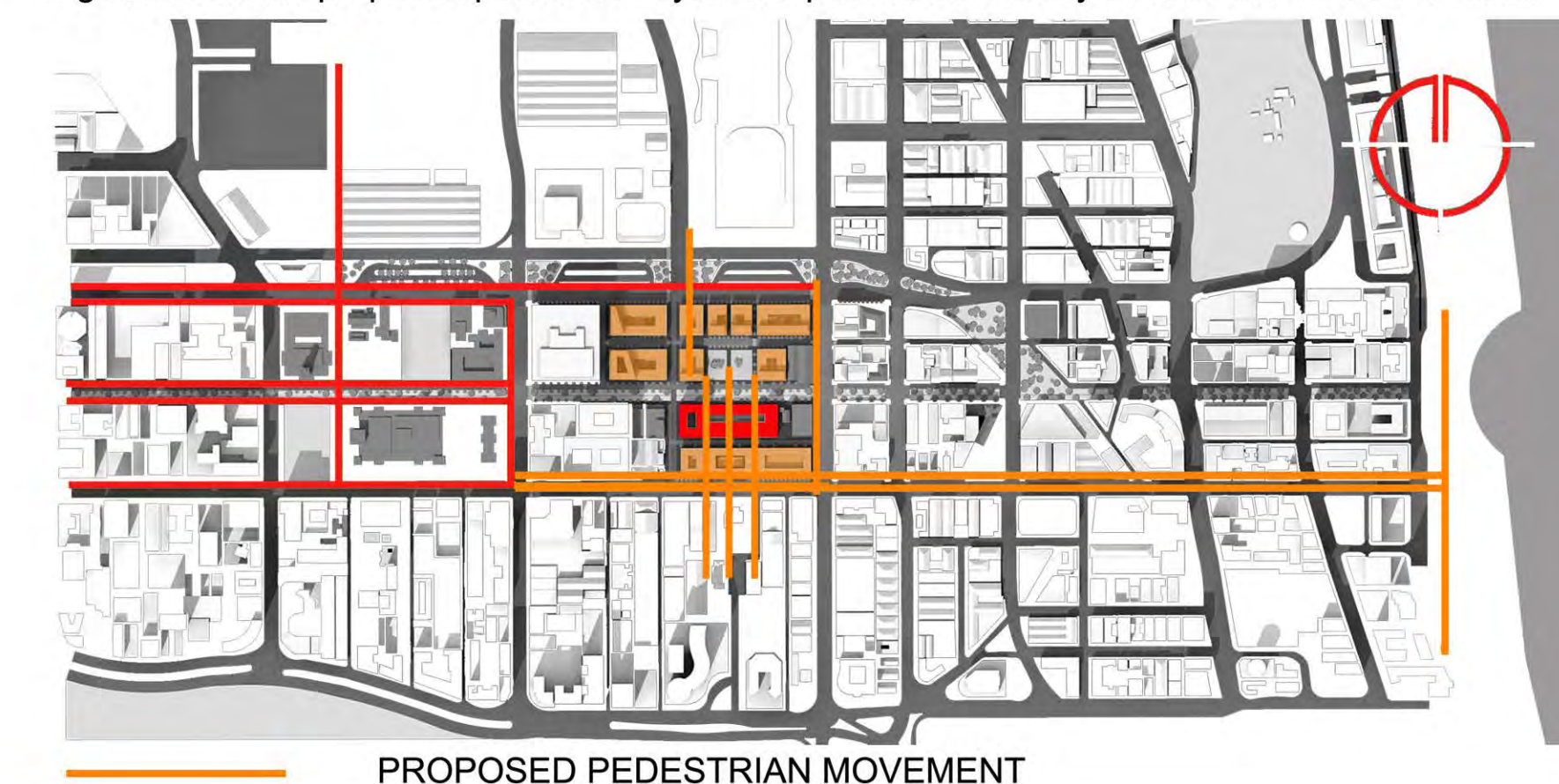
PROPOSED PEDESTRIAN MOVEMENT:

Pedestrian movement exists where there are social spaces and facilities for the public however as one continues towards the beachfront, the amount of pedestrian movement deteriorates due the lack of public spaces and industrial related businesses. There is a need to encourage pedestrian activity to move from the CBD to the beach.

Encourage as much pedestrian movement past the site. This will be achieved through the urban green park with mixed use environments as well as nodes along the path. The existing road is to be transformed into the urban green park leaving 2 existing lanes to serve public transport routes. Together with the proposed park & ride system a pedestrian friendly environment will be created.



EXISTING PEDESTRIAN MOVEMENT



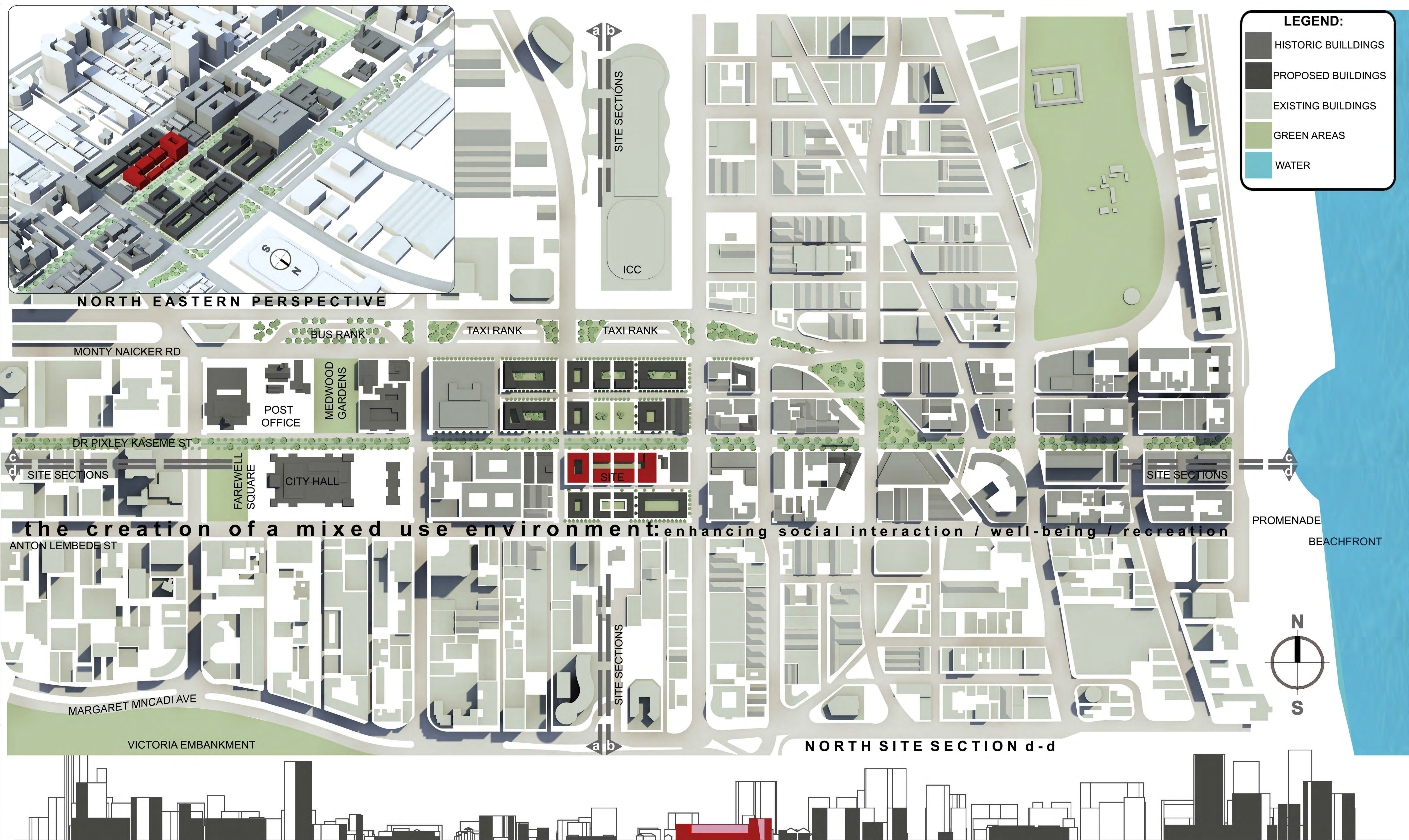
PROPOSED PEDESTRIAN MOVEMENT

URBAN DESIGN OBJECTIVES:

The proposed urban design is to aim in revitalising part of the Durban CBD, with the intention of linking the CBD to the beachfront through the urban green strip movement spine. Thus will therefore create an environment that enhances one's well-being and gives the inhabitants of Durban more opportunities to socially interact with one another.

- Urban design is to act as a catalyst for future development towards the beachfront.
- Split up the existing city blocks creating walkability.
- Provide for good connectivity to the urban design site area making it accessible.
- Creating a Mixed - Use environment.
- Increasing the density in the urban area.
- Focus on pedestrian friendly walkways over vehicle dominated contexts.
- Close to public transport.
- Connect the site to nature and consider biophilic design attributes such as planting trees and the creation of water features to instill a sense of tranquility in the context.
- The creation of a human scaled development that respects the public realm.
- Individual building blocks to incorporate atriums and courtyards to allow for more opportunities and to connect the buildings to nature.
- The creation of public spaces to encourage social interaction.
- Create strong links to the site.

By david sharkey

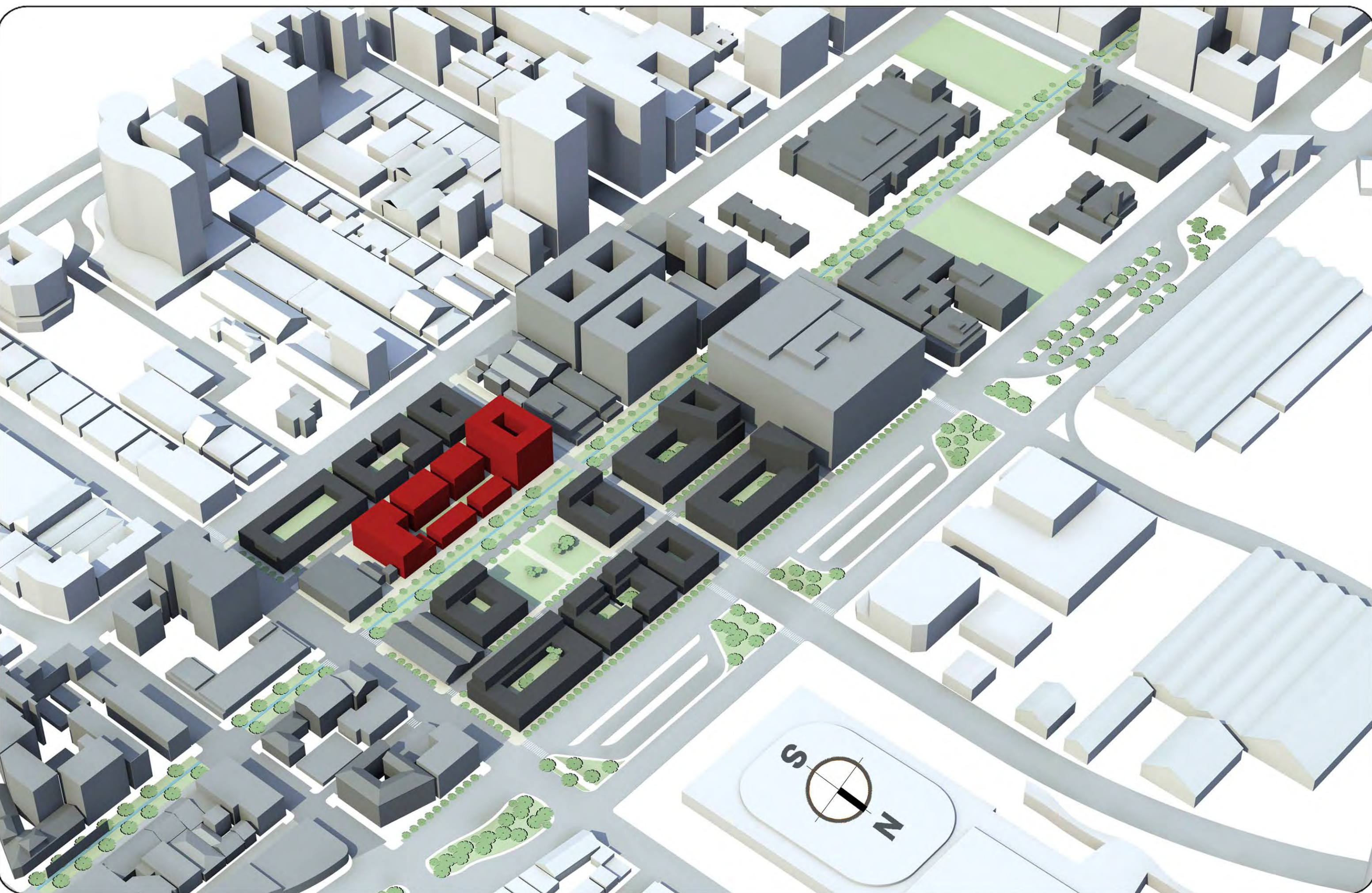


URBAN DESIGN PROPOSAL:

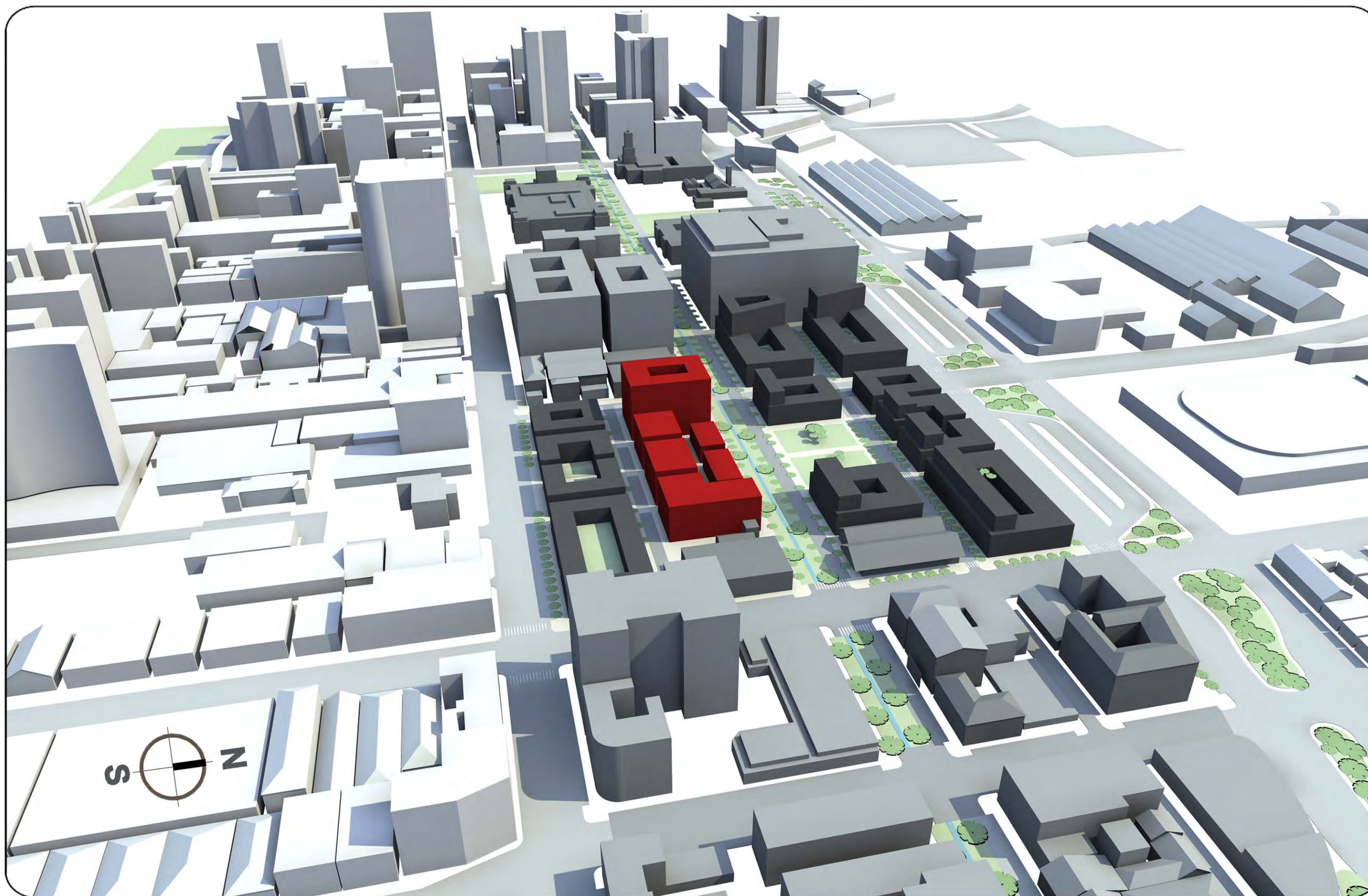
Aimed at revitalising part of the Durban CBD, with the intention of linking the CBD to the beachfront through the proposed urban green strip movement spine.

Urban design is to act as a catalyst for future development towards the beachfront. Split up the existing city blocks creating walkability, connectivity & accessibility. Creating a Mixed - Use environment, with increased density. Focus on pedestrian friendly walkways over vehicle dominated contexts. Connect the site to nature and consider biophilic design attributes such as planting trees and the creation of water features to instill a sense of tranquility in the context. The creation of a human scaled development that respects the public realm. Individual building blocks to incorporate atriums and courtyards to allow for more opportunities and to connect the buildings to nature. The creation of public spaces to encourage social interaction.

By david sharkey



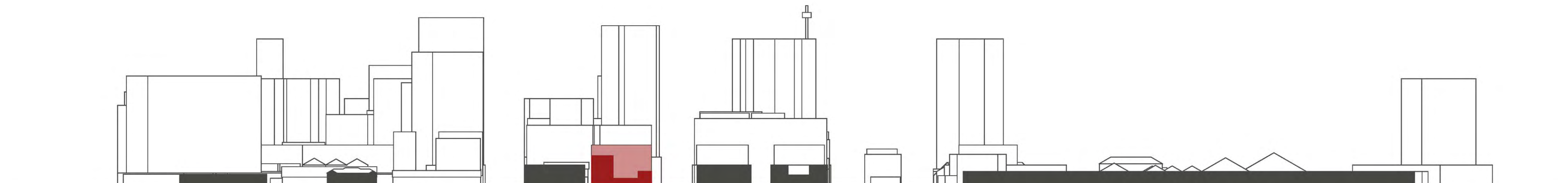
NORTH EASTERN PERSPECTIVE



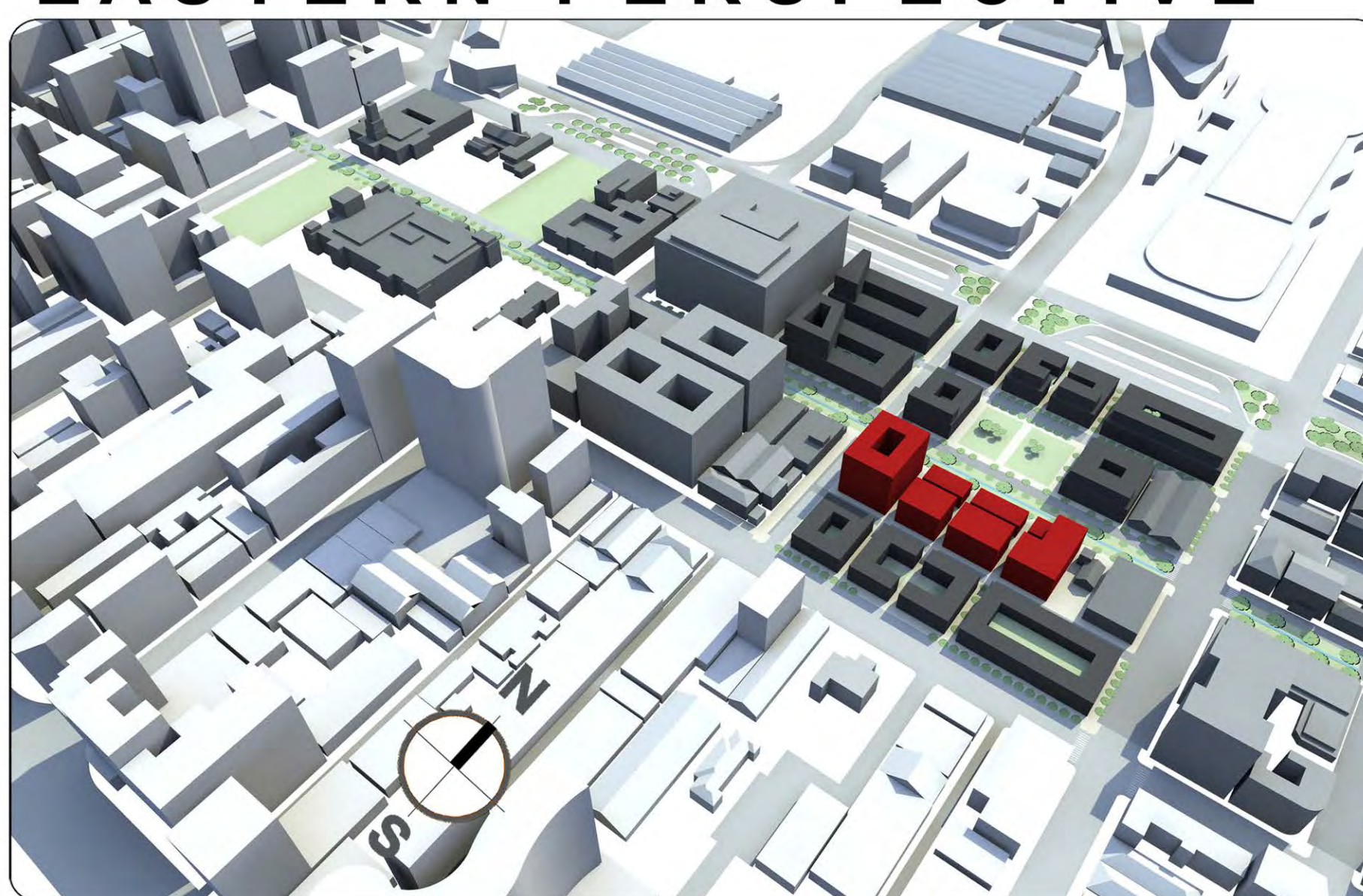
EASTERN PERSPECTIVE



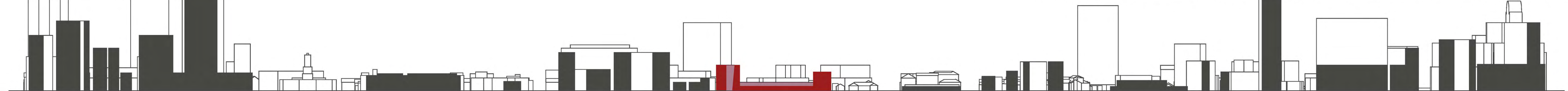
WEST SITE SECTION b-b



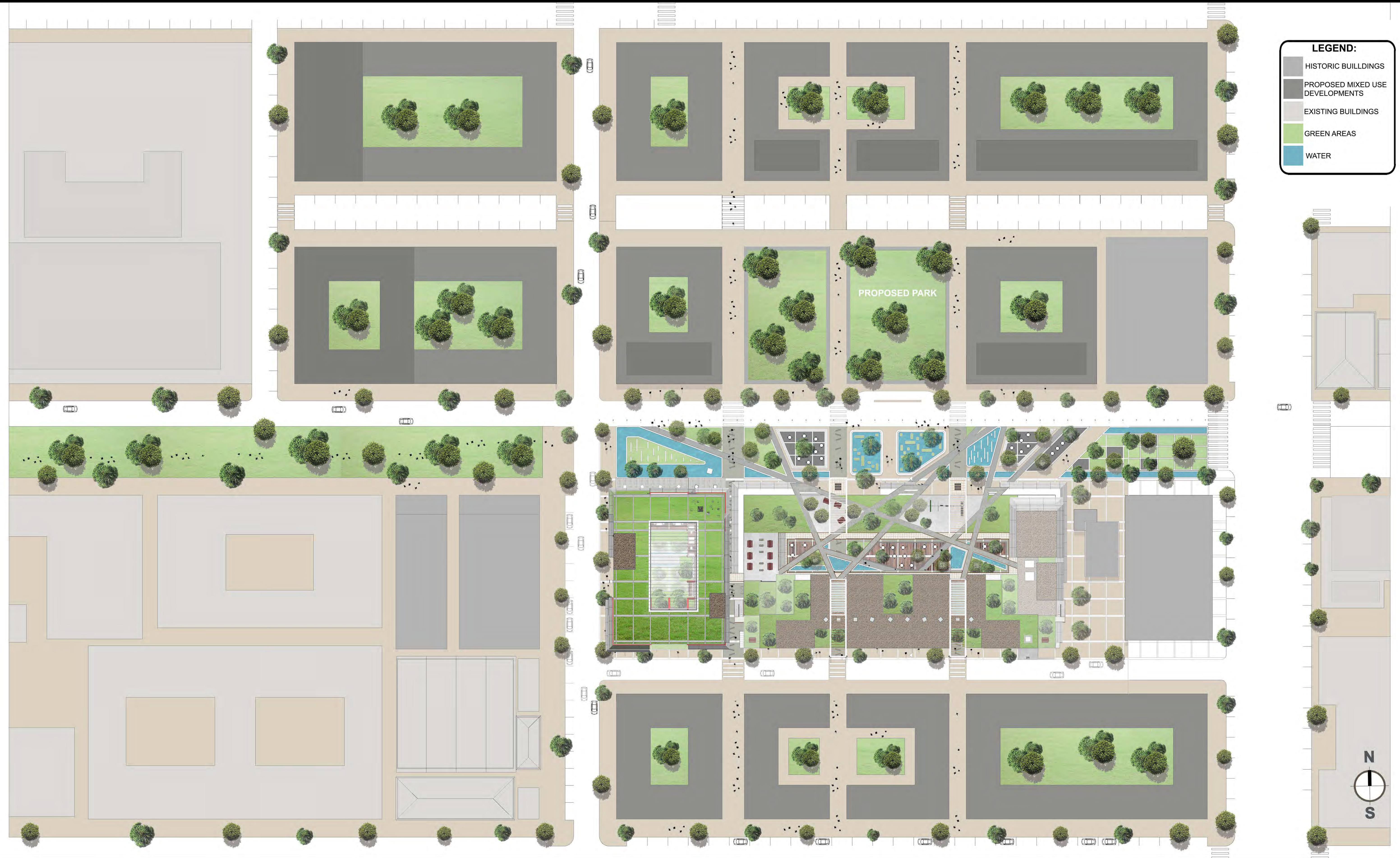
EAST SITE SECTION a-a



SOUTH EASTERN PERSPECTIVE



SOUTH SITE SECTION c-c



urban framework and multi use facility for durban 12

By david sharkey

Urban housing being FLEXIBLE through ADAPTION and TYPOLOGICAL VARIETY. The ADAPTION of the units would allow for INTERNAL FLEXIBILITY of SPATIAL relationships. TYPOLOGICAL variety of a wide range of unit typologies namely being one to four bedroom units, live / work units and studios allows users freedom of choice prior to occupation as well as to allow for change after occupation according to their wishes and demands. Some units to be flexible in terms of day and night time functions, with the use of FLEXIBLE FURNITURE. Taking DEMOGRAPHICAL CHANGE into account providing a unit that one can live in for one's life and make it their own.

The units labelled EXISTING are the units that have been used in the floor plans of the design. However with the use of dry wall partitions and fixed staircases as well as a fixed structural system and wet cores the units can adapt over time as illustrated in the following diagrams. There is a variety of combinations that these SINGLE units can adapt to, from one bedroom units to four bedroom units. This would suit the needs of a growing family. Floor finishes represent weather it is a one, two or three bedroom apartment.

THE UNITS LABELLED EXISTING ARE THE ONES USED IN THE DESIGN AND CAN ADAPT INTO ANYONE OF THE FOLLOWING UNITS AT ANY TIME.



SECOND FLOOR PLAN
ADAPTION



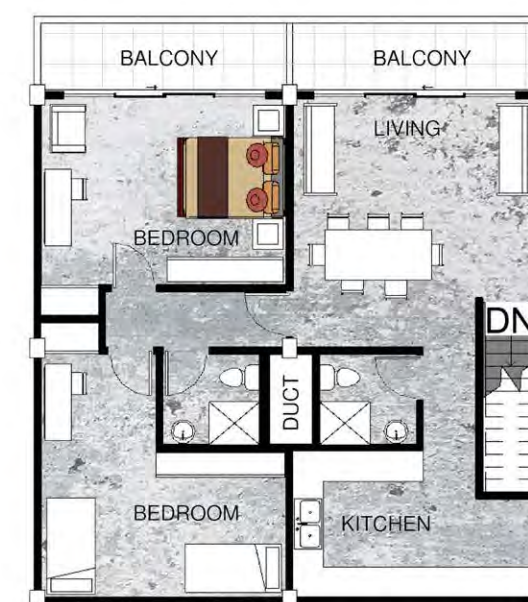
SECOND FLOOR PLAN
ADAPTION



THIRD FLOOR PLAN



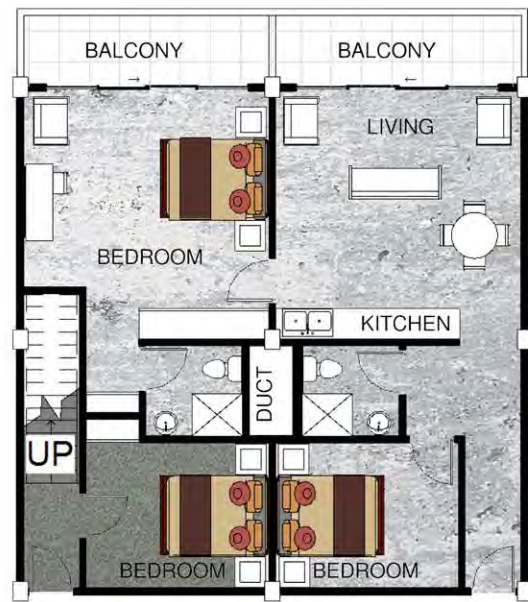
SECOND FLOOR PLAN
ADAPTION



SECOND FLOOR PLAN
ADAPTION



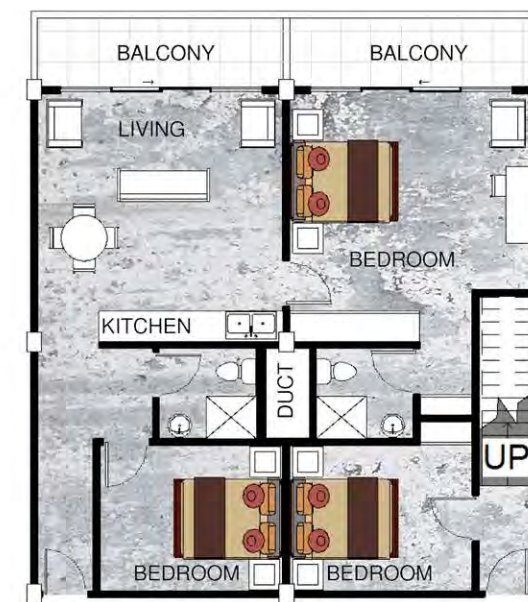
FIRST FLOOR PLAN
ADAPTION



FIRST FLOOR PLAN
ADAPTION



SECOND FLOOR PLAN
ADAPTION 1



FIRST FLOOR PLAN
ADAPTION



FIRST FLOOR PLAN
ADAPTION



SECOND FLOOR PLAN
EXISTING UNITS



SECOND FLOOR PLAN
EXISTING UNITS



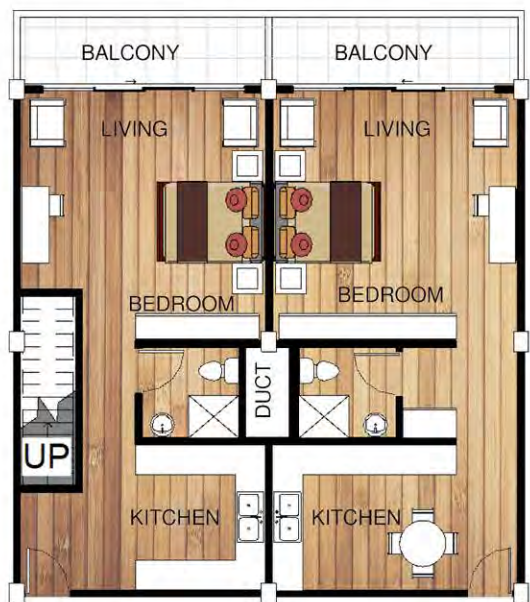
THIRD FLOOR PLAN



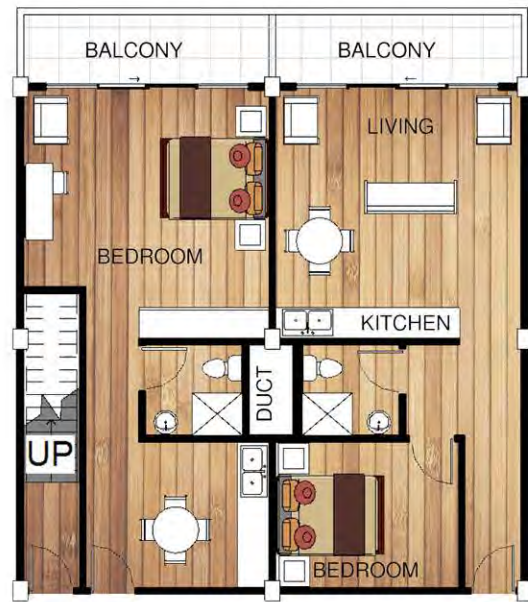
SECOND FLOOR PLAN
EXISTING UNITS



SECOND FLOOR PLAN
EXISTING UNITS



FIRST FLOOR PLAN
EXISTING UNITS



FIRST FLOOR PLAN
EXISTING UNITS



SECOND FLOOR PLAN
EXISTING



FIRST FLOOR PLAN
EXISTING UNITS



FIRST FLOOR PLAN
EXISTING UNITS

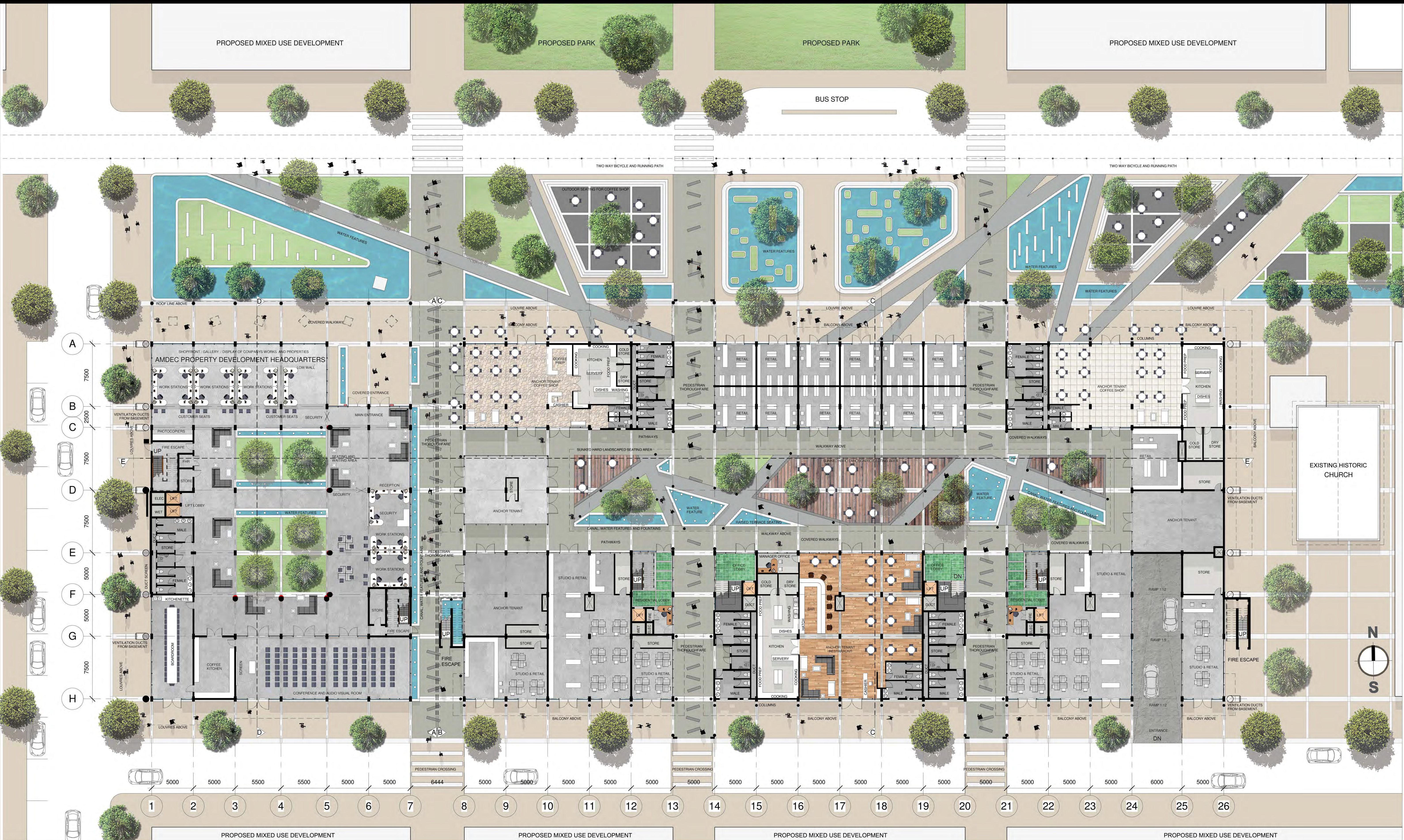
ADAPTION & FLEXIBILITY OF UNITS



scale 1:200

urban framework and multi use facility for durban 14

By david sharkey



GROUND FLOOR PLAN scale 1:200

By david sharkey

SCALE 1:200



By david sharkey



THIRD FLOOR PLAN

scale 1:200

By david sharkey



FOURTH FLOOR PLAN

scale 1:200

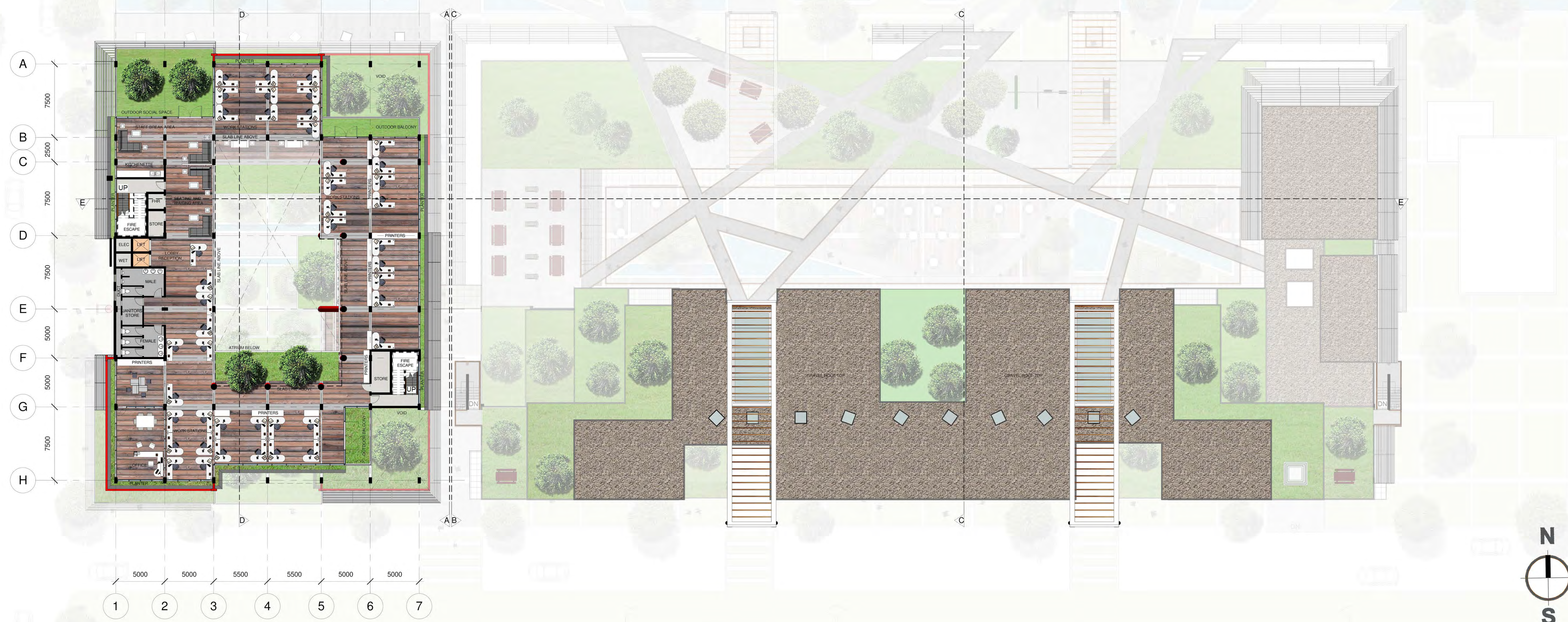
By david sharkey



FIFTH FLOOR PLAN

scale 1:200

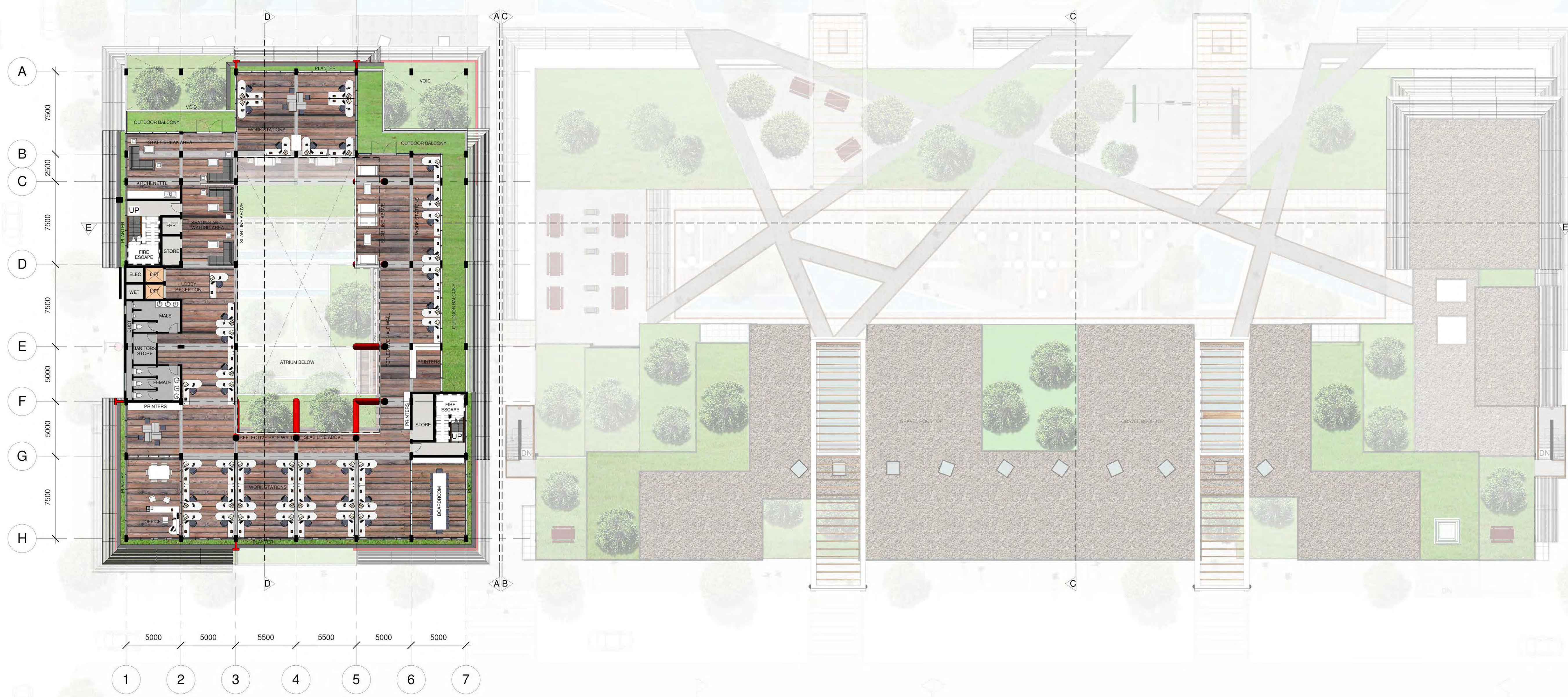
By david sharkey



SIXTH FLOOR PLAN

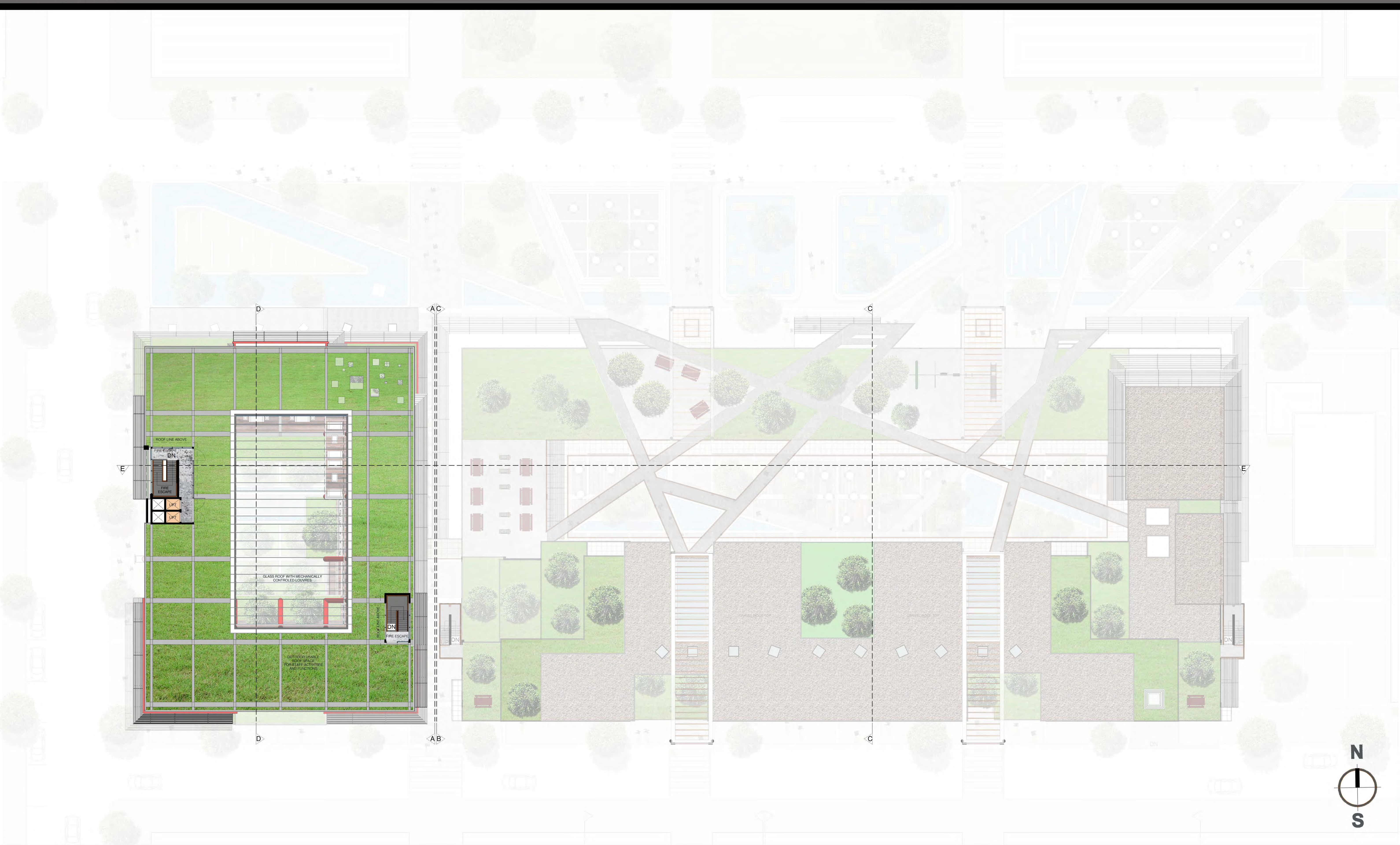
scale 1:200

By david sharkey



SEVENTH FLOOR PLAN

scale 1:200





WEST ELEVATION



EAST ELEVATION



NORTH ELEVATION

ELEVATIONS

scale 1:200

By david sharkey



SECTION A-A

SECTION B-B

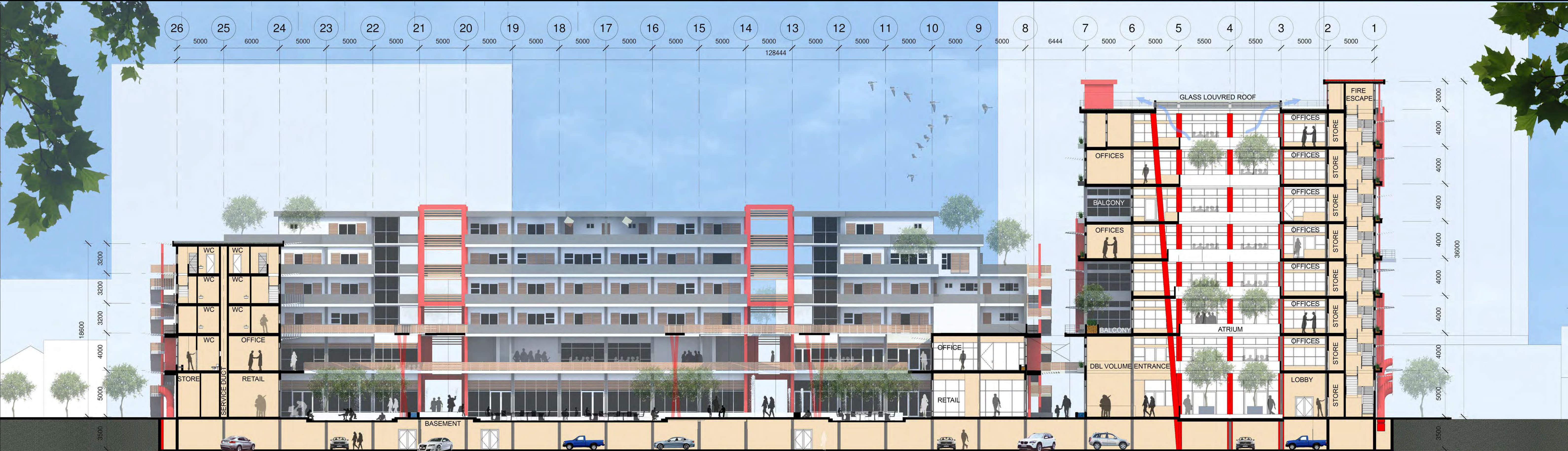


SOUTH ELEVATION



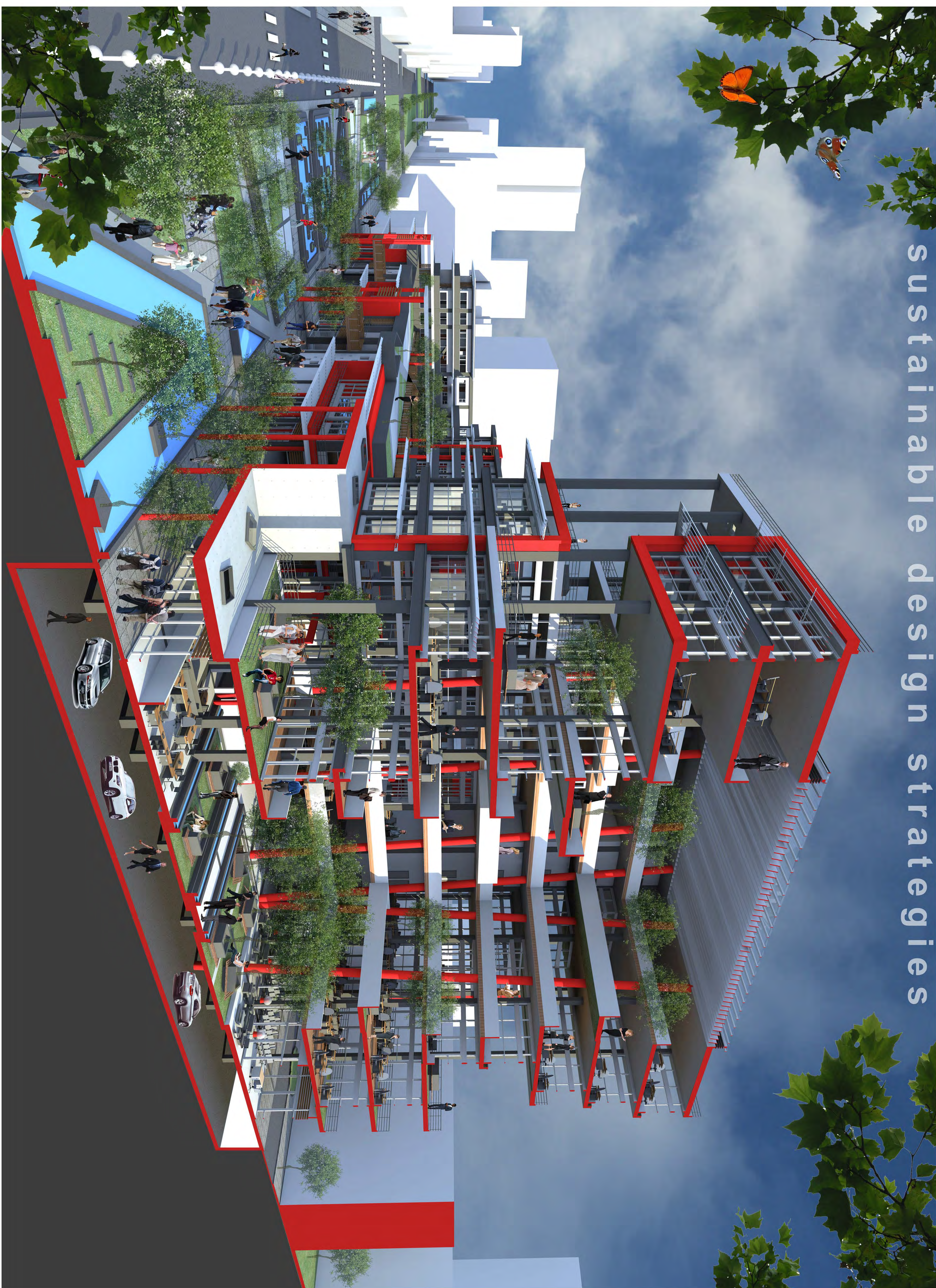
SECTION C-C

SECTION D-D

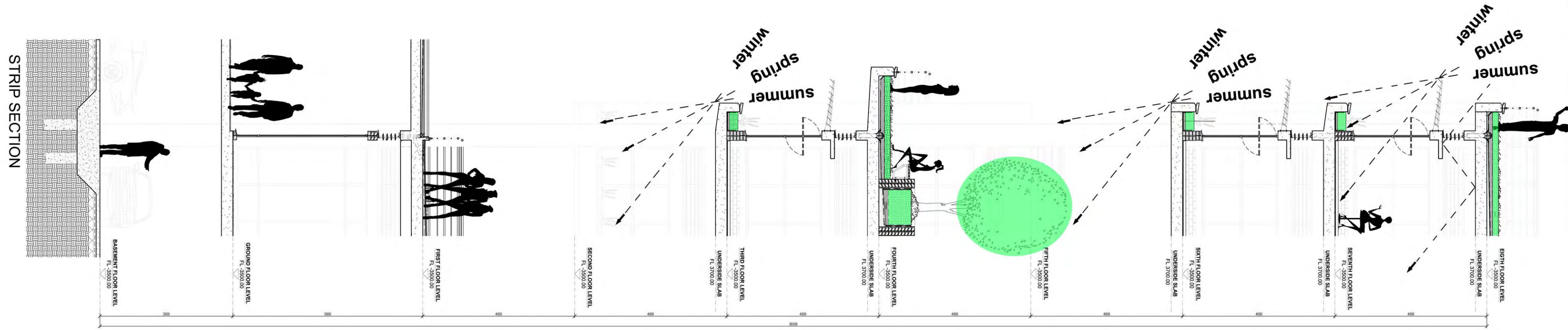


SECTION E-E

sustainable design strategies



SECTIONAL PERSPECTIVE OF ATRIUM



BIOPHILLIA = light / ventilation / trees / water

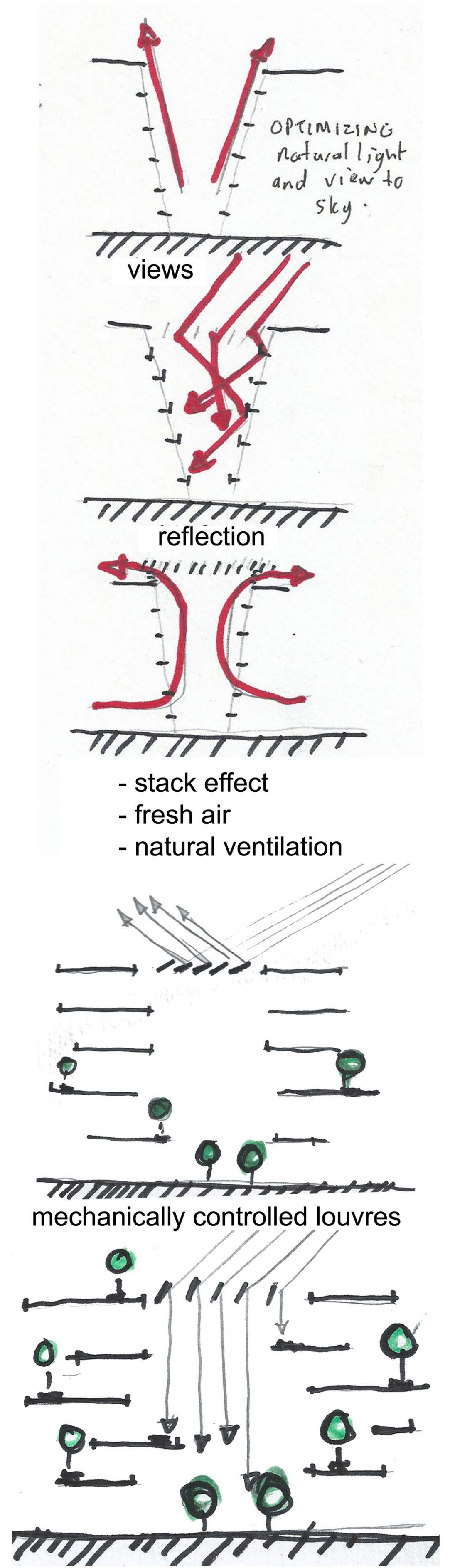


connecting people to nature

natural ventilation, natural lighting plants, water and spontaneous interaction with nature enhance well being.

- The Building design was created with an emphasis of acknowledging the urban design intentions of creating a walk able environment. The large site was split up into three creating link-ages through the site encouraging walkability to occur. The main consideration in the design process was to avoid the design of a large block that prohibited walkability, natural light and ventilation into spaces.

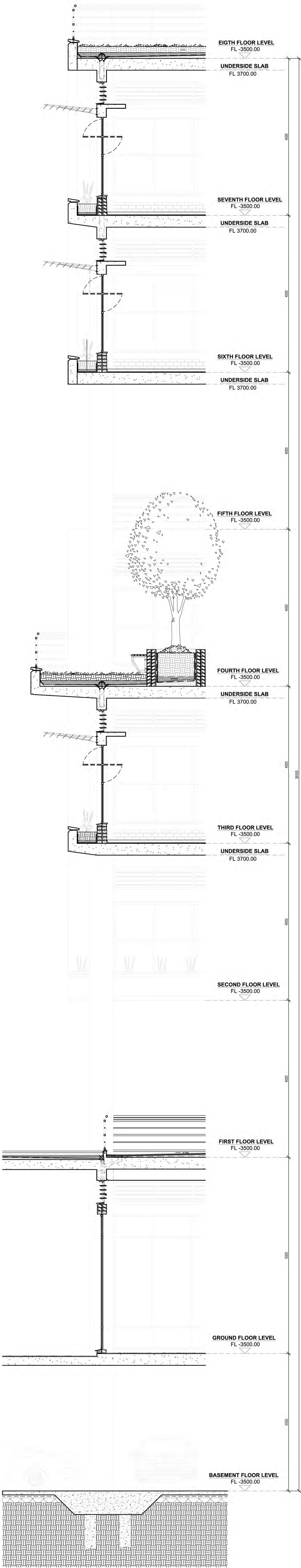
- The creation of an urban green movement spine linking the CBD to the beachfront encouraging recreation, social interaction and as much movement past the site as possible.



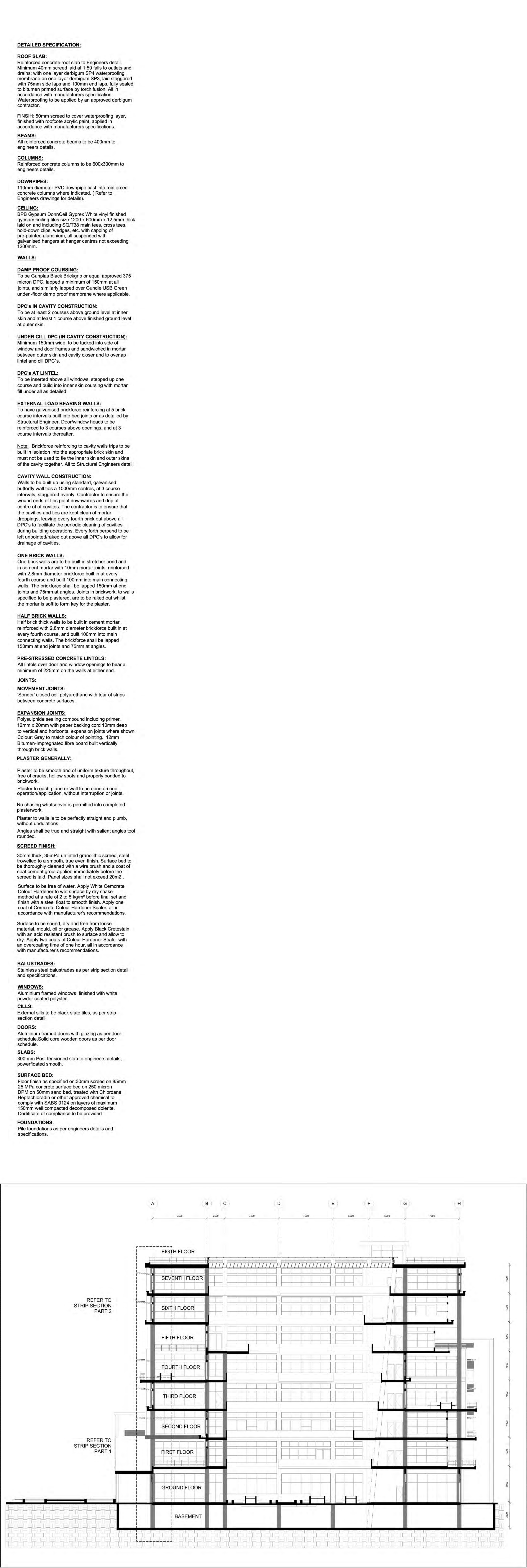
INTERIOR ATRIUM IMPRESSION

Interior and exterior roof gardens provide pockets where social interaction may occur. Further the use of natural & tactile materials, planting, water features, natural ventilation and lighting create the optimum working environment connecting people to nature and enhancing human well - being.





STRIP SECTION SCALE 1:35



SECTION D -D FROM DESIGN DRAWINGS

- NOTES :
- Balustrades, stairs, concrete slabs and wooden decks to Engineers specification
1. ROOF: Pitch as per Sections. Roof must be designed and built by Roof Specialists.Rainwater goods as per Roof Specialists specifications.
2. WALLS TO COMPLY WITH PART L OF N.B.R. ACT (NO. 103 OF 1977). Each course of blockwork and every third course of brickwork is to be reinforced with brickforce with solid joints in mortar below the window sill level, window head level and below wall External face of the inner skin of all Galvanised wire ties to be built in all 220mm/170mm walls at 160mm centres horizontally and every sixth course vertically for brick and third course for block. Two air bricks are to be provided on the external walls of rooms. Precast concrete lintels over all openings unless otherwise specified. Damp Proof Course and Anti Guards to be provided to comply with National Building Regulations Act (NO. 103 OF 1977).
3. FLOORS: TO COMPLY WITH PART J OF N.B.R. ACT (103 OF 1977). 100mm concrete surface bed with BRC mesh(Inf. 153) on 250 micron hyperplastic waterproofing laid in accordance with the manufacturer's specifications.
4. DRAINAGE: TO COMPLY WITH PART P OF N.B.R. ACT (NO. 103 OF 1977). All sanitary fittings to be trapped in accordance to Local Authority's Regulations. All bends and junctions to be fitted with Inspection Eyes. Adequate access panels to be fitted to all duct over Inspection Eyes.
5. STORMWATER: TO COMPLY WITH PART R OF N.B.R. ACT (NO. 103 OF 1977). Adequate stormwater drainage must be provided so as to not cause any damage to the property in question and adjoining properties
6. FOUNDATIONS: TO COMPLY WITH PART H OF N.B.R. ACT (NO. 103 OF 1977).
7. GLAZING: TO COMPLY WITH PART N OF N.B.R. ACT (NO. 103 OF 1977).
8. FIRE PROTECTION: TO COMPLY WITH PART T OF N.B.R. ACT (NO. 103 OF 1977).
- a. Check all dimensions & levels before commencing construction & report discrepancies to the Author of the plan.
- b. Contractor to use dimensions and not scale off the drawings.
- c. If on excavations, the site is found to contain poor soil conditions, a qualified Structural Engineer must be consulted to design foundations & structural work.
- d. All foundations to be taken down to hard virgin ground.
- e. All reinforced concrete slabs, staircases, beams, columns, cantilevers, retaining walls & foundations must be designed by a qualified Structural Engineer & must be built as per the Engineer's specifications.
- f. Builder must comply with National Building Regulations Act (No. 103 of 1977).

REVISIONS			
REV	DATE	SIGN	DESCRIPTION

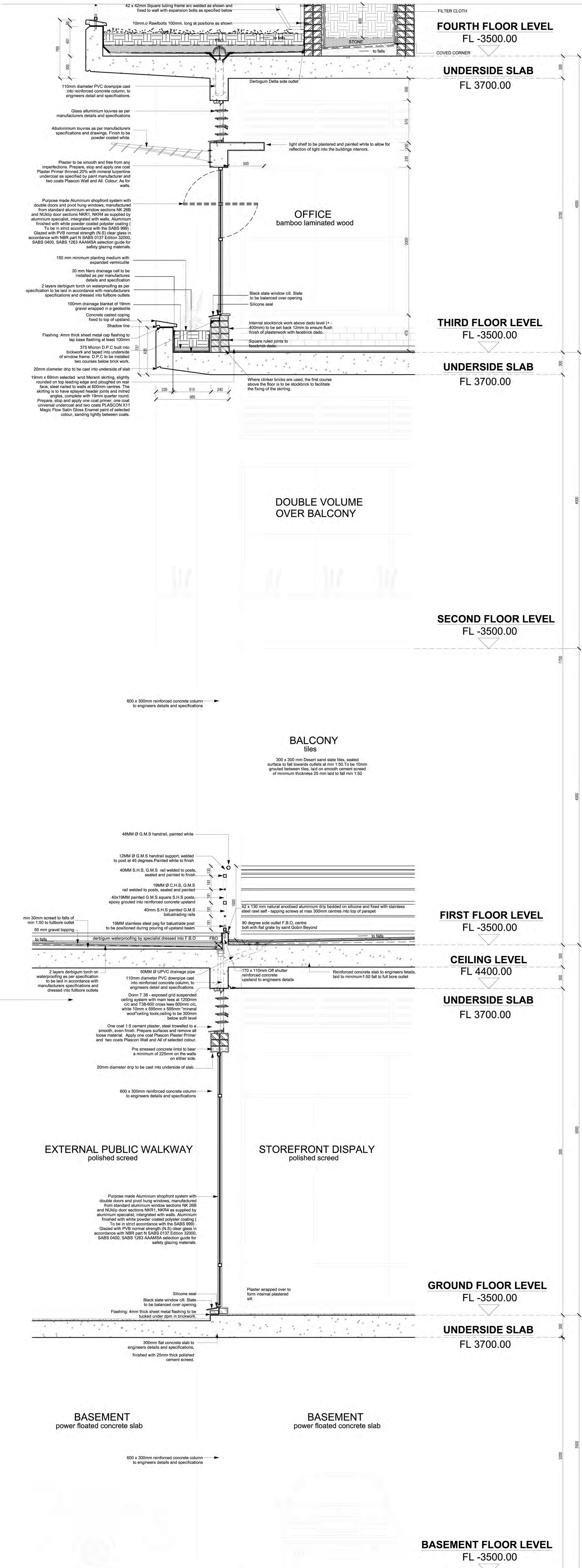
AMDEC PROPERTY DEVELOPERS AND DURBAN ETHEKWENI MUNICIPALITY

amdec PROPERTY DEVELOPMENT creating tomorrow's spaces

AREAS:		
BUILDINGS	EXISTING	NEW
	0 m2	42 320 m2
TOTAL	42 320 m2	
ERF AREA.	8000 m2	
COVERAGE		
F.A.R		
APPROVED BY CLIENT		
APPROVED BY		
APPROVED BY		
APPROVED BY		
DRAWING STATUS		
TENDER		
PROJECT TITLE		
A MULTI USE FACILTY FOR DURBAN, SOUTH AFRICA		
DRAWING DESCRIPTION		
STRIP SECTION TECHNICAL DETAILS		
SCALE		
1:20		
DATE		
11 November 2012		
CHECKED		
Juan Solis-Arias		
DRAWN		
David Sharkey		
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Sharkey architects

PROJECT NO :	DRAWING/SHEET NO :	REVISION NO :
001	01	00



REFER TO NEXT SHEET 02
FOR THE REMAINING
FLOORS

DETAILED SPECIFICATION:

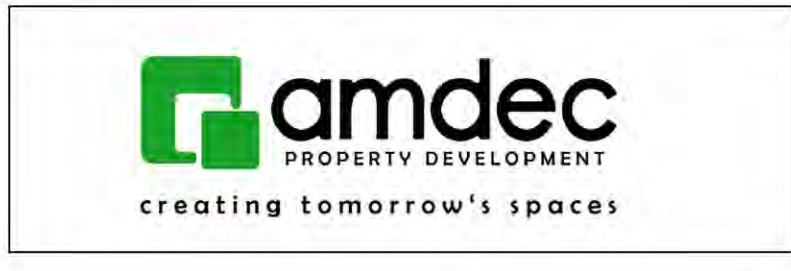
- ROOF SLAB:**
Reinforced concrete roof slab to Engineers detail.
Minimum 40mm screed laid at 1:50 falls to outlets and drains; with one layer derigum SP4 waterproofing membrane on one layer derigum SP3, laid staggered with 75mm side laps and 100mm end laps. Fully sealed to bitumen primed surface by torch fusion. All in accordance with manufacturers specification.
Waterproofing to be applied by an approved derigum contractor.
- FINISH:** 50mm screed to cover waterproofing layer, finished with roofcoat acrylic paint, applied in accordance with manufacturers specifications.
- BEAMS:**
All reinforced concrete beams to be 400mm to engineers details.
- COLUMNS:**
Reinforced concrete columns to be 600x300mm to engineers details.
- DOWNPIPES:**
110mm diameter PVC downpipe cast into reinforced concrete columns where indicated. (Refer to Engineers drawings for details).
- CEILING:**
BPS Gypsum DonnCell Gyproc White vinyl finished gypsum ceiling tiles size 1200 x 600mm x 12.5mm thick laid on and including SG/38 main tees, cross tees, hold-down clips, wedges, etc. with capping of pre-painted aluminium, all suspended with galvanised hangers at hanger centres not exceeding 1200mm.
- WALLS:**
DAMP PROOF COURSING:
To be Gunplas Black Brickgrip or equal approved 375 micron DPC, lapped a minimum of 150mm at all joints, and similarly lapped over Gunder USB Green under-floor damp proof membrane where applicable.
- DPC's IN CAVITY CONSTRUCTION:**
To be at least 2 courses above ground level at inner skin and at least 1 course above finished ground level at outer skin.
- UNDER CILL DPC (IN CAVITY CONSTRUCTION):**
Minimum 150mm wide, to be tucked into side of window and door frames and sandwiched in mortar between outer skin and cavity closer and to overlap lintel and cill DPC's.
- DPC's AT LINTEL:**
To be inserted above all windows, stepped up one course and built into inner skin coursing with mortar fill under all as detailed.
- EXTERNAL LOAD BEARING WALLS:**
To have galvanised brickforce reinforcing at 5 brick course intervals built into bed joints or as detailed by Structural Engineer. Door/window heads to be reinforced to 3 courses above openings, and at 3 course intervals thereafter.
- Note: Brickforce reinforcing to cavity walls trips to be built in isolation into the appropriate brick skin and must not be used to tie the inner skin and outer skins of the cavity together. All to Structural Engineers detail.
- CAVITY WALL CONSTRUCTION:**
Walls to be built up using standard, galvanised butterfly wall ties a 1000mm centres, at 3 course intervals, staggered evenly. Contractor to ensure the wound ends of ties point downwards and drip at centre of cavities. The contractor is to ensure that the cavities and ties are kept clean of mortar droppings, leaving every fourth brick out above all DPC's to facilitate the periodic cleaning of cavities during building operations. Every fourth perpend to be left unpainted/raked out above all DPC's to allow for drainage of cavities.
- ONE BRICK WALLS:**
One brick walls are to be built in stretcher bond and in cement mortar with 10mm mortar joints, reinforced with 2.8mm diameter brickforce built in at every fourth course and built 100mm into main connecting walls. The brickforce shall be lapped 150mm at end joints and 75mm at angles. Joints in brickwork, to walls specified to be plastered, are to be raked out whilst the mortar is soft to form key for the plaster.
- HALF BRICK WALLS:**
Half brick walls are to be built in cement mortar, reinforced with 2.8mm diameter brickforce built in at every fourth course, and built 100mm into main connecting walls. The brickforce shall be lapped 150mm at end joints and 75mm at angles.
- PRE-STRESSED CONCRETE LINTOLS:**
All lintols over door and window openings to bear a minimum of 225mm on the walls at either end.
- JOINTS:**
MOVEMENT JOINTS:
Sonder closed cell polyurethane with tear of strips between concrete surfaces.
- EXPANSION JOINTS:**
Polysulphide sealing compound including primer. 12mm x 20mm with paper backing cut 10mm deep to vertical and horizontal expansion joints where shown. Colour: Grey to match colour of pointing. 12mm Bitumen-impregnated fibre board built vertically through brick walls.
- PLASTER GENERALLY:**
Plaster to be smooth and of uniform texture throughout, free of cracks, hollow spots and properly bonded to brickwork.
Plaster to each plane or wall to be done on one operation/application, without interruption of joints.
No chasing whatsoever is permitted into completed plasterwork.
Plaster to walls is to be perfectly straight and plumb, without undulations.
Angles shall be true and straight with salient angles tool rounded.
- SCREED FINISH:**
30mm thick, 35mPa unlit granolithic screed, steel trowelled to a smooth, true even finish. Surface bed to be thoroughly cleaned with a wire brush and a coat of neat cement grout applied immediately before the screed is laid. Panel sizes shall not exceed 20m².
Surface to be free of water. Apply White Cement Colour Hardener to wet surface by dry shake method at a rate of 2 to 5 kg/m² before final set and finish with a steel float to smooth finish. Apply one coat of Cement Colour Hardener Sealer, all in accordance with manufacturer's recommendations.
- Surface to be sound, dry and free from loose material, mould, oil or grease. Apply Black Creststain with an acid resistant brush to surface and allow to dry. Apply two coats of Colour Hardener Sealer with an overcoating time of one hour, all in accordance with manufacturer's recommendations.
- BALUSTRADES:**
Stainless steel balustrades as per strip section detail and specifications.
- WINDOWS:**
Aluminium framed windows finished with white powder coated polyester.
- CILLS:**
External sills to be black slate tiles, as per strip section detail.
- DOORS:**
Aluminium framed doors with glazing as per door schedule. Solid core wooden doors as per door schedule.
- SLABS:**
300 mm Post tensioned slab to engineers details, powerfloated smooth.
- SURFACE BED:**
Floor finish as specified on 30mm screed on 85mm 25 MPa concrete surface bed on 250 micron DPM on 50mm sand bed, treated with Chlordane Heptachlorohydrin or other approved chemical to comply with SABS 0124 on layers of maximum 150mm well compacted decomposed dolomite. Certificate of compliance to be provided.
- FOUNDATIONS:**
Pile foundations as per engineers details and specifications.

- NOTES :
- Balustrades, stairs, concrete slabs and wooden decks to Engineers specification
1. ROOF: Pitch as per Sections. Roof must be designed and built by Roof Specialists. Rainwater goods as per Roof Specialists specifications.
2. WALLS TO COMPLY WITH PART L OF N.B.R. ACT (NO. 103 OF 1977). Each course of blockwork and every third course of brickwork is to be reinforced with brickforce with solid joints in mortar below the window cill level, window head level and below wall External face of the inner skin of all Galvanised wire ties to be built in at 220mm/170mm walls at 160mm centres horizontally and every sixth course vertically for brick and third course for block. Two air bricks are to be provided on the external walls of rooms. Precast concrete lintols over all openings unless otherwise specified. Damp Proof Course and Anti Guards to be provided to comply with National Building Regulations Act (NO. 103 OF 1977).
3. FLOORS: TO COMPLY WITH PART J OF N.B.R. ACT (103 OF 1977). 100mm concrete surface bed with BRC mesh/inf. 153) on 250 micron hyperplastic waterproofing laid in accordance with the manufacturer's specifications.
4. DRAINAGE: TO COMPLY WITH PART P OF N.B.R. ACT (NO. 103 OF 1977). All sanitary fittings to be trapped in accordance to Local Authority's Regulations. All bends and junctions to be fitted with Inspection Eyes. Adequate access panels to be fitted to all duct over Inspection Eyes.
5. STORMWATER: TO COMPLY WITH PART R OF N.B.R. ACT (NO. 103 OF 1977). Adequate stormwater drainage must be provided so as to not cause any damage to the property in question and adjoining properties.
6. FOUNDATIONS: TO COMPLY WITH PART H OF N.B.R. ACT (NO. 103 OF 1977).
7. GLAZING: TO COMPLY WITH PART N OF N.B.R. ACT (NO. 103 OF 1977).
8. FIRE PROTECTION: TO COMPLY WITH PART T OF N.B.R. ACT (NO. 103 OF 1977).
- a. Check all dimensions & levels before commencing construction & report discrepancies to the Author of the plan.
- b. Contractor to use dimensions and not scale off the drawings.
- c. If on excavations, the site is found to contain poor soil conditions, a qualified Structural Engineer must be consulted to design foundations & structural work.
- d. All foundations to be taken down to hard virgin ground.
- e. All reinforced concrete slabs, staircases, beams, columns, cantilevers, retaining walls & foundations must be designed by a qualified Structural Engineer & must be built as per the Engineer's specifications.
- f. Builder must comply with National Building Regulations Act (No. 103 of 1977).

GENERAL NOTE

REVISIONS			
REV	DATE	SIGN	DESCRIPTION

AMDEC PROPERTY DEVELOPERS AND DURBAN ETHEKWENI MUNICIPALITY



AREAS:	EXISTING	NEW
BUILDINGS	0 m ²	42 320 m ²
TOTAL	42 320 m ²	
ERF AREA	8000 m ²	
COVERAGE		
F.A.R		
APPROVED BY CLIENT		
APPROVED BY		
APPROVED BY		
APPROVED BY		

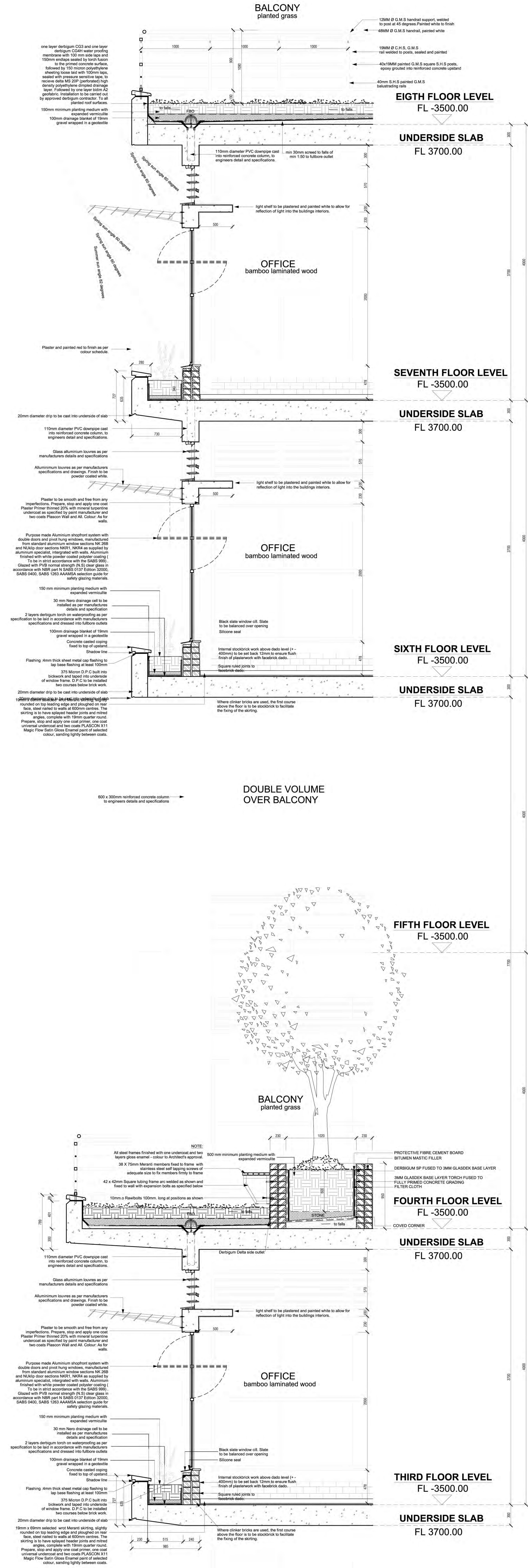
DRAWING STATUS
TENDER

PROJECT TITLE
A MULTI USE FACILITY FOR DURBAN, SOUTH AFRICA

DRAWING DESCRIPTION		
STRIP SECTION TECHNICAL DETAILS PART 1 OF 2		
SCALE	1:20	
DATE	11 November 2012	
CHECKED	Juan Solis-Arias	
DRAWN	David Sharkey	
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STRIP SECTION PART 1 OF 2 SCALE 1:20 reference : section d - d from design drawings



DETAILED SPECIFICATION:

ROOF SLAB:
Reinforced concrete roof slab to Engineers detail.
Minimum 40mm screed laid at 1:50 falls to outlets and drains, with one layer derbium GPM waterproofing membrane on one layer derbium SP3, laid staggered with 75mm side laps and 100mm end laps, fully sealed to bitumen primed surface by torch fusion. All in accordance with manufacturers specification.
Waterproofing to be applied by an approved derbium contractor.

FINISH: 50mm screed to cover waterproofing layer, finished with roofcoat acrylic paint, applied in accordance with manufacturers specifications.

BEAMS:
All reinforced concrete beams to be 400mm to engineers details.

COLUMNS:
Reinforced concrete columns to be 600x300mm to engineers details.

DOWNPIPES:
110mm diameter PVC downpipe cast into reinforced concrete columns where indicated. (Refer to Engineers drawings for details).

CEILING:
BPB Gypsum DonnCell Gyproc White vinyl finished gypsum ceiling tiles size 1200 x 600mm x 12.5mm thick laid on and including SQT38 main ties, cross ties, hold-down clips, wedges, etc. with capping of pre-painted aluminium, all suspended with galvanised hangers at hanger centres not exceeding 1200mm.

WALLS:

DAMP PROOF COURSE:
To be Gunplas Black Brickgrip or equal approved 375 micron DPC, lapped a minimum of 150mm at all joints, and similarly lapped over Gurdle USB Green under floor damp proof membrane where applicable.

DPC's IN CAVITY CONSTRUCTION:
To be at least 2 courses above ground level at inner skin and at least 1 course above finished ground level at outer skin.

UNDER CILL DPC (IN CAVITY CONSTRUCTION):
Minimum 150mm wide, to be tucked into side of window and door frames and sandwiched in mortar between outer skin and cavity closer and to overlap lintel and cill DPC's.

DPC's AT LINTEL:
To be inserted above all windows, stepped up one course and built into inner skin coursing with mortar fill under all as detailed.

EXTERNAL LOAD BEARING WALLS:
To have galvanised brickforce reinforcing at 5 brick course intervals built into bed joints or as detailed by Structural Engineer. Door/window heads to be reinforced to 3 courses above openings, and at 3 course intervals thereafter.

Note: Brickforce reinforcing to cavity walls trips to be built in isolation into the appropriate brick skin and must not be used to be the inner skin and outer skins of the cavity together. All to Structural Engineers detail.

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Half brick thick walls to be built in cement mortar, reinforced with 2.8mm diameter brickforce built in at every fourth course, and built 100mm into main connecting walls. The brickforce shall be lapped 150mm at end joints and 75mm at angles.

PRE-STRESSED CONCRETE LINTOLS:
All lintols over door and window openings to bear a minimum of 225mm on the walls at either end.

JOINTS:

MOVEMENT JOINTS:
"Sonder" closed cell polyurethane with tear of strips between concrete surfaces.

EXPANSION JOINTS:
Polysulphide sealing compound including primer.
12mm x 20mm with paper backing cord 10mm deep to vertical and horizontal expansion joints where shown.
Colour: Grey to match colour of pointing. 12mm Bitumen-impregnated fibre board built vertically through brick walls.

PLASTER GENERALLY:
Plaster to be smooth and of uniform texture throughout, free of cracks, hollow spots and properly bonded to brickwork.
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Surface to be free of water. Apply White Concrete Colour Hardener to wet surface by dry shake method at a rate of 2 to 5 kg/m² before final set and finish with a steel float to smooth finish. Apply one coat of Concrete Colour Hardener Sealer, all in accordance with manufacturer's recommendations.
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BALUSTRADES:
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SLABS:
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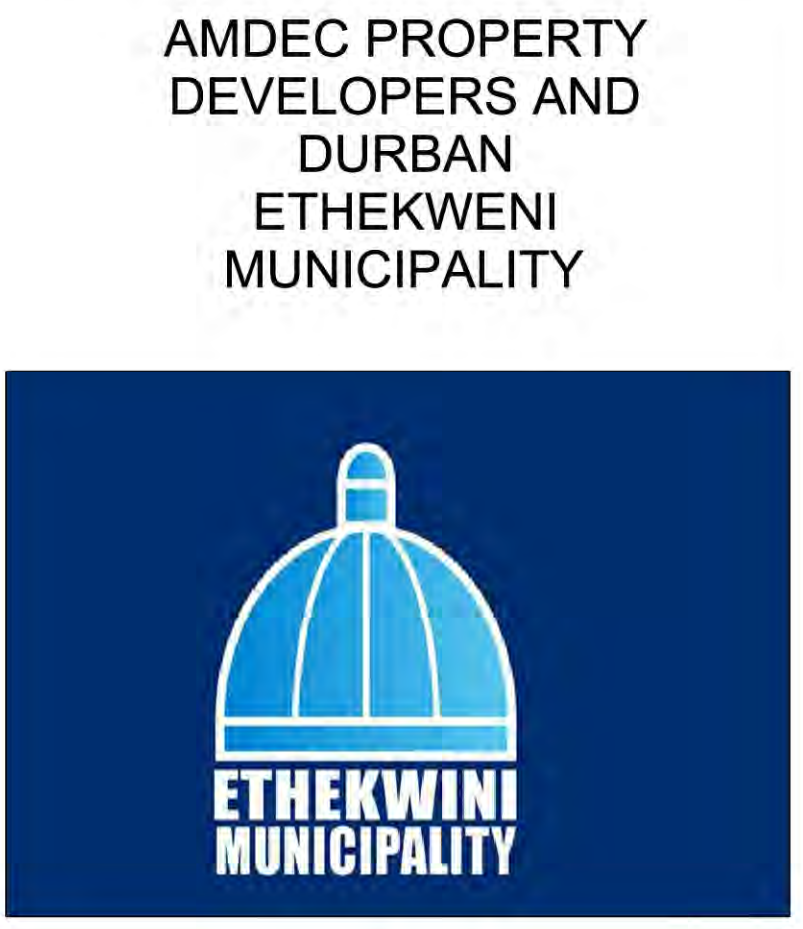
SURFACE BED:
Floor finish as specified on 30mm screed on 85mm 25 MPa concrete surface bed on 250 micron DPM on 50mm sand bed, treated with Chordane Heptachloradin or other approved chemical to comply with SABS D124 on layers of maximum 150mm well compacted decomposed dolerite. Certificate of compliance to be provided.

FOUNDATIONS:
Pile foundations as per engineers details and specifications.

- NOTES :**
- Balustrades, stairs, concrete slabs and wooden decks to Engineers specification
1. ROOF: Pitch as per Sections. Roof must be designed and built by Roof Specialists. Rainwater goods as per Roof Specialists specifications.
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GENERAL NOTE

REVISIONS			
REV	DATE	SIGN	DESCRIPTION



AREAS:	EXISTING	NEW
BUILDINGS	0 m ²	42 320 m ²
TOTAL ERF AREA	42 320 m ²	
COVERAGE F.A.R	8000 m ²	

APPROVED BY CLIENT
APPROVED BY
APPROVED BY
APPROVED BY

DRAWING STATUS TENDER
PROJECT TITLE A MULTI USE FACILITY FOR DURBAN, SOUTH AFRICA

DRAWING DESCRIPTION STRIP SECTION TECHNICAL DETAILS PART 2 OF 2
SCALE 1:20
DATE 11 November 2012
CHECKED Juan Solis-Arias
DRAWN David Sharkey
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