

**ARCHITECTURAL PSYCHOLOGY AND ITS IMPACT
ON CHILD DEVELOPMENT:**

A Proposed Educational Facility for Physically Disabled Children

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Master in Architecture
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DECLARATION

I declare that this dissertation is my own, unaided work and carried out exclusively by me under the supervision of Mr M.N. Mthethwa. It is being submitted for the degree of Master in Architecture at the University of KwaZulu – Natal. It has not been submitted before for any degree or examination in any other University.

.....

Mithasha Mistrey

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

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DEDICATION

This dissertation is dedicated to two very special people:

To my mother, for always encouraging me to pursue my dreams and never give up and most importantly, to always believe in myself. I know that you are always watching over me and you are forever in my heart.

To my nephew, sweet little Shahil.

ABSTRACT

The modern world is rapidly advancing towards a technological age where every aspect of people's lives revolves around scientific innovations and consumerism. These advancements have allowed architects to traverse many boundaries and the design of buildings almost seems limitless. However, this has also caused a shift in architecture to focus on the visual aspects of buildings. Most human beings are born with the use of all of their senses and it is through this that we use, understand and appreciate the built environment. However, if a building fails to entice one's sense of touch or even smell, then architecture has lost its true meaning; that of designing for people and not solely for consumerism. More often than not, children are also avid users of buildings and architecture, which has lost its essence of appealing to all of our senses, also loses its fascination to children as well.

Early childhood is the stage in life where people use their senses to the fullest capacity and it is through the perception of our surroundings that we learn, form meanings and identities. This dissertation thus aims to understand how the built environment psychologically affects children and how also, children perceive their surroundings. With that in mind, the purpose of this dissertation is twofold. Firstly, it sets out to investigate aspects of architectural psychology/perception and its relation to children and secondly, it will seek to understand how physical disabilities such as blindness and mobility impairments impact upon the design of buildings. This will set the brief for the design of an Educational Facility for Physically Disabled children, where all of these characteristics will be considered.

Through this study, specific characteristics of architectural psychology will be investigated. These include the following: understanding the human senses, sensory emotions and experiences, the effects of colour and light, legibility, wayfinding, place identity related to personal identity and thus critical regionalism and phenomenology. Lastly, the importance of creating sustainable environments and the importance of nature to children will also be looked into, as well as creating safety for children in any type of environment. This research will study the multi – faceted aspects that comprise architecture for the disabled. Therefore, the research will encompass both primary and secondary sources, including relevant precedent and case studies. This research will ultimately provide a design brief, which will inform the eventual outcome for the design of an Educational Facility for Physically Disabled Children.

TABLE OF CONTENTS

DECLARATION	iii
ACKNOWLEDGEMENTS	iv
DEDICATION	v
ABSTRACT	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	xiii
LIST OF FIGURES	xiv
LIST OF PLATES	xvi
GLOSSARY OF TERMS	xix

BACKGROUND RESEARCH ON ISSUES

CHAPTER 1	INTRODUCTION	1
	1.1 INTRODUCTION	1
	1.1.1 Background	1
	1.1.2 Motivation/Justification of the study	2
	1.2 DEFINITION OF THE PROBLEM, AIMS AND OBJECTIVES	2
	1.2.1 Definition of the Problem	2
	1.2.2 Aims	3
	1.2.3 Objectives	4
	1.3 SETTING OUT THE SCOPE	4
	1.3.1 Delimitation of Research Problem	4
	1.3.2 Definition of Terms	5
	1.3.3 Stating the Assumptions	6
	1.3.4 Key Questions	6
	1.3.5 Hypothesis	7
	1.4 THEORETICAL AND CONCEPTUAL FRAMEWORK	7
	1.4.1 Post – Structuralism and Architecture	7
	1.4.2 Architectural Psychology	9
	1.4.3 Critical Regionalism	10
	1.4.4 Phenomenology of Architecture	11

	1.4.5 Theories of Defensible Space	13
	1.5 RESEARCH METHODS AND MATERIALS	13
	1.6 CONCLUSION	15
CHAPTER 2	UNDERSTANDING THE NATURE OF DISABILITIES AND THEIR IMPACT ON ARCHITECTURE	17
	2.1 Introduction	17
	2.2 The Different Types of Physical Disabilities	18
	2.3 The Impact of Disabilities on the Architectural Environment	21
	2.4 Conclusion	22
CHAPTER 3	PSYCHOLOGY AND PERCEPTION OF THE BUILT ENVIRONMENT	24
	3.1 Introduction	24
	3.2 Understanding the Human Senses	26
	3.3 Architecture and Child Development	46
	3.4 Legibility, Orientation and Wayfinding for Children	59
	3.5 An Analysis of the Hazelwood School in Glasgow	68
	3.6 Light, Colour and Spatial Mood Qualities in Buildings	71
	3.7 Anthropometry: Scale, Proportion and Shape	81
	3.8 Patterns and Textures in Architectural Detail	88
	3.9 Conclusion	92
CHAPTER 4	THE INFLUENCE OF CRITICAL REGIONALISM ON CHILDREN’S FORMATION OF PLACE IDENTITY	93
	4.1 Introduction	93
	4.2 The Embodiment of Place in Built Environments	93
	4.3 An Analysis of the Tjibaou Cultural Centre	101
	4.4 The Spirit of Place: Phenomenology and Genius Loci	102
	4.5 Conclusion	111
CHAPTER 5	THE ROLE OF NATURE IN CHILD DEVELOPMENT AND ARCHITECTURAL PSYCHOLOGY	113
	5.1 Introduction	113
	5.2 Imagination and Play – The Wonder of Nature	113
	5.3 Designing Stimulating Schoolyards and Playgrounds	119
	5.4 An Analysis of the Boston Children’s Museum	123
	5.5 Creating Healing Environments for Disabled Children	126
	5.6 Conclusion	131

CHAPTER 6	CREATING SAFETY FOR CHILDREN IN THE BUILT ENVIRONMENT	133
	6.1 Introduction	133
	6.2 Oscar Newman: Defensible Space Principles	134
	6.3 Conclusion	138
CHAPTER 7	CASE STUDIES	139
	7.1 MACRO CONTEXT BACKGROUND – DURBAN	139
	7.2 AN ANALYSIS OF THE SEVEN FOUNTAINS SCHOOL IN TERMS OF SENSORY AND PHENOMENOLOGICAL DESIGN	141
	7.2.1 Introduction	141
	7.2.2 Justification of Case Study	141
	7.2.3 Location	141
	7.2.4 Historical and Social Context	142
	7.2.5 Empirical Data	142
	7.2.6 Conclusion	156
	7.4 AN ANALYSIS OF THE BROWNS SCHOOL IN TERMS OF BARRIER – FREE DESIGN	157
	7.3.1 Introduction	157
	7.3.2 Justification of Case Study	157
	7.3.3 Location	157
	7.3.4 Historical and Social Context	158
	7.3.5 Empirical Data	159
	7.3.6 Conclusion	175
	7.3 AN ANALYSIS OF THE OPEN AIR SCHOOL IN TERMS OF BARRIER – FREE DESIGN	176
	7.3.1 Introduction	176
	7.3.2 Justification of Case Study	176
	7.3.3 Location	176
	7.3.4 Historical and Social Context	177
	7.3.5 Empirical Data	177
	7.3.6 Conclusion	192
CHAPTER 8	ANALYSIS AND DISCUSSION	193
CHAPTER 9	CONCLUSION AND RECOMMENDATIONS	197
REFERENCES		199

APPENDICES	APPENDIX 1 – FOCUSED INTERVIEWS	212
	APPENDIX 2 – OBSERVED BEHAVIOUR SHEETS	215
	APPENDIX 3 – SEVEN FOUNTAINS BUILDING STUDY	219
	APPENDIX 4 – PLAYGROUND FOR THE DISABLED	220
	APPENDIX 5 – ANTHROPOMETRIC DATA – CHILDREN	222
	APPENDIX 6 – ANTHROPOMETRIC DATA – DISABLED	224

PART TWO

DESIGN REPORT

CHAPTER 1	INTRODUCTION	228
	1.1 INTRODUCTION	228
	1.2 PROJECT DESCRIPTION	229
	1.3 THE NOTIONAL CLIENT	233
	1.3.1 The Client's Organisation	233
	1.3.2 Funding and Revenue Generators	234
	1.3.3 The Client's Requirements	234
	1.3.4 Detailed Client Brief	235
	1.3.5 Schedule of Accommodation	236
	1.4 CONCLUSION	245
CHAPTER 2	SITE SELECTION, SURVEY AND ANALYSIS	246
	2.1 INTRODUCTION	246
	2.2 SITE OPTIONS AND DISCUSSIONS	246
	2.2.1 Site Selection Criteria	246
	2.2.2 Potential Sites	248
	2.2.3 Conclusion and Recommendations	256
	2.3 HISTORICAL BACKGROUND OF SELECTED SITE	256
	2.3.1 Location	256
	2.3.2 History	256
	2.4 DESCRIPTION OF EXISTING SITE CONDITIONS	256
	2.5 SITE ANALYSIS	258
	2.6 CONCLUSION	260
CHAPTER 3	DESIGN DEVELOPMENT AND RESOLUTION	260
	3.1 CONCEPTUAL AND THEORETICAL ISSUES	260
	3.1.1 Introduction	260
	3.1.2 Concept Developments	261
	3.2 FINAL DESIGN PROPOSAL	262
	3.2.1 Urban Design Conceptual Developments	262
	3.2.2 Design Development and Resolution	263
	3.2.2.1 Planning	263
	3.2.2.2 Building Form	264

3.2.2.3 Wayfinding	265
3.2.2.4 Playgrounds	266
ARCHITECTURAL DESIGN DRAWINGS	267
REFERENCES AND BIBLIOGRAPHY	268
APPENDICES	269
APPENDIX 1 – BUILDING BULLETINS	269

LIST OF TABLES

PART ONE

CHAPTER THREE

Table 3.1	Colours and emotions	75
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CHAPTER SEVEN

Table 7.1	Seven Fountains: materials palette	147
Table 7.2	Seven Fountains: colour palette	148
Table 7.3	Seven Fountains: sensory features	149

LIST OF FIGURES

PART ONE

CHAPTER THREE

Figure 3.1	The six sensory systems	26
Figure 3.2	Pale colours composition	42
Figure 3.3	Day's sketch of a hideaway	45
Figure 3.4	Metamorphic variation in buildings	51
Figure 3.5	Ordered and random paths	65
Figure 3.6	Articulated paths	65
Figure 3.7	Baroque/Rococo Entranceway	66
Figure 3.8	Hazelwood school: site plan	68
Figure 3.9	Patterns	89

CHAPTER FOUR

Figure 4.1	Plan of Seabird Island School	98
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CHAPTER FIVE

Figure 5.1	Circular Playground	119
Figure 5.2	Boston Children's Museum: plan	124

CHAPTER SIX

Figure 6.1	Medieval fortress cities	133
Figure 6.2	Concentric circles of defensible space	134
Figure 6.3	Hierarchy of defensible space	136

CHAPTER SEVEN

Figure 7.1	Map of Durban	139
Figure 7.2	Seven Fountains: site plan	143
Figure 7.3	Seven Fountains: ground floor plan	143
Figure 7.4	Seven Fountains: upper floor plan	144
Figure 7.5	Seven Fountains: gutter detail	151

Figure 7.6	Seven Fountains: sketch of stairs	154
Figure 7.7	Seven Fountains: sketch facade	154
Figure 7.8	Browns School: urban location	158
Figure 7.9	Browns School: axonometric view	160
Figure 7.10	Browns School: main plan	162
Figure 7.11	Browns School: wayfinding analysis	163
Figure 7.12	Browns School: sizes of spaces	166
Figure 7.13	Browns School: sizes of spaces	167
Figure 7.14	Browns School: sizes of spaces	168
Figure 7.15	Browns School: sizes of spaces	169
Figure 7.16	Browns School: three dimensional form	172
Figure 7.17	Browns School: site sketches and observations	174
Figure 7.18	The Open Air School: urban location	176
Figure 7.19	The Open Air School: relationship to other schools	178
Figure 7.20	The Open Air School: urban plan	179
Figure 7.21	The Open Air School: detailed plan	180
Figure 7.22	The Open Air School: wayfinding analysis	181
Figure 7.23	The Open Air School: sizes of spaces	184
Figure 7.24	The Open Air School: sizes of spaces	185
Figure 7.25	The Open Air School: sizes of spaces	186
Figure 7.26	The Open Air School: site sketch of storytelling tree	191
Figure 7.27	The Open Air School: social design	191
Figure 7.28	The Open Air School: diagrammatic layout of spaces	192

LIST OF PLATES

PART ONE

CHAPTER THREE

Plate 3.1	Textured play spaces	28
Plate 3.2	Mud Palace in Benin, Nigeria	30
Plate 3.3	Times Square, New York City	31
Plate 3.4	Textured mosaic pattern on building	33
Plate 3.5	Child smelling a flower	34
Plate 3.6	Playground of a nature school	35
Plate 3.7	Children speaking down a gutter	37
Plate 3.8	Wall at the Little School	39
Plate 3.9	Children on a balancing beam	47
Plate 3.10	The Or – Akiva Kindergarten	49
Plate 3.11	Steel building	50
Plate 3.12	Nido Stella Nursery School 1	52
Plate 3.13	Nido Stella Nursery School 2	53
Plate 3.14	Symbolic entrance	54
Plate 3.15	Child – friendly elements in building	57
Plate 3.16	Diana School (Reggio Emilia)	58
Plate 3.17	Paris: axonometric view	59
Plate 3.18	Building landmark: defined entrance	62
Plate 3.19	Hazelwood school: wayfinding wall	69
Plate 3.20	Hazelwood school: lighting	70
Plate 3.21	Hazelwood school: alternating facades	70
Plate 3.22	Light and dark spaces	71
Plate 3.23	Coloured light box windows	72
Plate 3.24	Glossy materials and fluorescent lighting	72
Plate 3.25	Natural lighting	73
Plate 3.26	Dappled lighting in church	74
Plate 3.27	Red and yellow: children’s museum	76
Plate 3.28	Luis Barragan: colour	77

Plate 3.29	Steiner Nursery building	78
Plate 3.30	Bright, primary colours	78
Plate 3.31	Aldo Van Eyck: colour	79
Plate 3.32	Leonardo Da Vinci's Vitruvian man	82
Plate 3.33	Scale for children 1	83
Plate 3.34	Scale for children 2	83
Plate 3.35	Scale and context	84
Plate 3.36	Large spaces and scale	85
Plate 3.37	Lines, edges, form and scale	85
Plate 3.38	Child – scaled tables and chairs	86
Plate 3.39	Angled walls appear aggressive	87
Plate 3.40	Plants and scale	88
Plate 3.41	Patterns in spaces	89
Plate 3.42	Patterns on the ground	90
Plate 3.43	Different textures	91

CHAPTER FOUR

Plate 4.1	Memory inspired courtyards	94
Plate 4.2	Tadao Ando: Children's Museum	96
Plate 4.3	Tectonics of building	97
Plate 4.4	Seabird Island School: Elevation	98
Plate 4.5	Kindergarten in Vaduz: sloping roof form	100
Plate 4.6	Sensory appeal through design	105
Plate 4.7	Sassi Di Matera	107
Plate 4.8	Fawood Children's Centre: colour on elevation	109
Plate 4.9	Fawood Children's Centre: internal play spaces	110

CHAPTER FIVE

Plate 5.1	Children and nature	114
Plate 5.2	The Koh Kood Children's Centre	116
Plate 5.3	Children gardening	117
Plate 5.4	Garden of the Senses, Durban	118

Plate 5.5	Disabled child: adventure playground	120
Plate 5.6	Playground: central space	121
Plate 5.7	Music garden	123
Plate 5.8	Boston Children’s Museum: general view	125
Plate 5.9	Boston Children’s Museum: path and boulders	125
Plate 5.10	Willow tunnel	127
Plate 5.11	Healing garden	130
Plate 5.12	Healing garden: tactile elements	131

CHAPTER SEVEN

Plate 7.1	Seven Fountains: view of mountains	152
Plate 7.2	Seven Fountains: child – scaled water fountain	155
Plate 7.3	Seven Fountains: playground	155
Plate 7.4	Seven Fountains: column and roof details	155
Plate 7.5	Seven Fountains: classroom as a focal point	155
Plate 7.6	Seven Fountains: classrooms	155
Plate 7.7	Browns School: defensible planting	159
Plate 7.8	Browns School: special swing	161
Plate 7.9	Browns School: airbricks (textures)	170
Plate 7.10	Browns School: textures	171
Plate 7.11	Browns School: sensory elements (courtyard)	171
Plate 7.12	The Open Air School: entrance facade	177
Plate 7.13	The Open Air School: undulating ramp	187
Plate 7.14	The Open Air School: texture variations	188
Plate 7.15	The Open Air School: main facade	189
Plate 7.16	The Open Air School: architectural expression	189

GLOSSARY OF TERMS

<i>Disabled</i>	Physically impaired.
<i>Handicapped</i>	People who experience barriers due to their physical environment are referred to as being handicapped.
<i>Kinaesthesia</i>	Perception of muscular movement or effort (muscular sense).
<i>Synaesthesia</i>	Sensation produced in one modality when a stimulus is applied to another modality, such as when hearing a certain sound induces the visualisation of a certain colour.
<i>Hapticity</i>	The ability to experience the environment through active exploration.
<i>Cognitive</i>	The mental processes of perception, memory, judgement and reasoning.
<i>Gestalt</i>	Configuration, pattern or organized field having specific properties that cannot be derived from the summation of its component parts or unified whole.
<i>Individuation</i>	Is the process through which a person becomes his or her true self, whereby the innate elements of personality, the different experiences of a person's life and the different aspects and components of the immature psyche become integrated over time into a well – functioning whole.
<i>Legibility</i>	The quality of architectural design that affects the perception and readability of its individual parts as well as the unified whole.
<i>Orientation</i>	The ability to locate oneself physically and socially in an environment.
<i>Wayfinding</i>	The process of using spatial and environmental clues to navigate through an environment.
<i>Tectonics</i>	The construction detailing and materials used in a building.

MEDICAL GLOSSARY

<i>Blindness</i>	The loss or obstruction of sight.
<i>Cystic Fibrosis</i>	Common recessive genetic disease which affects the entire body, causing progressive disability and early death.
<i>Diabetes</i>	Is a group of metabolic diseases in which a person has high blood sugar, either because the body does not produce enough

insulin or because the cells do not respond to the insulin that is produced.

Deafness

Wholly or partly without hearing.

Multi – sensory impairment

The impairment of more than one sense – such as when a person is both blind and deaf.

Autism

Autism is a disorder of neural development characterized by impaired social interaction and communication and by restricted and repetitive behaviour. These signs all begin before a child is three years old.

Cerebral palsy

Motor conditions that cause physical disability in human development, chiefly in various areas of body movement. Treatment includes speech therapy, physical therapy, occupational therapy and the use of orthotic devices and communication aids.

Spina bifida

(split spine) is a developmental congenital disorder which is caused when some of the vertebrae enclosing the spinal cord are not fully formed and remained unfused and open.

Osteogenesis imperfecta

(brittle bone disease or Lobstein syndrome) is a genetic bone disorder where people are born with defective connective tissue or are unable to produce it. Physiotherapy and hydrotherapy are common treatments.

Down syndrome

A chromosomal condition which is characterized by the presence or extra copy of genetic material on the 21st chromosome, either in whole or part. Associated with impairment of cognitive ability and physical growth and a particular set of facial characteristics.

PART ONE

BACKGROUND RESEARCH ON ISSUES

“The slow metamorphosis of a totally dependent infant into a separate and distinct individual is aided and continually reaffirmed by the acquisition of skills, particularly when they involve objects, places and spaces that belong to him or her.”

(Weinstein and David, 1987:27)

CHAPTER ONE

INTRODUCTION

“Wouldn’t it give us pleasure to see a string of meaningful details in a (sic) child’s world? Things that admittedly serve trivial purposes that stand for themselves and their function and besides, come together in the realm of fantasy, of poetry. They could be minor details: a star of light, patterns in a wall...little things, showing that we have made an effort to understand the world of children; that we have overcome what stands between us – age, drawing board, cost, calculations, ambitions – architecture.”

(Dudek, 2005:44)

PART ONE

BACKGROUND RESEARCH ON ISSUES

CHAPTER 1 INTRODUCTION

INTRODUCTION

Background

The buildings that people use on a daily basis serve to provide places within which we can live our lives. Every building shapes our actions and experiences, some in more profound ways than others. Our experiences are determined by our perception modalities and humans thus rely on all of their senses to fully understand, interpret and engage with their surroundings. The way buildings and spaces are perceived can therefore have a multitude of psychological effects on people. Every person in the world was once a little child and these first few years of human life are the most crucial to the development of a healthy and happy human being. During these years, the growth of children is influenced by various stimuli, in the environment that surrounds them; their parents, siblings, toys and the natural environment. Therefore, children's development is actively enhanced by the use of their sensory modes; visual, tactile, aural, olfactory and haptic. There are buildings and spaces which are specifically for children and these should be designed to positively influence them and their progress as they learn about themselves, life and their surroundings (Day, 2007).

There are however, a large number of children in the world and South Africa who are born physically disabled, blind or deaf and this can have a major impact on their development (Statssa, 2001). Many buildings are not designed to cater appropriately for the disabled and for children and this can have negative psychological implications if they are handicapped further by their physical environment. For their health and well – being, it is extremely crucial for disabled children to have satisfactory childhoods and the built environment can play a role in this.

Motivation and Justification of the Study

In spite of the numerous learning and play environments that are available for children today, there is still a need for a provision of appropriate places that cater for them. Most of these places are not entirely effective in stimulating children so that they learn through their environments. Attention is not paid to the ways in which these environments are designed or structured, so that they enhance a child's experience, making them feel safe, secure and almost as if they are at home. The main motivations for this study are as follows:

- Built environments can effectively appeal to children, their sense perceptions and experiences and the study aims to determine how different types of built environments psychologically affect children.
- There are not enough special learning and therapeutic environments to cater for the large amounts of disabled children in South Africa (particularly Durban) and existing institutions are not effective in offering rehabilitation for them (Gwitima and Khupe, 2008).

DEFINITION OF THE PROBLEM, AIMS AND OBJECTIVES

Definition of the Problem

In the 21st century, technological advancements have changed the way that human life is structured, resulting in globalisation and changes to social and cultural norms. Children are exposed to large amounts of electronic equipment and are losing the essence of what it means to be a child (Keeler, 2008 and Kroner, 1994). Learning environments, child – care settings, playgrounds, parks, orphanages and homes are the places within which children are supposed to develop the psychological and social skills necessary for them to thrive as adults in the future. Children are also less exposed to natural environments and animals, an aspect which can be considered to be extremely important for children's growth. One of the results of nature – deficit disorders is that people are not aware of the impacts that man is having on the earth and if children begin to appreciate nature from a young age; they can have a positive, sustainable influence in their adult lives (Day, 2007; Dudek, 1996 and Keeler, 2008). The development of disabled children requires a more careful understanding of their situation as well as a dedicated approach to the design of

environments for them. Disabled children are children first and it is imperative to understand that they see themselves as being different and abnormal to other children who can perform many tasks with ease. If the environment has been designed to cater for the specific needs of disabled children, it would help them to build confidence and self – esteem which would then enable them to believe in themselves and build a future. Architecture can provide a therapeutic and educational component to their lives, enriching their every experience and allowing them to feel more confident about their environments no matter where they go (Urry, 1970).

In Durban, as well as many cities around the world, one can find the phenomenon of children who are disabled in some form. Current facilities that work to take in these children are not designed to specifically cater for the intense development and stimulation which every child needs (Gwitima and Khupe, 2008). During a child’s first few years, their environments are perceived with great intensity and every stimulus becomes a learning experience. It is greatly significant for disabled children that their environments offer a rich variety of stimuli, teaching them about themselves and life (Arthur & Passini, 1992 and Urry, 1970).

Aims

- The aim of the research is to explore and understand how children perceive the world around them and the built environment and therefore, how the built environment can be designed to effectively act as a stimulant in helping to change the lives of disabled children, considering that they have physical disabilities which impair their normal functioning.
- To develop an appropriate approach to architecture which focuses on stimulating one’s senses, thus having positive psychological benefits.
- The research aims to consider the concepts of architecture that naturally makes children feel safe, fostering a sense of identity and meaning for them thereby facilitating the natural growth of their personalities and identities.

Objectives

- The aims will be achieved by looking into the actual effects that architectural form, space and the built environment have on children and also how children perceive various micro and macro spaces.
- This will extend into understanding what elements of the built environment can make children feel vulnerable and unstable, thus looking into the concept of defensible space.
- Stimulating children also becomes an important factor in the design of buildings for them and a pertinent question related to this is: what stimulates children best, is it bright colours, a lot of toys, active playgrounds or interaction with children their age? This will be narrowed and specified to look into the aspects of architectural design that can act to stimulate, heal and aid the lives of disabled children, enabling them to become active, independent participants within their surroundings rather than staid individuals, who feel excluded.
- More importantly, the factors which contribute to children's physical disability (specifically blindness and mobility impairment) will be analysed and discussed, setting a framework to understand the emotional effects that have been induced upon these children. This will lead to a resolution of how the built environment can act as a healing environment, by adequately providing what is or has been missing.
- Architectural examples will also be analysed in order to fully understand the aspects of architecture which facilitate learning processes in children, as well as directly impacting on their development and growth.

SETTING OUT THE SCOPE

Delimitation of the Research Problem

The research will focus on understanding the causes, symptoms and effects of disablement and by providing this essential background information, a typology of issues that relate to them will then be identified. This will aid in understanding their psychological and physical needs considering that they have been challenged in certain aspects of life which other people take for granted, such as sight or hearing. Specific physical disabilities such as blindness, mobility impairment and cerebral palsy will be

analysed and discussed, but for the purpose of the research, mental and rare disabilities will not be discussed.

Furthermore, this study will delve into the aspects of how the built environment can serve to facilitate the self – realisation, growth and development of children by exploring the concepts of sensory and playful architecture. Spaces and the built environment affect the users and the study will inquire into how children perceive spaces, so that from an early stage, their environments can help them to develop into happy and healthy human beings. Aspects such as colour, light, shape, patterns, scale (anthropometrics) and wayfinding will be discussed in relation to the psychological effects that they have on children. This becomes significantly important to disabled children as the built environment thus becomes the unit which enables them to understand their situation and how best to deal with it. The document will present precedent and case studies that will analyse a range of children’s schools or learning environments such as museums, child – care centres, parks, gardens and playgrounds, which aim to provide effective architectural solutions to the needs and wants of children (disabled or not).

Definition of the Terms

- **Disabled children** are children who have been physically impaired in some way or in multiple ways. There are physical disabilities such as blindness and paralysis or there are intellectual disabilities such as autism.
- **Built environment** refers to components of architecture that includes private and public buildings as well as parks, urban squares and playgrounds.
- **Sensory stimulation** is a term that refers to the stimulation of people’s senses, those being, sight, touch, hearing, taste or smell.
- **Wayfinding** refers to the use of signage, tactile and auditory clues in the design of buildings in order to lead people through environments within which they have no preconceived idea of spatial layouts.
- **Barrier – free design** refers to the careful design and construction of the built environment (interior and exterior) so that it is accessible to persons with mobility and/or sensory deficits.

- **Anthropometrics** is a term which relates to the precise measurement of size, proportion and musculature of people, such as reach or angle of movement, so as to design spaces, furniture and fittings which allow for the most effective use of those spaces.
- **Healing architecture** is a term that is normally applied to the design of hospitals where the spaces are designed to act as sources of further healing to the patients.

Stating the Assumptions

The research for this study is based on the following assumptions:

- Many child – care settings (the physical environment in particular) are not designed to target the stimulation and development of children’s senses.
- There are a large and increasing number of disabled children in Durban and there are not enough special schools which cater for them (Gwitima and Khupe, 2008).
- Existing institutions have not been properly designed with disabled children in mind because many of them simply just provide buildings for children to learn in.

Key Questions

- What is the relation between human perception and the built environment and subsequently, how does the built environment affect people, particularly children?
- How do children perceive space, forms and their surroundings in terms of scale, height, textures, patterns, colours, sounds and smells and how can designers incorporate these ideas in their buildings to effectively allow children in becoming active participants with the built environment, thus acknowledging their surroundings in a more positive way?
- What are the effects of varying forms of direct, indirect and symbolic contact with nature during childhood?
- How can the design of spaces aid the healing of children who are disabled?
- How can the built environment create a sense of meaning and identity in children’s lives?
- How can the built environment be designed in such a way that it can foster a sense of security and assurance in children?

Hypothesis

The built environment plays a major part in affecting the psychology of children, especially from an early age when they begin to perceive certain aspects of their surroundings that they then translate into emotions (good or bad). Colours, light, textures, patterns, shapes, scale and appropriate architectural mechanisms can be used to stimulate children's minds and imaginations, allowing them to become resourceful and intuitive. It can also allow them to form a sense of personal identity. It is also proposed that the psychological aspects of space and architecture can be an important element in aiding the rehabilitation and development of disabled children. This can make them feel safe as well as allowing them to feel secure within themselves, further stimulating their minds so that they can develop into mature adults capable of handling any life situation. Learning environments for these children can be designed with the utmost care and without high cost implications so that children can enjoy an active environment which constantly shapes and moulds to their individual needs and is a pleasurable, stimulating place at all times.

THEORETICAL AND CONCEPTUAL FRAMEWORK

Post – Structuralism and Architecture

Structuralism and post – structuralism influenced a group of architects in the 1970's, among them being Bernard Tschumi, Rem Koolhaas and Nigel Coates. These theories of post – structuralism came about due to the belief that modernist urbanism was void of meaning and vitality. Livesey (2007) refers to the writings of many exemplary philosophers and he outlines the main ideas behind theories of post – structuralism in architecture. These ideas are centred on the concept that people's lives are shaped by events and experiences which occur at every level of existence and these aspects have simply been forgotten in the realms of urbanism and architecture. In summary, Livesey writes that events are the basic mediums through which physical experience develops and these events are ever – changing. In these theories of events, they can be seen as having properties such as height, intensity, associations with colours and values that are imprinted by people. Objects such as furniture and buildings can also be sensed as being aspects of events, providing platforms for them to occur. Livesey (2007) then refers to the concept of the narrative, which is a sequence of events that occurs in time and space

and evolves from the level of the city as a whole down to individual buildings, monuments or landmarks. Every aspect of a building can be seen as an event, from the cross of a church to the large entrance doors, as Livesey (2007) suggests:

“The interconnection of events in time and space means that the contemporary city provides a useful model for describing the complexity of events. In a public park, the greenness of the space is an event, as are all the environmental aspects, whether wind, sun, seasons, time of day/night, and/or smells. All of the individual elements that comprise the park are events, these exist in time so are constantly changing, while retaining an enduring dimension. The use of the park and its larger contents are also events. All of this means that in space and time, a complex set of forces are continuously creating and shifting the nature of the park” (Livesey, 2007: 15)”.

It then follows from an understanding of this theory that events in architecture include every aspect of the built form and therefore, they need to be carefully considered as they are intrinsically tied to the direct experiences of the users. Similarly, Tschumi (cited in Nesbitt, 1996, 158) argues that there are limits to architecture and these can come in any form such as scale, proportion, symmetry, form, function and composition. Every era has its own theme of architectural discourse yet they all seem to be interconnected, as styles and themes are recurring throughout. Architectural language and texts have been an important aspect to architecture throughout centuries and has probably been the biggest influence in recent times. However, it seems as if Vitruvius’ original ideas of *venustas* (beauty), *firmitas* (structure) and *utilitas* (accommodation) have been disbanded in recent architectural work. Vision in architecture seems to be more dominant than considering the relationship between the entire body and space in architecture. Bodies, movement and the senses are an intricate part of architecture and a shift needs to occur in order to facilitate design which takes this into consideration. The human senses are related to spaces and events, events are related to buildings and spaces and this forms a trilogy, indicating the relationship between architecture, bodies and events. Events are inseparable from their enclosures and occur as a result of them. Architecture can be separated from art because it allows bodies to move within space, facilitating the use of every aspect of the human body and post – structuralist ideas propose that architecture has to revert back to designing for people and not simply for vision or beauty (Nesbitt, 1996). Humaneness in architecture is also related to theories of perception, psychology and phenomenology.

Architectural Psychology

The term architectural psychology mainly refers to the school of thought that assesses the psychological implications that built environments have on people by understanding aspects such as materials, colour, light, patterns, scale, proportions and shapes (Canter, 1970). It is closely related to sensory architecture, which is a form of architecture that has developed in response to modern technologies and human being's desires to become fully integrated with their surroundings. Sensory architecture can be thought of as the experiences of spaces through the means of using our senses and the ability of perception allows individuals creative exploration and discovery. Within the properties of space, people learn to adapt to artificial or natural environments. In order to prevent an alienation of architecture, designers need to strive towards a higher awareness of multi – sensory perception in their buildings and spaces. It is difficult however, to anticipate how people will react to their surroundings, because it is related to individual emotions and senses. The general senses that people use are: taste, smell, hearing, sight and touch, but there are also the senses termed hapticity, kinaesthesia and synaesthesia. Hapticity refers to the sense of touch, but in a three – dimensional way and this thus becomes the most primary experience in architecture because the sense of the skin acts as a mediator between the body and the world. Kinaesthesia is the exploration of the environment through movement, with the eyes or with our bodies. Moving through space with the body makes a person experience architecture in a less static way and this makes it very important for architecture. Synaesthesia is a phenomenon that can be described as the transferral of sensory information from one sense to the other. For example, people associate the colour blue as something that would be cold, thus connecting the sense of sight with that of touch (Hesselgren, 1975).

The Gestalt principles of psychology, which were conceived in Germany early in the twentieth century, are devised of organising information into patterns (gestalts) of meaning which could then be understood easily. These principles describe how the structure of sensory stimuli received by a person can lead to perceptions of patterns or gestalts. Therefore gestalt psychologists were firm believers that human beings perceived their micro and macro environments with the entirety of the human body (Wilson, 1984: 68 & 152). The principle of creating patterns of understanding perceptions formed the

main foundation for perception and psychology, when it was first introduced (Wilson, 1984, Popow, 2000 & Haber and Hershenson, 1973: 190). These laws of Gestalt psychology were then replaced by Jean Piaget's theories of schemata, which can be defined as reactions to situations. These were thought to be formed during the stages of mental development through a person's interaction with their environment. This shows that spatial consciousness is based upon experiences with objects (Norberg – Schulz, 1971: 11).

The way that adults and children perceive spaces is very different and this can be brought about due to the lack of knowledge of the world that children naturally have. It is through exploration and direct interaction with their environment that children learn and thus grow, not just physically but mentally and emotionally (Bower, 1977). Perception is an active experience, where a child finds information through mobility; hence kinaesthesia becomes important in designing spaces for children. A built environment which affords a child to be alert to the external stimuli through movement and social actions will then encourage him or her to create a bond with that place and it then becomes a favourite place for the child. Spaces should permit children opportunities for engagement, discovery, creativity and revelation, allowing for gradual change or diversity, so that the child becomes constantly fascinated. This allows children to develop the idea that space or architecture is a structure, which itself evolves.

In researching this concept, the idea is to understand firstly, how children experience and perceive space and how different design intentions affect them. Secondly, this will translate into a typology of principles in terms of sensory architecture and architectural psychology as to what elements in design can be effective in enhancing a child's experience of their built environment, particularly a child who has had no stimulation or one who is disabled.

Critical Regionalism

The theory of Critical Regionalism was introduced as an alternative to Postmodernism and the idea behind it was to recognise the value of the identity of a physical, social and cultural situation. These ideals would then become an integral part of the design process, moving away from the transposition of formulaic buildings onto sites, buildings that had

no relation to the specific place, site conditions and social and physical context. As physical conditions dictate a certain type of building, so too does it generate a certain type of *people* who use those buildings and places, as Nesbitt suggests „an exemplary work of architecture evokes the oneiric essence of the site, together with the inescapable materiality of building“ (Nesbitt, 1996: 468).

Central to critical regionalism are engagement and accentuation of the topography of the site, the use of local materials and response to light and climate. These elements are said to enhance people’s experiences with buildings and space, rather than just focusing on providing an image – oriented building typology (cited in Nesbitt, 1996). This theory is therefore extremely relevant to the perception and psychology of architecture as it demonstrates the concepts that act to enhance experiential space. Also, the theory relates to designing for a particular site at a specific point in time and this is crucial in architecture that is designed for children as it allows them to relate to their natural surroundings without having to decipher a building’s forms or scale. This aspect allows them to form a self – identity as well as place – identity, strengthening their overall perceptions of built forms.

Phenomenology of Architecture

Christian Norberg – Schulz, an architectural theorist, was a pioneer thinker in the theory of phenomenology associated with architecture and he drew his inspiration from the ideas of Martin Heidegger. Heidegger’s (1971) writings on dwelling and place spoke about place being intimately related and directly influenced by human existence. He declared that the sensory engagement of people creates different actions and experiences, all of which are bound to and defined by the place within which they occur. Dwelling and building meant the same thing to Heidegger and it is from this that Norberg – Schulz drew his inspiration, as they both firmly believed that the rituals, traditions and conditions of human existence are rooted and thus stem from the places that they inhabit. The concept of place – making founds a phenomenological and experiential linkage which combines people (culture), site and building (Sharr, cited in Menin, 2003).

Norberg – Schulz refers to phenomenology as, „a method that urges a return to things as opposed to abstractions and mental construction“ (cited in Nesbitt, 1996: 412). Drawing from his writings on the theory, phenomenology can thus be described as the ability to make an environment meaningful to people by creating specific places. Architecture should aim to clarify the location of human existence and basic architectural elements thus become important; walls, floors, ceilings, boundaries or even frames (Nesbitt, 1996).

Phenomenology also engages with ideas of site location and the tectonics of details that allows a certain character to manifest in the architecture. The qualities and characters of materials as well as light and colour, also become critical elements, as they are the essentials to building design and development. According to Norberg – Schulz (1979), the world consists of many phenomena, such as; animals, trees, towns, wood, water, sunlight, the moon and stars, night and day and the changing seasons. There are also intangible phenomena such as feelings, thoughts and emotions as experienced by people and animals alike. Some phenomena therefore form an environment to others, for instance, the forest consists of trees and animals and a concrete term for these environments is place. Places exude certain characters and they are therefore qualitative and wholesome phenomenon, where each part of the environment should be seen as working in unison with the other. Therefore, the meanings that people give to places and the identities that they then form from these meanings can become crucial to their individual traits, or even to the value that is added to a particular society or culture. As adults, the meaning that we attach to places and environments is simple and relative to our thinking, as we have developed our senses and mental states. For children, on the other hand, places could imply entirely different meanings. What we may see as being a large and beautiful park to take a walk in, children may construct it in their minds as being a fairytale forest within which to enact their imaginative fantasies. Also, places can have deep and significant meanings for children, where that same park might recall an extremely memorable experience, which allows that child a significant attachment to that particular place as captured in a particular frame of time. Places and their meanings therefore have significance to children’s development as that allows them to construct realities of attachment and relationships (Day, 1997: 5).

Theories of Defensible Space

The defensible space theory is based on notions of crime prevention and neighbourhood safety and it was promoted by architect and planner Oscar Newman. Defensible space is defined as a set of principles that can be used in the building design and site layout that allows the inhabitants to become key agents in their security; crime will then be reduced and mitigated through careful design of the urban environment.

Newman (1996) has defined four principles that make up defensible space:

Territoriality: refers to the idea that one's home or dwelling is valued.

Natural Surveillance: the link between an area's physical characteristics and people's ability to see what is happening around them.

Image: the capability of the physical design to convey a sense of security.

Milieu: a feature that may affect security (Newman, 1996).

Careful design of the physical environment creates a sense of territorialism, which then becomes a strong deterrent to criminals and vandals. Areas in built environments should be well – defined for functional purposes, paths should be defined for movement, outdoor areas should have a good connection to homes and indoor areas should be designed so that there is a visual link to the outside so that natural surveillance can occur. This theory is applicable to any type of planned space and can be particularly effective in the design of buildings for children as they are susceptible to harm and violence without being able to defend themselves. Thus, the site and building design can help in providing safety and control measures so that children can feel safer and more at ease rather than feeling vulnerable as this would adversely affect their image of that building, especially if it is a school building which they stay in every day. Safety is one of the most important factors when designing for children and needs to be considered from the outset of the design process.

RESEARCH METHODS AND MATERIALS

The purpose of the research is to organise a system and method that involves the collection and analysis of relevant information that would pave the way for a resolution of the problem that has been presented. The approach that will be taken will include the

collection of data, the analysis of case studies and the choosing of a site and subsequently a site survey. These will help to gain a clearer understanding of the research problem. The observation of case studies (primary research) then becomes an important part of the research process as it allows the researcher to gain insight into existing conditions of the research problem and an analysis of what elements work and those that do not. The research is to be qualitative rather than quantitative and for the primary data, focused interviews will be used, aimed at understanding the relation between the environment and people. Educators, teachers, child developmental psychologists, various other therapists and architectural professionals will be interviewed during this process.

Approaches to be used in the analysis of case studies are as follows:

- **Empirical Data:** this includes an observation and analysis of the case studies in all aspects, from the macro level through to the ways in which the inhabitants use the spaces (interior and exterior).
- **Research Data:** this includes the historical background and design of the case study at the time of its inception.
- **Surveys and interviews:** this includes surveys of the building/s, internal and external spaces as well as the ways in which the various spaces have been executed and are used. Interviews will be conducted on the people who use the building/s on a daily basis in order to gain a greater understanding of people's experiences and perceptions of the different forms and spaces.

For the purpose of gathering of secondary data which is relevant to the problem, the following resources will be accessed and used:

- The resources within libraries.
- The resources on the internet and computer.
- Various means of communication.
- These research materials will include books, journals, electronic data and images, as well as non – published items such as papers (conference), articles, local and international precedent studies and the raw data that is collected from analysis and surveys.

CONCLUSION

In conclusion, it can be said that designing with children in mind is an important part of architecture as more often than not, children are avid users of many buildings. The world is perceived differently to children and therefore designing for them can impact their lives in a magnitude of ways. Built environments for disabled children, in particular, need to address the urgent need for the building and site design to effectively act as stimulants in developing children who have physical impairments. Schools such as those which provide for special educational needs also need to have flexibility as a consideration of the design process so that the ever changing and growing needs of disabled children can be accommodated appropriately. A comprehensive literature review will now be set out, furthering the ideas expended in the above concepts and theories and setting a theoretical framework for the research.

- Chapter two of the literature review will explore the different types of physical disabilities and will briefly explain the impact they have on the design of buildings.
- Chapter three sets the framework for the main theoretical approach and argument, exploring the ideas behind perception and psychology of the built environment. These concepts and theories are set out in such a way that they are always tied back to understanding how the psychological implications of architectural environments affect child development. This chapter is broken down into the various parts which were considered to be relevant to architectural psychology; the human senses, the importance of experience, emotions and memory and architecture and child development. Wayfinding, orientation and legibility relate to this as well, but more so to designing for the disabled. Colour, light, patterns, textures, shapes and scale all relate to both wayfinding as well as psychology and perception.
- Chapter four follows, explaining the importance of place identity, culture and history to the creation of place – sensitive architecture which can play a part in the formation of personal identity. This is achieved by looking into the concepts of critical regionalism and phenomenology of architecture.

- Chapter five outlines the importance of nature and play to child development, forming a triangulated connection between nature, architecture and child development.
- Chapter six deals with the issues of safety for children in built environments, looking at the concept of defensible space.
- Chapter seven is based on the theories set out in the literature review and takes these theories into consideration in the exploration of appropriate case studies. These have been chosen and analysed to further support the research and provide a foundation for the project design.
- Chapter eight is an analysis and discussion of all of the above mentioned chapters, stating the findings from each.
- Lastly, chapter nine is the conclusion to the entirety of part one, stating whether the main problem statement, key questions and hypothesis have been answered, pertaining to the findings from the analysis and discussions.

CHAPTER TWO

UNDERSTANDING THE NATURE OF DISABILITIES AND THEIR IMPACT ON ARCHITECTURE

“Disabled children are children first and disabled second.”

(Weinstein and David, 1987:188)

CHAPTER 2 UNDERSTANDING THE NATURE OF DISABILITIES AND THEIR IMPACT ON ARCHITECTURE

Introduction

All children have patterns of individual strengths and weaknesses and these differences among children and people is what makes life interesting. A normal child can be described as one who does not deviate from developmental norms. In other words, development can be described as a process of change that a child undergoes on the route to adulthood. Thain et al (1980) stated that this development occurs through the interaction with the environment. With time, children learn to make distinctions between the signals coming from their senses which allow them to exhibit a range of behaviours, which is called differentiation (Day, 2007). Different stages of development have differing characteristics and children cannot learn certain things until they have reached that stage of development where they are able to comprehend exactly the situation that they are in. Most importantly, children develop physically, mentally and emotionally all at once. A large percentage of children are born with their senses in a good working order and those that are not developed fully at birth generally develop over time. Children use their senses in the process of perception, converting everyday stimulation into useful information and this is a skill which must be learned through experience and this aspect of development is vital to the growth of children. Thain et al (1980) argue that if a child does not learn adequate perceptual skills early in life, he or she will have difficulty mastering the more complex tasks later on in life.

With that in mind, there are many children with mental or physical disabilities and this population is increasing rapidly on a daily basis (Statssa, 2001). These disabilities may be caused due to accidents, infections, birth trauma and they may be congenital or hereditary. Children may have one disability such as deafness or multiple disabilities such as cerebral palsy with hearing loss as well as mental retardation. When a child has a congenital disability, this means that it is present at birth, while hereditary refers to the transmission of a trait from the parent to the child. Dealing with disabled children becomes harrowing for the families and medical and educational support becomes critical to the healthy development of these children. In the past, educational programs for

disabled children were few and far between and many children were put into institutions or hidden away at home starting at an early age because people could not understand how to deal with them (Gwitima and Khupe, 2008). Educational systems were not equipped to deal with them either and as a result, very few disabled children were taught in a systematic manner. With advances in the medical field, however, the dialogue between medical and educational systems has been developing rapidly and it has been realised that a concerted effort is required in the care and teaching of disabled children.

Education for disabled children varies in terms of the degree and extent of the disability. If a child is not severely disabled, he or she may attend a normal school, however, those with extreme disabilities may find it extremely difficult to become integrated into a normal school environment. Architectural barriers are usually the main reasons that children find difficulty at normal schools (CTBUH, 1992) and it is therefore important that disabled children be placed in an educational setting which also provides physical therapy so that they too can enjoy a comfortable and care – free childhood. Special learning programmes need be formulated for children with disabilities to help them cope better with daily tasks. For disabled children’s development, they should also be encouraged to learn how to do things themselves and good teaching also makes a difference. Day (2007), Urry (1970), Werner (1987) and Wilbur et al (1980) state that disabled children need more stimulation and activity than children without disabilities. They outline the main areas which should be greatly considered for disabled children and these are; movement, body control, strength, balance, use of the hands, stimulating the senses, communication, socialising, observing, thinking and doing. Repetition should be avoided and variety is vital in stimulating their development. These aspects, suggested above, need to be carefully considered in architectural environments for disabled children and therefore, as a starting point, an understanding of the different types of disabilities (their causes and symptoms) will be outlined to enhance the research and architectural solution.

The Different Types of Physical Disabilities

The types of disabilities affecting people ranges from the more common disabilities such as blindness, deafness and cerebral palsy, to rare diseases such as osteogenesis

imperfecta. There are many different types of disabilities and their causes, symptoms and treatments are sometimes dissimilar but do overlap. Children who have more than one disability are referred to as having multi – sensory impairments. For the purpose of this research three main types of disabilities will be discussed as these were found to be very common in KwaZulu Natal (Statssa, 2001: 1); blindness, cerebral palsy and mobility impairments (paralysis/lack of the arms or legs). There are many causes for general physical disabilities and some of them occur through accidents when the child is very young or even through amputation for various reasons and this part will also be discussed in brief, to gain a better understanding of their circumstances.

Difficulty with seeing can be mild, moderate or severe and those children who cannot see at all are called blind. Werner (1987) stated that most blind children can see a little and some can see the difference between light and dark, but cannot distinguish the shapes of objects, while others can see only large objects. Some children with cerebral palsy or other disabilities are partly or completely blind and blindness can make the progress of early skills slow and challenging. Brain damage causes blindness in children, usually in combination with other physical disabilities. Causes of this can include German measles during pregnancy, delayed breathing at birth as well as meningitis. Children who are blind can develop early skills just as quickly as other children and their other senses become heightened and more attuned in their use (Werner, 1987: 246). For blind children to get accustomed to their surrounding environments, they use their hands and ears to orient themselves to wherever they need to go. They do this by using landmarks within the environment to understand where they are as they easily remember that objects, walls and other things are placed in certain context to rooms or spaces. Once a blind child has been guided by other people, over time he or she will learn to adapt to their surroundings and will eventually find their way around easily. Blind children are taught to read and write using braille which is a system of raised dots that denote letters and numbers and which can be read through touch, with the fingertips (Werner, 1987: 253).

Cerebral palsy (brain paralysis) affects movement and body position. This type of disability comes from brain damage which happened before the baby was born, during

birth or as a young baby. The parts of the brain which control movement is what is affected and once damaged, these parts of the brain do not recover. The movements, body positions and related problems can be improved depending on how the child is treated. In many countries, it is the most frequent cause of physical disability amongst children and in South Africa it accounts for being the second highest recorded disability (Statssa, 2001: 14). Muscle stiffness or spasticity causes part of the body to be rigid or stiff, therefore movements are slow and awkward. The stiffness increases when the child is distraught or excited or even when their body is in certain positions. The pattern of stiffness varies from child to child. Uncontrolled movements, called athetosis; are sluggish, wriggly or quick movements of the child's feet, arms, hands or face muscles. When a child moves by choice, body parts move too fast and too far and a child's balance will be poor causing him or her to fall over easily. Children with athetosis will have a normal intelligence but if the muscles for speech are affected, it will be hard for them to communicate, thus necessitating the need for a speech or language therapist. Ataxia occurs when a child has difficulty beginning to sit and stand, thus they fall often and have very clumsy use of their hands. Usually, this problem lasts for life and because they may seem so clumsy, other children often make fun of them. Medicines usually do not help children with forms of cerebral palsy and the damaged parts of the brain cannot be repaired. Most children do learn to walk but much later than normal. Some children may need crutches, braces or other aids and there are many different ways to help children who cannot walk, through the use of wheelchairs, special walkers or hand – pedal tricycles. Helping these children early in life means to encourage them to keep their bodies straight, make sure their arms are constantly in use in front of them and ensure that they bear weight equally on both sides of their bodies. Werner also suggests that to relieve and relax spastic muscles, applying warm soaks to the child's body or having him or her lie in warm water may help, therefore water treatments in the forms of pools or hydrotherapy may be applicable (Werner, 1987: 87). Quinn (1998) stated that a child with cerebral palsy should be exposed to a variety of sights, sounds and textures, which would greatly help to encourage their development.

Lastly, there are many types of other physical disabilities and these children end up being in wheelchairs or have a mild to moderate paralysis that causes the loss of only one arm

or leg. Paralysis (muscle weakness) can begin when the child is small and it may affect any muscles of the body but is most prevalent in the legs. In most cases, the intelligence and feelings of the child are not extremely affected except when the child has been paralysed due to an accident or illness. Injuries to the spinal cord can also cause paralysis of the arms and legs. Usually, the children with these types of disabilities need a lot more stimulation in order for them to become independent, healthy people later in life.

The Impact of Disabilities on the Architectural Environment

People who have physical disabilities such as those listed above are impeded from using buildings in many ways. The blind and wheelchair bound find it difficult to use stairs. Some spaces become too small for wheelchairs to manoeuvre in and the blind struggle to find their way around without having some form of orientation training beforehand. People who experience these barriers are referred to as being *handicapped* by their environments. Creating enabling environments for the disabled has become crucial to architects and designing for disabled children becomes even more of a challenge. The life story of each disabled person is unique and their experience with the surroundings shapes their entire life as Mayer Spivack stated (cited in Lifchez and Winslow, 1979: 61):

“When people live in environments restricted to a severely limited range of settings in which to carry out all the behaviour that constitutes the human repertoire, their ability to function as individuals and family groups, and the integrity and quality of their society, may be impaired. People fail to maintain deep, lasting interpersonal relationships, they may suffer in their ability to work, provide or eat food, to sleep in deep renewing comfort, play, raise children, explore and protect territory, to meet with their peers, and make decisions which control the shape and quality of life”.

Therefore, designing for the disabled requires an understanding of the implications of various disabilities on the architectural environment; be it a dwelling, hospital, school or library, each place requires a unique approach. People who are blind generally have intensified senses of touch, hearing and smell, which develop over time. For them, architectural environments should have enhanced aspects of textures, echoes from surfaces and particular smells in specific places to help them remember places and thus find their surroundings legible and easy to navigate. Anthropometrics also becomes a characteristic to greatly take into consideration, since the sizes of wheelchairs would also affect various components of building design. Brebner (1982: 121) stated that the crucial

aspects of building design which are directly related to people using wheelchairs are as follows:

- Parking and vehicular access and covered protection becomes extremely important, as well as surfaces to pathways.
- Anthropometrics defines the design of aspects such as reaching, sitting and moving through passages.
- Doorways, ablutions and lifts were the main sources of problems in the past and despite recent advances, built environments still offer barriers in the form of these.
- Some types of terrain will require the use of ramps for the disabled and thus, the choice of site also becomes one of the determining factors of building design (Brebner, 1982: 121).

Scale and proportion are intrinsically linked to anthropometric design and these also become important to consider. All of these aspects form part of barrier – free design, which can be described as „an environment that supports the independent functioning of individuals so that they can get to, and participate without assistance in, everyday activities such as acquisition of goods and services, community living, employment and leisure“ (Council on Tall Buildings and Urban Habitat, 1992: 27). The concepts of accessibility and adaptability also form part of the dynamic relationship between a disabled person and the environment. However, no matter where a person is, the concepts remain basically the same, but most importantly, when designing for disabled children, one must always remember that they are children *first* and disabled second.

Conclusion

Since the crux of the research lies in understanding the relationship between architecture and child development, an understanding of psychology theories and child development will be set out in the following chapters. The connection and undeniable relationship between architectural environments and their impact on child development will also be explored. Therefore, sensory architecture, adaptability, anthropometrics, wayfinding and legibility, which all form part of designing barrier – free environments, will be dealt with

in order to gain a deeper understanding on how to create successful, sensitive built environments for children.

CHAPTER THREE

PSYCHOLOGY AND PERCEPTION OF THE BUILT ENVIRONMENT

“The need to form architectural space which is not just functional but supports young children’s learning and their sense of psychological well – being and develops their spatial and bodily awareness, is fundamental.”

(Dudek, 1996:10)

CHAPTER 3 PSYCHOLOGY AND PERCEPTION OF THE BUILT ENVIRONMENT

Introduction

When psychology had begun to develop as a form of new science, over a hundred years ago, the process of perception was the starting point for those who were initially interested in the field. This initial research, findings and writings formed the ground – breaking foundation to modern psychological thought and research, in the form of the Gestalt theories. Since the idea of psychology in architecture is an evolving field, comprising many spheres of thought, it is imperative to detail the roots of psychology itself, hence, the principles of Gestalt. Kohler (1969: 33 – 53) refers to these early psychologists studying aspects such as movement, shapes, music, colour contrast, geometric illusions, patterns and people’s perceptions of these relating to their emotions and experiences. Thus, the Gestalt theory related to understanding people’s interpretations of their environments, space, objects and other people. In the beginning with such explorations in perception, it was found that the senses and human brain work in unison to create perceptions of the world around us. One of the main tenets of Gestalt theory is the belief that our perception and understanding of objects and events in the world depends on the appearance and actions of whole objects and not their individual parts. An example of this lies in the fact that when we look at a square, we see it as we understand it to be – a square – not as four lines and four angles. This whole form approach sought to define the principles of human perception and it is from this that the concept of figure – ground arose. The Gestalt principles thus described how the structure of sensory stimuli received by a person can lead to a perception of patterns, which help people to understand through experience, the world around them. This then led to a comprehension of the link between memory, experience and perception (Kohler, 1969; Popow, 2000; Wilson 1984: 68 and Winn & Snyder).

The laws of Gestalt psychology led to the formation of various other theories, some of which arose as a conflict to that of the Gestalt theory; however it was the development of the schema theory which then became widely accepted as a realistic understanding of human perception. This theory was advocated by developmental psychologist and

philosopher; Jean Piaget in 1926. Piaget's theories of cognitive development were mainly developed out of observing children and his research formed a pivotal role to understanding their growth and development. Children can be considered to be active rather than passive participants in their own development as Ault (1977: 12 – 13) described:

“The assumption of an active child implies that the child inherently tries to make sense out of his environment. If certain experiences will help the child figure out a problem, then the child will seek out those experiences. As soon as he has figured out the solution (to his own satisfaction), he will turn his attention to other matters. In other words, a child is active because he has an intrinsic motivation to learn about his world”.

Piaget's theory of cognitive development began with the idea of *schemes*, which can be described as organized patterns or habits of behaviour, which form part of daily life. For infants, these behaviours include aspects such as grasping, biting and looking but according to Piaget, they do not perform these simultaneously. However, the range of children's behaviour differs during the stages of development that Piaget claims they undergo. These stages are: the sensorimotor stage (birth to two years), preoperational stage (two to seven years), concrete operational stage (seven to twelve years) and the formal operational stage (twelve to adulthood). The sensorimotor stage is the period when a child solves problems using his sensory systems and motoric activity. Symbolic functioning is the main characteristic of the preoperational stage, which is the process of making one thing represent a different thing (which is usually not present), an example of this would be a child using a plastic spade to represent a real one. There are four parts to symbolic functioning; search for hidden objects, delayed imitation, symbolic play and language (Ault, 1977: 48). The concrete operational stage infers that children can solve a variety of tasks, by themselves and lastly, the formal operational stage is the period when logical thought and problem solving comes into play (Ault, 1977: 18 – 73). The concept of schema can be related to all of the above mentioned stages of development. There are many explanations of what schemata are, but most theorists agree that they are organized structures which exist in a person's memory and thus contain the sum of that person's knowledge of the world. One of the fundamental beliefs of Piaget was that a child's environment provided the vehicle for intellectual development. Other theorists such as Lev Vygotsky and Jerome Brunner also believed in the importance of the stimulus

presented by the external environment, however, they also emphasised the importance of culture to the development of children and an incorporation of culture into the everyday environments of children. Tilstone and Layton (2004) observe that Vygotsky believed that active construction of knowledge in children is achieved through discovery and curiosity. It is hypothesized that this can only be activated by interaction with the environment and people. If children are situated within an environment which does not actively engage them to be curious about their surroundings, then they would not learn by themselves. Since it has been established that child development is closely tied to sensory stimulation, the following chapters will deal with understanding the human senses and their importance to designing architectural environments which can actively engage children's learning processes and thus development.

Understanding the Human Senses

Perception refers to any process that allows us to gain an awareness of what is happening outside our bodies, around us in the external environment that we inhabit on a daily basis and according to the research of Bower

(1977); we have six sensory systems (Fig 3.1). The first five are: touch, taste, smell, hearing and sight and the sixth sensory system is considered to be a combination of the following: proprioception, hapticity, kinaesthesia and synaesthesia. Proprioception can be described as the sense which tells us where the mobile parts of our bodies are in relation to the rest of the body and hapticity is the sense as experienced through the skin, without



Figure 3.1: An image of the six sensory systems by Sally Augustin (Augustin, 2009: 37).

having to really touch anything. Kinaesthesia is the sense that allows us to experience the environment through the movement of our bodies, such as when we run through a field of flowers; we feel the wind in our hair and the rushing of air past us. Lastly, synaesthesia is a phenomenon rather than a sense and it can be understood as the transferral of sensory

information from one sense to another (Bower, 1977 and Isbell & Isbell, 2007: 12 – 13). All of these senses have the same surface structure, that is; the skin, which consists of specialised peripheral receptors that are connected to the brain by a network of nerves and this indicates that babies have fewer skin receptors than adults do. The most specialised skin sense is taste, but visual awareness creates knowledge of the processes of the world that cannot be given sufficiently by any other sense. In order to understand perception and our senses, it is important to comprehend how the human body works and acts in harmony so that people can see, touch, taste, smell or hear the world around them.

Gregory's (1990) research in the field of perception has brought about a significant understanding of the complicated processes that occur in the eye and the brain. He states that the patterns of stimulation on the retina's of the human eye allow people to see and perceive. The eye can be described as a camera which feeds the brain information through a series of electrical impulses and actually seeing objects requires many sources of information, including knowledge or memory of the object, person or place. This knowledge can only arise from memory and experience and this may also include other or all of the senses (Gregory, 1990: 17). The brain is an intensely complex organ and it is associated with memory, sensation, thinking and motor control of the limbs and sense organs. Vision starts with the retinas, which are outgrowths of the brain and visual representation corresponds with the brain's depiction of touch, so the senses of sight and touch are closely related, as we cannot touch anything accurately unless we can see what it is we are touching and where that object is placed within our spatial realm. Therefore, people who are blind have a very developed sense of touch as well as smell and hearing, as these senses become acutely honed to help that person to function in a world that is dominated by the visual experience. The movement of the eyes are essential to vision and there are two important light receptor cells in the eyes; the cones and the rods. The cones function only in daylight conditions and they give a person colour vision, while the rods work under low illumination and they give vision only of shades of grey. It is also an interesting fact to note that the eyes are separated by roughly 6.3cm and they receive somewhat different views and this is known as disparity, which gives a person the perception of depth (Brebner, 1982: 35 – 39 and Gregory, 1990).

Detecting movement in our surroundings is essential to human survival; therefore perception is basic to all knowledge and Hesselgren (1975: 193) stated that „A human being who is kept isolated from stimuli and thus, having no perceptions, cannot function“. Therefore, it can be said that kinaesthetic perceptions are important for our orientation in



Plate 3.1: Textured play spaces for children can enhance their tactile awareness and spatial experience (Weinstein and David, 1987: 135).

the physical world and these can be highly aesthetically evaluated, for example, a play sculpture can be seen as being visually interesting, but it can also be a tactile element which allows people to touch and feel the materials of the sculpture, enhancing the experience in a more tangible way. Tactile perception gives different materials expression through the spontaneity of feeling and these expressions can act to relay information of the external world, such as whether a surface is too hard or cold to sit on for a long period of time (Plate 3.1). This aesthetic attitude allows people to evaluate their perceptions in a positive or negative way and is especially important for babies. Each person in a space processes the available information they perceive differently and how people interpret what they sense is determined by what life has taught them in terms of what is important, desirable and useful (Baird and Lutkus, 1982).

All of our senses make a particular sort of contribution to our experiences of places. Scents and tastes have strong emotional effects on people, smells can help with cognitive or evaluative tasks and they also trigger associated memories. Tastes influence us psychologically through their links to smells. Sound allows us to have cultural associations to familiar musical forms and in that way, we can find personal meaning from music. What we feel with our skin affects how we perform particular tasks and this influences us at an instinctual level. Visual information influences how we analyse

things around us and these reactions are strongly linked to the culture of the viewer as Popow (2000: 1) suggests:

“Environmental psychology would surely, but not completely, confirm why people might behave in awe at the sight of the awesome vertical interior of a Medieval cathedral and perhaps the giant multi – coloured stained glass windows, the varied materials and textures on the floors, walls and ceilings and finer patterned stone detailing. Given these factors one would have to take into account the physical surroundings that assail the senses in any environment”.

Therefore, the effects of human sensory experiences are additive, which means that there needs to be a total of the various influences of each of the senses to determine a final psychological state.

The sensory processing capacity of an infant begins when it is in the womb and continuously develops throughout childhood. Each of the human senses develops at their own rates and both genetics and the environment influence sensory development (Isbell and Isbell, 2007: 14). The infant experiences a world in which the body and environment tend to fuse. Long before a child has verbal or visual expression, they develop a distinction between the inside and outside world which is discovered through a process of successful and unsuccessful transactions between the child’s body and the environment in which the child detects and responds to sensations emanating from the inside (coenaesthesia) as well as from outside the body (Said, p. 2). Bloomer and Moore (1977) stated that the human heart exemplifies the phenomenon of an internal landmark and it is referred to as the centre place and therefore a sense of centre is indispensable for the ordering of stimuli and an essential key to the psychic geography of our internal world. A sense of centre is a concept of musculature with all of its kinaesthetic associations and of orientation in response to the pull of gravity. Bloomer and Moore (1977) refer to basic architectural elements as being references from the human body. Columns can be seen as celebrations of the upright human stance, walls describe human territoriality and roofs serve to crown a building just like a human head crowns the body. The qualities that are thus invested by people in columns, walls and roofs gives a much deeper meaning to architecture. They also refer to the word aesthetics in architecture and explain that it comes from the Greek word *aesthetikos*, which means sense perception. This is an important statement to understand because we perceive everything around us with our

senses and our experiences are thus affiliated with sense perception (Norberg – Schulz, 1971: 10).

Therefore, in architecture, movement upward can symbolise growth, longing and reaching and movement downward can be a metaphor for compression, submersion and absorption, which even children can translate because it can be argued that:

“All architecture functions as a potential stimulus for movement, real or imagined. A building is an incitement to action, a stage for movement and interaction. It is one partner in a dialogue with the body. (Bloomer and Moore, 1977: 59)”.

A similar view has been championed by renowned architect Juhani Pallasmaa (2005) who argues that all of the senses, including vision, are extensions of the tactile sense and all sensory experiences are thus related to tactility. He states that in order for architecture to be life – enhancing, it has to address all of the senses simultaneously and allow people to



Plate 3.2: A photograph of a traditional palace in the city of Benin, Nigeria, which was constructed out of clay and mud (Dmochowski, 1990: 1.15).

fuse their image of self with their experiences of the world. During the Renaissance, the five senses were understood to form a hierarchical system from the highest sense of vision down to touch. This system of the senses was related to cosmology, vision was correlated to fire and light, hearing to air, smell to vapour, taste to water and touch to earth (Pallasmaa,

2005). Pallasmaa (2005) affirms that architecture is continually confronted with questions of human existence, expressing and relating man’s being in the world, to time, duration, life and death. Artistic impression associated with architecture is engaged with meanings that are incorporated and thus lived, by people, rather than simply being intellectually understood, such as the architecture of traditional cultures around the world, which was connected to the wisdom of the human body as they saw it. Structures which

were made out of indigenous clay and mud seemed to be reflections of the muscular and haptic senses of the human body (Plate 3.2). The architecture of these cultures was sensitive to the people who built and used those environments on a daily basis and their experiences were much more significant than those currently being experienced in the techno – cultural urban realms of many societies around the world. Architecture has lost its sense of realism and an image – conscious; consumerist culture has pervaded the essence of cities.

Pallasmaa (2005), Tuan (1977) and Wilson (1984) all express concern for the shift in contemporary architecture to target people’s sense of sight and how they view buildings. They believe that architecture has become concerned with the visual impacts of image and style, exhibited by consumerism and advertising and has thus lost the essence of appealing to all of the senses (Plate 3.3). Good architecture should offer shapes and surfaces which have been moulded for the *touch* of the eye thus enriching people’s memories and dreams, past and future into a combined, inspiring experience. A powerful architectural experience can silence

noise and focus attention on a person’s very existence and architecture should enable people to perceive permanence and change so that they can place themselves in the continuum of culture and time. Children and adults view the world in very different ways and this is due to the fact that adults have memories and associations with their environment, whereas to children, the world is an exciting and fascinating



Plate 3.3: A photograph of Times Square in New York City. Even though this is considered to be a landmark within the city, it represents a consumerist, image - oriented society (www.wikipedia.com).

realm to explore. For them, the world can be described as a large sensorial exploratorium, a place which feeds their imagination at every twist and turn. According to Christopher Day (2007: 12), children under six years of age learn mainly through experience and this comes intuitively to them. When children set out to play, explore, learn or experience, they recognize connections between objects, places, people and time and this allows them

to build unified mental images. The human senses complete impressions of situations and this includes moods and meanings and therefore children's thinking is inextricably bound to a sense – perceptible world.

With that in mind, Rudolf Steiner (cited in Day, 2007) proposes that people possess twelve forms of information: four will oriented, four feeling oriented and four cognitive senses. The cognitive senses are: language, thought, individual – spirit – recognition (identifying one's inner identity) and hearing. Will oriented senses include balance, movement, health as well as the sense of touch. Touch, movement, balance, taste and smell tell us how things affect us whereas hearing, sight and warmth give us information about the nature of things. It can therefore be stated that there are *direct* and *indirect* senses, direct senses are those which we use almost every second, touch, taste, sight, hearing and smell and the indirect senses are those which we don't think about all of the time, those being; kinaesthesia, balance and thought and the sense of synaesthesia which allows us to relate one sense to the other. The senses work in unison with one another and when a person is impaired of a single sense, such as sight, hearing or movement, the other senses become more active than they normally would be and this fact in itself is a testament to the flexibility of the human body to adapt to severe circumstances. When designing for children, architects need to take into consideration various aspects of the human senses and their relation to architecture and these have been summarised below.

Touch: The largest organ in the human body is the skin and it is the main organ for the sense of touch. Touching allows us to sense temperatures and differences between objects and materials, such as those that are rough or smooth, soft or hard and wet or dry. Our sense of touch profoundly affects our perceptions and has been shown to influence thoughts and behaviour and physical concepts such as warmth and hardness are amongst the initial feelings that infants develop and remember (Ackerman, 2010). For children under three years of age and particularly those with special needs, touch is the most critical sense as it is importantly linked to feelings and emotions. People truly comprehend and experience their environments through the use of their skin, which enables any form of tactility and moreover, the sense of touch is also linked to the other senses, through the skin. Proprioception and touch are related in subtle ways and

impairment of either can result in deficits in one's perceptual abilities. Kinaesthetic – vestibular stimulation is the coordination of balance and the movement of the entire body and the resulting sensation occurs primarily through the skin. It relates to the development of social responsiveness, fine motor reflexes, goal directedness in securing objects, problem solving as well as object permanence in terms of recognising objects which are outside the immediate sensory experience (cited in Altman and Wohlwill, 1978: 37). Niklasson and Norlander (2010: 328) acknowledge the importance of kinaesthetic stimulation to the development of movement and emotions, because it is considered to be naturally linked and hence, this type of stimulation is used in sensorimotor therapy on children, using stereotypic movements. Psychologists and physiologists use the term haptic or hapticity to describe the ability to experience the environment through active exploration.

The materials and surfaces that we encounter on a daily basis are experientially rich tools for establishing place identity and if they do not feel welcoming to the touch, they will

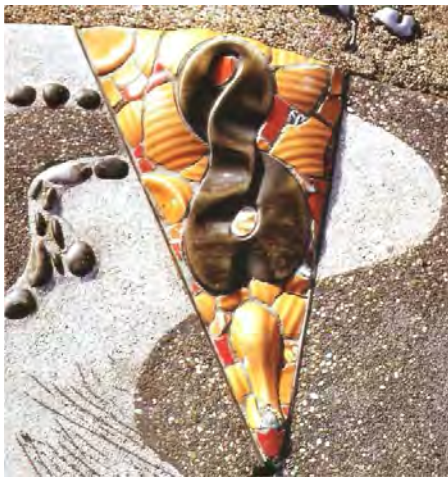


Plate 3.4: Textures on buildings can exploit tactile experiences (Keeler, 2008: 43).

not allow a person to feel comfortable, negating any positive experiences. The use of multiple materials can create a sense of confusion, especially to children and it is therefore important to consider the types of materials which are being used in buildings. This simple element can be used to exploit their tactile sensory experiences (Plate 3.4), thus allowing them to form connections to spaces and places and at the same time teaching them about the environments that surround them because, „(i)f deprived of loving, parental touch in infancy and with few chances to touch natural things, children can develop a

disturbed sense of touch“ (Day, 2007: 85). Children can be seen to naturally reach out and touch things and one of the observations noted is that they frequently taste objects with their tongue and this almost seems to be a natural reflex. Our sense of taste helps us to detect the flavour of substances, especially the food that we consume on a daily basis and it can also be considered as an extension of our tactile sense. The sensation of taste

can be categorized into four basic tastes; bitterness, sourness, saltiness and sweetness, but these contribute only partially to the sensation because the texture and smell of food also heightens the experience.

Smell: The sense of smell is a very direct sense and human beings can smell over ten thousand different types of odours (Day, 2007: 84). These scents can vary and they have



Plate 3.5: Smells can trigger certain emotions in children (Keeler, 2008: 44).

ill – defined boundaries as they are neither visible nor touchable. However, smell is an important tool for inducing emotions which are associated with particular memories; for example, a child might experience emotions of happiness when they smell a flower which could remind them of the perfume that their mother wears (Plate 3.5). Smells convey the essence of objects and things and how we relate to them and scents can play a more emotional and expressive role in our everyday lives. Since our sense of smell is

cognitively bonded to memory associations, scents could be used in architectural environments to pave new ways for learning and remembering. For example, people can use scents to navigate around buildings and studies (Augustin, 2009) have also shown that how buildings smell can affect the moods of the users. This can facilitate a higher sense of symbolism and personalization in architecture creating a more direct connection to people.

Buildings which are built of natural materials such as earth, stone or wood will convey smells of natural elements, whereas buildings which are designed of modern technologies such as steel and concrete can smell more industrial and clinical. Certain types of paints and materials used in buildings can produce smells which are slightly toxic and damaging to the human body and these should be avoided, particularly in buildings for children. Certain preschools and kindergartens around the world, such as Reggio Emilia preschools, Steiner schools and nature schools have used certain plants, building and

furnishing materials to create what Christopher Day (2007: 84) calls smellscapes. For example, the Schlitz Audubon Nature Preschool in Wisconsin is placed within a forest, prairie and wetland and their underlying philosophy is that young children need to positively connect to the natural world. Half of the children's class time is spent



Plate 3.6: The playground of a nature school (Keeler, 2008: 62).

outdoors, every single day (Plate 3.6). They are taken on daily hikes and encouraged to build homes and look after all kinds of animals. All of the building materials at this school are natural, blending in with the landscape (Keeler, 2008: 63). These smellscapes can be defined as areas in buildings which have defined smells and scents and this can allow children to create connections to their built environment, by actually using their sense of smell to create those particular experiences.

Human beings process smells and emotions in the same part of their brain which would explain why they have such a direct effect on our moods. Smells can be used to put people in good moods, change the way they think about their lives and alter the way that people's brains work in order to solve problems. People's sense of smell varies by ethnic group as well as by gender and in general, women have a better sense of smell. When people smell a pleasant scent, they feel more confident and can also feel as if they have been in a space for a shorter period of time, such as when we are waiting in a long queue. Pleasant scents can also be used to attract people to places, where they would then want to linger a little longer. These spaces can feel larger, cleaner and brighter.

This can be achieved through the incorporation of particular types of scents in the built environment. For example, lemon and jasmine scents have been shown to improve performance on mental tasks, while lavender improves performance on mathematical tasks. Peppermint improves the performance of physical tasks, by making them seem

less frustrating. This type of scent scape can make people feel less tired or rushed and sometimes they can believe that they are performing better at the task in hand. Lemon and cinnamon – vanilla can be particularly strong in lifting people's moods, while lavender or cedar can reduce tension. Smelling oranges, vanilla, jasmine, hyacinth, lime, rose and cypress have been shown to reduce anxiety levels. Scents that should be used to calm people down include lavender, rose, almond, pine, chamomile, sandalwood and spiced apple. Those that energize people include peppermint, lemon, basil, cloves, grapefruit and rosemary (Augustin, 2009). Integrating these and other stimulating scents into architectural environments can enhance the way people sense architecture and with careful design, it can be a useful tool to create particular moods in places or even form part of the wayfinding process.

Sound: Our sense of hearing is actuated within our ears and it is a sense which detects sounds or vibratory movement that is communicated through mediums such as air, water or ground. Biology and psychology work hand in hand to determine many emotional responses to sound. Predictable rhythms are relaxing, complex harmonies are invigorating and fast beats can increase energy levels. With sound, the relevant comparison in the human body is our heart rate, which beats 50 – 70 times a minute when we are rested and relaxed. Rhythms which are faster than this invigorate us as our heart rate synchronises with the beat of the sounds that surround us, beating at the same pace. It follows that our respiration coordinates with our heartbeat and we cannot relax when we hear an unpredictable noise because our breathing and heart cannot mimic it.

Sounds can greatly enrich a person's sense of space as well as their experiences in spaces. When we hear things, we don't normally see what we are hearing and sounds, just like smells and things that are touched, affect people's moods and emotions. As they are usually exploring their environments, children enjoy out of the ordinary sounding places such as tunnels, caves, echoing walls, naturally silent spaces or even pipes (Plate 3.7) that they can speak down, as these elements allow them to stretch their imaginations. Materials sound different, such as a tin roof and a tiled roof do, when it is raining. The size, shape and proportion of buildings also affects sound and studies show that confusing acoustics in rooms can reduce children's understanding and attention capabilities

(Spencer & Blades, 2006). Circular rooms, for example, concentrate sound and also give the visual impression of being socially desirable. Rooms and spaces which are soft



Plate 3.7: Children using the gutters to hear one another
(Keeler, 2008: 47).

furnished also tend to sound softer, warmer and moreover welcoming, rather than rooms which are hard, smooth surfaced and empty. In children's environments, noise can be a major source of social friction and evidence shows that it can induce depression and trigger violence (Spencer & Blades, 2006). Therefore, it can be argued that our sense of hearing is extremely crucial to our daily life and the way we perceive our surroundings and apart from the acute senses already

discussed, there are also indirect senses that are linked to our five main senses, such as balance and movement. Balance is undeniably and biologically linked to the inner ears, the eyes, skin receptors and other sensory receptors (muscle and joint). Movement of the body is uncontrollable without proper balance and these two aspects can also be translated into concepts in architectural compositions, which are intended to be related to the human body.

Balance: The inner ears have an important role to play in achieving balance of the human body, thus helping us to monitor the direction of motion. Balance refers to the steadiness that is achieved in the human body and lateral balance in children becomes fully established at around the age of seven. This so called finer sense is important as it challenges and stimulates health, alertness and physical and mental development. Balance helps us to locate our equilibrium in space and this gives us the possibility for different points of view within spatial realms and forms and it allows us to see the world in a distinctive way. It is therefore linked to individual identity and in that way balance is also connected to the structure and tectonics of building. If a building or composition

appears unbalanced in some way, people and particularly children, might feel uneasy and scared. Living and balanced architecture can be seen to induce living and balanced moods in people and balance does not necessarily have to mean symmetry in the case of architecture. Wilson (1984: 43) states that balance in architecture is directly affected by aspects such as colour, shadow and texture. Built environments for young children can be designed to afford them opportunities for exploring unrestricted movement of their bodies and Schneider (2001) maintains that developing good posture, body awareness and orientation is critical for the healthy development of children. Movement is inextricably related to balance and it is also referred to as the kinaesthetic sense.

Movement: The system of posture in the human body is based on the senses of balance and movement. Without posture, people cannot stand straight, move, sit or walk. Posture helps us to find our relationship to the environment in the sense that since we all have backbones with which to stand up straight, we all face the world straight ahead. This help to develop one's body awareness in space and this begins during the stage of infancy when reflexive movements such as sucking, biting and crawling occur. Schneider (2001) stated that „(a)s the child uses her surveying instruments – the senses of balance, self – movement and touch, she will build up a map of the space around her (spatial orientation) and of her own body in space (body awareness)“. Movement and posture in developing spatial orientation, helps children to recognise boundaries, thus stimulating their exploration capabilities.

It can also be argued that movement or the kinaesthetic sense, reveals people's internal character on the outside of their bodies, through the use of expressions such as dancing, smiling, frowning, running or even talking. Children unassumingly use movement to express how they are feeling, when they are happy, they leap into the air or hop about, or if they are upset and angry, they can beat tables or throw their whole bodies around. It is most important to understand that movement can be used to extend children's powers of expression, deepening their imagination and make – believe capabilities and ultimately their growth. It is a known fact that physical activity stimulates blood circulation and oxygenation, which encourages alertness and reduces the body's proneness to illness and infections. Studies also suggest that activities such as dance brings dramatic

improvements in academic learning, whereas television and video games makes children increasingly inactive (Day, 2007: 17).

With these thoughts in mind, it can be summed up that children's environments can be designed to support a wide range of movement possibilities for body and object control as well as self in space experiences. Surfaces, textural patterns and ambience within spaces can provide for exploratory movement as children are naturally curious. Aptly titled, The Little School in California is a three – classroom pre – school which caters for about 100 children. One of the unique aspects of this school is the S – shaped canted wall which is



Plate 3.8: The canted wall which facilitates a broad range of movement possibilities for the children (Mostaedi, 2006: 135 & 142).

made of studs and gypsum boards (Plate 3.8). This wall has random, punctured holes of different shapes and sizes and is an element which allows children to explore various movement possibilities. Children are inventive in their use of the wall and it provides a range of exciting experiences on a daily basis. The wall highlights how a simple aspect of architectural design can provide endless hours of fun for children but also teaching them about movement through spaces and encouraging them to use their upper bodies as they lift, pull and crawl themselves through the wall (Mostaedi, 2006: 134). Other elements such as lofts, fireman's poles, nets and ladders could be incorporated as exciting features into architectural spaces as they encourage lateral and horizontal movement.

Exercise and joyful movements can be good for treating mild depression and therefore the way that spaces flow, move and morph into each other can soothe, calm, entrance, thrill or challenge, providing multiple layers of opportunity for children. Balance and movement are therefore as important to consider as the five main senses and are not to be considered as being separate from them. Following the indirect senses, there are also finer senses which are not necessarily physically expressed, but they form a part of the entirety of the human sensory system. These will be discussed in brief, hereafter.

The finer senses: Day (2007: 96) refers to senses which he calls spirit revealing and these are: sound – music, language – meaning, thoughts and concepts and individual essence – build – human wholeness and his ideas on these senses follows on the initial writings of Rudolf Steiner. The development of these senses depends on the refinement of balance, movement and touch, which are related to people's sense of well – being. Each sense has different boundaries with multilayers of information, rounding off one's understanding of the world. Language – sense is particularly important to architecture as it relates to places and their languages of form, space, scale, colour, structure and materials.

Commenting on Day's idea of language – sense, Grange (cited in Seamon & Mugerauer, 1985) stated that there is a language to the human body and there would seem to be four elemental structures that the body uses in order to find its place in the world; posture, orientation, feel and comprehension. These structures comprise the way in which human beings establish place within an environment. The space in front of us therefore dominates our consciousness and our attention or participation is demanded by the environment before us. We structure our place through distance and this culminates in the act of orientation, so we know where we are. The knowledge of where we are, is rooted in our bodies in knowing that we can discriminate between the near and the distant object. Orientation helps us to structure our environmental feel and the word feel is used by Grange (cited in Seamon & Mugerauer, 1985) as both a noun and a verb. He intends for it to be used in both ways as he argues that the human body is both substantive and active. In this sense he refers to the backdrop which supports orientation. For example, to say that something is far away is to sense the vastness of the space; therefore we feel

vastness from within our bodies when we sense our own limits and their relation to the surrounding environment. Feeling allows us to experience a sense of place intimately and comprehension can be understood as a unifying of the above mentioned elements; posture, orientation and feel. This act of comprehension creates an ultimate sense of unity and this is what is characteristic of place. Comprehension is the reason why places always seem to have moods and the psychology of posture, orientation and feel is a pattern of meaning. It is also the reason why people are so different, in the sense that if a space seems cramped to one person, it may seem cosy to another which is therefore directly related to the human senses.

Ultimately, whether it is cities, or individual buildings, the human senses are an important element in helping people, especially children, to decipher their surroundings so that they can derive meanings from them. Architecture, just like any other art form has the ability to affect people's lives in a myriad of ways and it does so because we experience the built environment through our bodies and senses. All of the senses are related and connected in intricate ways to each other and places that are designed for people in mind become truly meaningful to them because these places would induce emotions in people, create memories and enhance their experiences.

Memory is often associated with recalling to the mind something which was learned at an earlier stage of life and this kind of description implies a conscious awareness of something from the past. It is an integral part of our existence and cognitive psychology has brought about a more complete understanding of memory. It is through the linkage of emotions and experiences that the process of remembrance (memory) comes about. Almost every person has childhood memories and it is what we experience during those formative years that shape who we are in our adult lives. The emotions that we feel on a daily basis mould our experiences which serve to inform us about the world, in both positive and negative ways. These experiences are hardened into memories which get recollected at various points during the life stage, in order for people to assess their various life situations. An example of this would be a child who gets stuck on a rooftop and cannot figure out his way down, he or she could incur a fear of heights from the experience. The experiences and meanings that people attach to objects or places can

change with knowledge, but all initial knowledge is relayed through our senses. The experience of a meaning is a factor of great importance within the total perceptual process and it is something that we add to perception spontaneously. For human beings, the meaning of objects has a practical purpose – they inform us about something in the environment. Emotion is used to indicate various feelings that people experience; fear, joy, anger, sorrow or happiness and there is almost an unlimited number of emotions and impulses. Our emotions play an important role in our evaluations and perceptions and these sensorial emotions are first awakened by sensations; for example, a colour composition that contains light and pale colours can be described as inducing feelings of relaxation and calm (Fig 3.2). Environments that are used and experienced by children are referred to as phenomenal landscapes by Moore and Young (cited in Altman and Wohlwill, 1978: 83). According to them, these phenomenal landscapes are composed of three interdependent realms of experience: the sociological environment of cultural

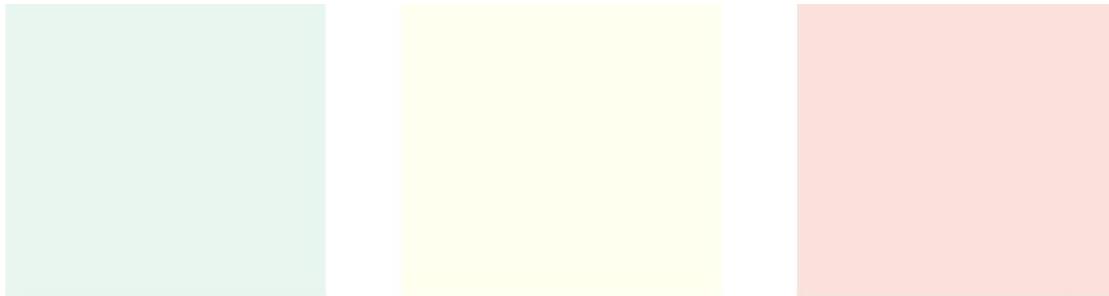


Figure 3.2: A relaxing pale colour composition (Source: Author).

meanings and interpersonal connections; the physiographic landscape comprising of spaces, people, objects, natural and built elements; and the environment of body and mind. This indicates a clear arrangement leading to the understanding that there exists a complex relationship between the human body, mind and the external environment. The perception of light seems to be more directly connected to the basic emotions than any other perception modality, as light can be linked to sentiments of hope and optimism. Emotion connections to colours are also psychologically influential and are dependent on the attributes of the colour such as where the colour is situated in the visual field as well as the kind of form that the colour fills. Colours are normally associated with certain emotions and some of these are connected to specific cultures and the architecture of places normally reflects this.

Relating to emotions and meanings in architecture, Sally Augustin (2009) refers to the term place science, which is a discipline that uses structured thinking to establish how the place we are in physically influences the mental state. She states that for every person there is one particular sense which is more dominant than the others and place science acknowledges this, allowing places to be designed in order to appeal to every person, however, this aspect seems to be very vague and irrelevant if designing for more than one person (Augustin, 2009). The way that information we get through our senses affects us emotionally is important because much of our behaviour is emotionally based and something we don't actually think about, at least consciously. Emotions control our life experiences and all places have an emotional influence. If a place provides psychologically contradictory sensory experiences, a person's feelings in that space will be determined by the conflicting elements. Places can also have behaviour rules and rituals associated with them and place design can encourage or discourage these behaviours. Augustin (2009) cites basic motives which she states propels human beings through their lives and all of these motives can be related to physical places, some more, some less and she argues that these motives should guide space design. These place science design motives are as follows:

- **POWER:** Places provide information, directly or indirectly and through this information, people can be influenced by each other. An example of this would be the cathedrals throughout the world that were designed and built to specifically instill an awe of God. Power in places can be subtle and it can also be brutally displayed, this depending on the type of emotion one wants to bring out in people.
- **CURIOSITY:** Spaces can help people to grow and develop by providing opportunities for learning and self – enhancement.
- **INDEPENDENCE:** Spaces can be designed to assist people in controlling their own destiny, thus enhancing a sense of independence. These spaces allow us to control and manipulate them in terms of use and access to other people or objects. The option to make a space private is highly desired by people, especially young children. When people can regulate their privacy in a space, being there can have positive psychological ramifications.

- **STATUS:** The design of spaces, the objects placed in it and how it is used communicates the relative status of its owner or owners.
- **SOCIAL CONTACT:** All humans need some form of social contact, even the most introverted ones. Uncontrollable social interaction can be very bad and makes people tense and panicky.
- **HONOUR:** Honour can also mean tradition in this case and places easily communicate how much people value their traditions. Even the smallest living space will include places for keeping meaningful objects.
- **IDEALISM:** Certain places may be imbued with symbols which convey a sense of people's ideals.
- **PHYSICAL EXERCISE:** Physical exercise has been proven to have great significance for people and the way that places are designed can encourage them to partake in physical exercise, even if it is something as simple as just walking through an interesting garden.
- **FAMILY:** Homes help people to raise children and thus connect to family. All of the spaces within homes communicate important information to the family and about the people who use them. People's approach to tradition also comes into play here as it determines what they value and how they want their families to live.
- **ORDER:** People tend to like order to their lives and spaces should be designed to allow them to achieve this.
- **ACCEPTANCE:** People communicate their desire for approval in spaces by following the social conventions of groups that they want to accept them.
- **TRANQUILITY:** Place design can help people to reduce stress and tension by providing spaces for restorative opportunities (Augustin, 2009: 16 – 18).

Well – designed places can be defined in psychological terms. They enhance life experiences, provide people with energy, support their need to communicate with other people and allow for private, quiet moments. In well – designed places, people achieve their concrete and psychological goals. These spaces put people in the mood for the activities that they engage in, whether they are in the company of others or by themselves.

Wolfe (cited in Altman and Wohlwill, 1978) examines the concept of *privacy* in people's lives and how the environment serves to fulfil various levels of privacy. She argues that privacy is a way of enhancing and protecting the self and the environmental facet of privacy is composed of three elements which traverse the boundaries of meanings connected to experience. Firstly, culture within societies plays a defining role in shaping



Figure 3.3: Hideaways and niches provide spaces for children and people to have privacy (Day, 2007: 18).

privacy situations of the individual. Secondly, the environment itself can be seen as being critical to shaping human behaviour and thus privacy situations. Lastly, the limits imposed on privacy situations will differ throughout a person's lifespan depending on cultural and sociophysical conditions. Thus the concept of privacy and its invasion are closely linked to the experiences people have during given circumstances. Since the early years of childhood are critical to the formation of identity, the experiences during these years allow children to

understand what they are capable and not capable of doing. A child's development is intimately tied to the process of separation of that person from the social and physical environment (cited in Altman and Wohlwill, 1978: 183). Simply stated, children need to form a sense of themselves, in order to have a meaningful understanding of the world and complex social relationships. Such psychological separation requires that a child experience aloneness or privacy in some form (Fig 3.3). However, in order to prevent negative experiences, volition; or the desire to choose privacy, should be present so that a child can decide when and how they want to be alone instead of being forced into it, not necessarily by other people, but also by environmental design (Fig 3.3). It can be assumed then that the emotions people feel in places becomes an important factor in their actual experiences and for children this is a crucial factor. If a space or place scares them, they would not want to use it and architectural environments should be designed to be child friendly and welcoming to their emotions and ultimately their senses and

experiences. The human body is capable of understanding and relating to various aspects of architecture such as patterns, designs and structures. Now that we have an understanding of basic perceptual processes, their relevance to designing (for children, specifically) will be outlined and analysed. Since psychology in architecture is a broad field of theory and research, only various aspects will be looked into for the purpose of this research, these being; colour, light, patterns, textures, architectural forms, types of spaces, architectural details and external play environments (including natural ones).

Architecture and Child Development

Early childhood is the most rapid stage of development in the human life cycle and the years from birth to eight years of age are critical to ensure the complete healthy cognitive, social, physical and emotional development of children. Hence, early childhood is when the environment actually has an important impact on determining how a child grows and develops, as Cook and Cook (2005) suggest:

“Piaget believed that extensive interaction with the environment is absolutely essential for each person’s cognitive development. Though Piaget acknowledged that biological maturation sets the limits within which cognitive development occurs, he placed much more emphasis on the role of the environment (Cook and Cook, 2005: 6)”.

Hart and Moore (cited in Downs and Stea, 1973: 259 – 261) propose that there are three forms or stages of development – sensorimotor (active), perceptual and conceptual. The sensorimotor stage begins when a child is born until two years of age and it is during this period that a child develops into an organism capable of coordinated actions and thoughts. After this, from the ages of two to seven, children are defined by intuitive thought processes, which allow them to represent the world using symbols. Between the ages of seven to twelve, they begin to have logical thought and are thus able to differentiate and understand dissimilar points of view. The final period, from eleven to fifteen and beyond marks the transition into higher forms of intellectual development. This research concludes that „the representation of space arises from the coordination and internalization of actions“ (Downs and Stea, 1973: 261). Thus, acting – in – space is what supports a child to build up his or her knowledge of that spatial environment and its qualities. Understanding the various stages of child development and how they relate to

the environment of the child is essential in creating spaces that meet the needs of children because this can have a direct impact on the architectural resolution.

New – born babies have few memories and probably no thoughts about their futures. Perception is less useful to babies as they cannot control it like adults do. At birth, babies have a very efficient visual system which allows them to register useful information. Baird and Lutkus (1982), Bower (1977) and Day (2007) stated that a baby’s initial visual experience is three – dimensional and not perceived as a flat picture; therefore they can pick up the position of objects as well as changes in the position of objects in space. New – born babies also seem to be able to detect the differences between emptiness, hardness and solidity and this is a clear indication that their perceptual world is unified and has varying degrees of inter – sensory synchronization. In Bower’s research of the perceptual world of babies and children, he raises the point that babies can recognise identity between him/herself and the people who take



Plate 3.9: A balancing beam at a school provides children the opportunity to engage their senses and learn about their bodies through balance and movement which is activated by their interaction with the environment (Kroner, 1994: 9).

care of them and this shows that babies exhibit a predilection to behave in a particular social manner during their interaction with other humans. Children learn about their environments through the use of all of their senses and their perceptual system grows more and more competent during the period of infancy. Piaget (cited in Weinstein & David, 1987) described the first period of intellectual development as the stage within which infants deal with experience primarily through their senses and the capacity to move their bodies through space. It is assumed then that environments for children under three years of age should encourage complete movement of all limbs (Plate 3.9) and these experiences can be enhanced if the environments are sensorially rich and varied. Since

motion permits children to locate themselves freely in space, assume different body positions, create their own boundaries and fulfil potential, the ideal environment should conceive of all surfaces as an invitation to move in ways which would give motoric aptitudes their fullest reign. Adults can classify buildings and spaces as libraries, museums, kitchens or lounges, but children see these differently; rooms and spaces can be a forest full of dinosaurs or a sea full of dolphins because their imagination and creativity allows them to transform spaces into their own little worlds.

Day (2007) stated that the experiences of growing up in predictable environments that are filled with character can create personal identity in children as well as place identity and emotional security. However, predictable environments can sometimes be unexciting for children and this means that they cannot be filled with a character which is easily identified by them. It can then be assumed that by using the word predictable, Day could be referring to environments which are safe and legible. Architectural environments which are safe and legible yet stimulating and flexible can be special and character – filled to children of all ages. Very young children see everything as a unified image and they tend to bestow emotional qualities to places, using their environments to understand themselves and their social standing. Three to five year olds can distinguish place – mood meaning, four to seven year olds are interested in how places are used, eight to nine year olds incur a sense of place and thirteen to fifteen year olds start to consciously give the aesthetics of their surroundings value (Day, 2007: 190 – 203). Once children become aware of their individuality, they inhabit a world between themselves and their environments, between fact and fantasy and this is where the designed environment can play a role in shaping creative and flexible thinking as well as individual identity. Imaginative fantasies help children to organize thoughts and feelings and moreover, fantasy is full of symbolic meaning, which is a crucial element to children’s intellectual and emotional development. An example of this is the Or – Akiva Kindergarten in Caesarea, Israel which is a building whose design principles were based on historical and mythical fairy tales. Knafo Klimor, the architects, stated that kindergartens should provide an environment which creates an imaginary world, where children can receive physical and social exposure to the world. They have thus employed geometry, colours and images to evoke associative meanings in the minds of the children. The architectural



Plate 3.10: Images of the Or – Akiva kindergarten (Mostaedi, 2006: 298 – 299).

symbolism is a representation of three elephants traversing the dunes of Caesarea, reflecting the region’s ancient history in a place which is close to the archaeological site and ancient Roman city of the same name (Plate 3.10). Therefore, the images of the three elephants suggest a point of departure for the children to extend their perceptions through the meanings permeated by the architecture (Mostaedi, 2006: 296).

With imagination being a factor to consider, sterile buildings and rectilinear rooms have the idea of fantasy sucked out of them and do not in any way encourage children to play creatively. Adaptability in buildings and outdoor spaces increases the potential for creative play. For small children, solid buildings can emphasize a sense of security whereas steel buildings, which look lightweight, are better suited to teenagers (Plate 3.11). Surroundings that are rich in experiential possibilities for children can increase their resourcefulness as contradiction and challenges are essential to their developmental



Plate 3.11: Buildings constructed mainly out of steel and glass appear lightweight and are more suited to older children as younger children feel more protected in solid – looking buildings (Kroner, 1994: 18).

needs. Decipherable architecture, particularly for disabled children is vital, because they should not feel or get lost in any part of a building; spaces should be designed to flow well into each other, otherwise, the environment can be perceived to be confusing. Architecture that is legible and easily assimilated is also associated with different moods and character that is created. Mood individuality in spaces can convey a certain identity which can be related to function; cosy and warm, spacious and airy, soft and quiet or light and open. Distinctiveness in places is essential for identity and building character but a lack of coherent unity can lack harmony, making children feel disjointed and insecure as they cannot understand or „decipher“ their surroundings. Creating a sense of spatial unity in buildings is more about form – generators and building materials.

Day (2007: 22) refers to the process and concept of metamorphosis as having a similar train of thought, where one principle can manifest itself in different yet related forms. He argues that metamorphic variation guarantees visual unity which is meaningful, thus

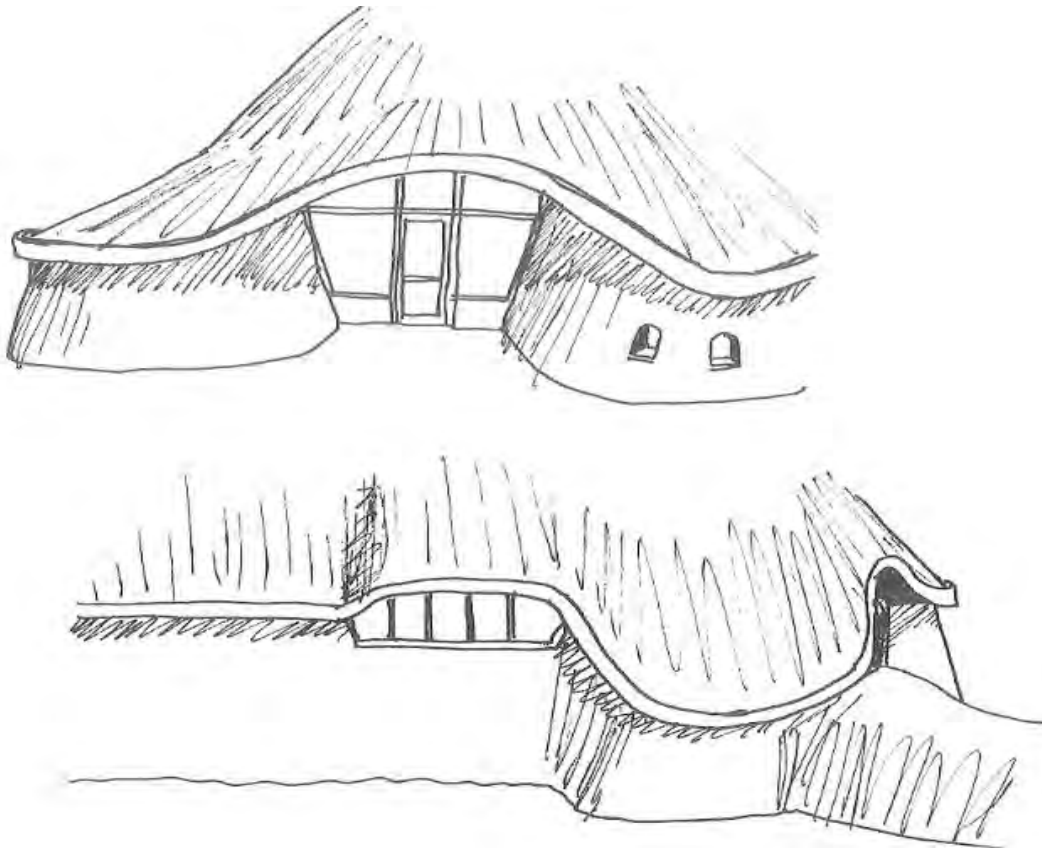


Figure 3.4: Christopher Day's impression of metamorphic variation translated into building design (Day, 2007: 23).

strengthening coherence and identity which ultimately supports children's feelings of security (Fig 3.4). Day also confirms that defensible space measures can have a significant effect in making outdoor areas feel safe for children (Day, 2007: 31). Courtyards or atriums at the centre of buildings links everything practically, making the image of the whole seem more intelligible. Internal courtyards can be designed to be used for concerts and plays rather than having a separate building or room for that particular activity, one which hardly gets used. The more flexible buildings are in terms of movement patterns and room activities, the less institutional they feel (and look) and flexibility is a critical component to consider. Buildings which look inviting and interesting reflect values of pride and this can make children feel as if they are worth something, especially those who are disabled.

Adequate development depends on self – induced experiences which give children feedback about the consequences of their actions upon materials and their movement through space. Somatosensory stimulation can improve the perception of form and space in children with learning disorders. Textured and malleable elements may be critical to these children developmentally, therapeutically and aesthetically. Olds (cited in Weinstein & David, 1987) stated that the success of many child settings is proportional to the variety of spaces that can be created within the four walls of a room. As a designer, it is important to note that the level of engagement in activities which enhance a child’s development is directly affected by architectural spatial definition and overall size and scale. Children are agents in their own development and the environment should be designed to allow children to be in a constant ebb and flow of activities which stimulates and enhances their development. The cognitive development of children is a function of



Plate 3.12: A stimulating play environment which allows for a variety of possibilities, at the Nido Stella Nursery School. The colours used are not too stimulating and all of the furniture is child – scaled, creating an environment which is fascinating and exciting to children. Innovative skylights enhance the children’s imaginations (Mostaedi, 2006: 111).

the total ecological environment within which the child has been placed. Qualitatively different areas for conflicting activities such as messy versus clean can make a space more manageable, interesting and interpretable for children. Every space should have its own mood to match the level of activity and physical energy. The Nido Stella Nursery

School in Modena, Italy was designed with the intent of creating an environment which was rich in its atmosphere and character because the architect's believed that it would enhance children's learning as well as their sense of identity. One of the main goals was to create a rich sensorial environment hosting a wide range of colours, materials, surfaces and types of light (Plate 3.12 and 3.13). There is a central piazza to the school and the classes are subdivided into a mini workshop, a resting zone, a soft zone, an engine zone, a building zone and a work desk zone. This allocation of zones indicates a high degree of separation of activities, so that they bleed into one another and allow the children ease of access, control and allowing them visibility of every part of the interior spaces, as well as adaptability within the various spaces provided (Mostaedi, 2006: 104).



Plate 3.13: Interior spaces of the Nido Stella School, showing the range of sensorial capabilities in the spaces provided (Mostaedi, 2006: 110 & 113).

It was stated, at the beginning of this chapter, that the early years of a child's life are the most important to their development. Many urban and suburban children spend their days in kindergartens or child – care centres and these environments become their macrocosms of cognitive, physical, emotional and social development. Mark Dudek (1996) speaks about the architecture of kindergartens and schools and he explains that the word kindergarten is derived from the notion of the school as a metaphorical garden and this alludes to the idea of children as unfolding plants which is what they can figuratively be thought of as being. Dudek mentions the child development theory called high/scope

which he says is based on the idea that children learn best from activities which they plan and carry out themselves (Dudek, 1996). With this in mind, the functional level of the environment is crucial in the support of activities as it defines the spaces within which the children may feel safe and secure in order to develop their games.

There are various meanings that are associated with kindergarten architecture. For example, the entrance area is a symbolic transition and a psychologically important point



Plate 3.14: A well – defined entrance is an important symbolic transition for young children (Dudek, 2000).

where child – parent separation occurs and therefore it should be caressing and inviting to children of all ages (Plate 3.14). The psychological concerns of the growing child can be reflected in the architectural environment so that it generates its own programme which is in tune with the complex aspects of child development. In terms of children who are in psychological therapy, secret hiding places and the idea of treasures has an important symbolic relevance as it helps them to isolate themselves from the world and create their own world where they can feel in control. According to the research of Spencer and Blades (2006), learning

environments can have a big impact on the development of children and they suggest that there are two interacting elements which can strengthen the environment’s contribution to education. One is the architectural facility and the other is the arranged environment. The architectural facility provides settings for the interactions between people, objects and materials in the space, thus organizing access to external spaces and resources. It is easy to understand that the organization of the architectural facility forms the framework to establish the arranged environment. Physical and spatial aspects of a learning environment convey symbolic messages about what is expected to happen in a particular place. When circulation patterns surrounding activities is not clear, disruptive behaviour may occur amongst the children as they become confused and irritable about how to access another activity. Rooms or spaces which are acoustically dead are easily just as

bad as noisy ones and the effects of noise on children can be harmful, causing them to lose concentration. Research indicates that excessive levels of noise can influence stress, blood pressure, cognitive task success and feelings of helplessness (Spencer and Blades, 2006: 96 – 97).

Following this, Edward's (cited in Dudek, 1996) and Moore's (cited in Weinstein & David, 1987) research focused on the effects of open – plan versus closed – plan facilities in child – care environments and their findings is an interesting contribution to the understanding of the relationship between spatial flow and child development. Their outcomes showed that closed – plan child care facilities had more noise distractions and less structured activity patterns. The best overall solution, according to them, is modified open – plan facilities or spaces (Plate 3, 12). This refers to the organisation of space into a multitude of large and small activity spaces that are open enough to allow children to see the play possibilities available to them while also providing enough enclosure in order for the children to feel protected from noise and visual distractions. Moore (cited in Weinstein & David, 1987) refers to an experiment he conducted to understand the effects of spatial arrangement. He rearranged furniture and introduced more shelving and raised platforms to act as partial or full partitions. The result was that the children used the space much more enthusiastically and thus exhibited a range of behaviours and were less fidgety. They also showed less passive behaviour as well as more object manipulative behaviour because they could understand how to use their environment in a way which seemed much easier to them. He suggests that the degree of spatial definition can be measured in the following ways:

- Degree of enclosure in each room or area as well as visual connections to other activity/behaviour settings.
- Degree of appropriateness of the size of activity settings and the amount of work surfaces and storage.
- Degree of concentration of all resources in the settings that pertain to one activity.
- Degree of softness and flexibility and the availability of a variety of seating and working positions.

- The amount of resources available for the children's creativity (cited in Weinstein & David, 1987).

Similar research to Moore, carried out by Elizabeth Prescott (cited in Weinstein & David, 1987) also shows a direct association between spatial quality and behaviour in children. She assesses a number of child care centres in America and found that those which rated with a high spatial quality affected the children positively as they were found to be more involved in activities and teachers also spent more time on fostering social interaction. Prescott's environmental assessment looked at the following aspects of physical space as being the most vital in creating well – defined, child centred spaces:

- Organization to have clear and appropriate paths within spaces.
- Variety of activities within a setting.
- The potential that a setting and its props offers for manipulation and alteration.
- Special problems such as lighting, sun, shade, noise or even dust. Poor links between indoors and outdoors can create chronic problems (cited in Weinstein & David, 1987).

The presence of soft materials such as rugs, pillows, sand, mud, grass and paints generates opportunities for messy activities and feelings of body containment in children. She most importantly argues the fact that planned environments do not permit children to become attached to places, things or adults. Rather, the complexities of the everyday world are mastered by children as they watch, ask questions and absorb knowledge by imitation and experimentation. Thus, planned environments should increase the opportunities for children to explore and experiment naturally and safely. These environments also need to be carefully considered in terms of their overall aesthetic values as well as the messages and meanings they convey. A successful architectural composition should allow for all of these aspects to work in harmony with one another. Places which emanate messages of value, identity and responsibility can induce similar attitudes in children, whereas uncared, rundown places do the exact opposite. Bullying in children is a common issue in many schools around the world and this type of behaviour can scar children for life. This occurs when children are crowded into spaces, bored or

out of adult view and that it could also occur as a result of insecurity in the child who is being the bully. Therefore it can be argued that bullying can be reduced by creating more space and implementing defensible space measures so that there are no unsupervised areas which could provide opportunities for aggressiveness to occur. Buildings which portray images of fortresses and institutions and which seem powerful to children should rather be child – friendly and harmonious to reduce aggressiveness and feelings of dominance (Plate 3.15). Buildings can perpetuate ideas about how children learn, what they learn and how they are taught.



Plate 3.15: Buildings which are designed with children in mind emanates an identity which enhances children’s experiences. Fortress – like buildings are unsuitable for children and do not stimulate their development or growth in any way (The Images Publishing Group, 2004: 34).

Buildings can also convey subtle messages to children about what is important and what is deserving of respect. This is particularly important in an age where education is viewed with a certain degree of contempt. The underlying assumption of the Reggio Emilia approach to school design is that space matters enormously and these schools reflect the vision of those who inhabit it. The system recognises that children are born with a natural sense of exploration and that they learn about the realities of the world through the use of their senses. Community oriented projects also form a part of the core of the Reggio system and there is always a community space at the schools which allows

the parents to participate in some of the children's activities. This in itself is important as it allows the children to sense a crucial symbolic message; that of wholesome communities. For example, The Diana School, designed in 1968 was done according to the Reggio Emilia approach. A space at the centre of the school is similar to a city's piazza and is a reflection of that key element in Italian towns and cities. All spaces open out onto this piazza and its concept is the provision of a place where social interaction



Plate 3.16: Images on the left – glass walls used to extend the relationship to the outdoors and image to the right – an interior view of a well-lit classroom at the Diana School (Sanoff, 1994: 17 – 18).

and exchange of ideas occurs. The atelier or studio of this school is a key space where children explore ideas through the medium of art and the atelier is a major component of the Reggio Emilia approach. Light was seen to be important to the design of the building and is thus brought into the building through the use of large glass walls (Plate 3.16) and an atrium (Sanoff, 1994, 15 – 19).

There have been many theories about the psychology of space and its impact on people and as the above theories have pointed out, it is extremely important to take this into cognisance when designing for children. Children are innocent, being born with having no experiences of the world and are thus easily influenced. If this is taken into consideration, spaces and buildings can be designed to cater for their development in an active and exciting way. If buildings become their third teacher, so to speak, then architecture would take on a heightened role to them and become a medium for child development. Buildings also have the capacity to be designed so that they teach children

about nature, conservation and local sustainability, as well as informing them about their cultural identities and heritages, affirming a sense of community and identity. This would go a long way as children would carry these attitudes into their adult lives and they would expectantly have positive impacts on society. Architecture for children is thus very important in this day and age and should be carefully considered. Following this, various aspects of architectural psychology which can be applied to buildings for children, will be discussed and analysed, beginning with legibility of architectural environments and how this can be structured through orientation, wayfinding, colour, shapes, forms, patterns and materials.

Legibility, Orientation and Wayfinding for Children

People and animals use their senses and acute abilities to organize their environments and thus find their way around them. This is a fundamental aspect to human life and the need



Plate 3.17: The city of Paris is an example of an ordered urban design which is full of symbols and landmarks which signify the collective meaning of the place and people (Cameron, 1991).

to recognize and document our surroundings has a practical importance to all individuals. An ordered environment can serve as a form of reference to people, providing the material for symbolism and the collective meanings of a place (Plate 3.17). Cities are the powerful symbols of people and diverse societies and their designs can have strong meanings, becoming extensions

of the vividness of the world that we live in. Kevin Lynch (1960) stated that if a city environment is visibly organized and sharply defined, then a person can inform it with meanings and connections. He postulates that paths, edges, nodes and landmarks are the building blocks to forming a defined urban fabric. These elements are concerned with the organization of lines which connect parts of the city as well as lines of reference which link buildings and spaces. These lines of reference can be site lines, directional flow of movements, organizational axes or building edges and they form a system of linkages

which allow city patterns to be read as a continuous system, where spaces flow easily into each other and there are clear transition zones between buildings and spaces (Lynch, 1960). In order to gain a better understanding of Lynch's theories, the elements of paths, edges, nodes and landmarks are summarised below:

- Paths are the channels along which an observer moves and they are the predominant elements of a city in people's images. People use paths to move through the city and therefore observe it, thus they need to be placed and arranged in such a way to allow for a visual coherence to the city form.
- Edges are linear elements which are not considered to be paths by an observer and they act as boundaries, such as edges of developments and walls. They perform the function of lateral references to people and are not as dominant as paths. Some edges may be barriers, more or less penetrable and they act as organizing features for people who see them as holding together pieces of areas.
- Nodes are the strategic points in a city which are the intensive focus for an observer. They can be junctions, breaks in transportation, crossings or convergence of paths or they can simply be concentrations which gain a sense of character. These nodes can be the focus of an area and they could stand as symbols for something that is particular to a city.
- Landmarks are also points of reference, just as nodes are and they are also symbolic gestures representative of a city; however the difference is that they usually cannot be entered into and are of a much grander scale than nodes (Lynch, 1960: 47 – 48).

Paths are proposed to possess kinaesthetic qualities and the sense of motion along a path can produce an unforgettable image and visual perception is a key element to this, therefore, placing objects along a path can heighten a person's experience. A series of focal points combined together can create a strong image for a city, town, area or site. Nodes can stand as symbolic of something and they are also related to paths, as paths converge into nodes. Strong physical forms are not essential to nodes; landscaping or urban detailing can provide enough significance. Introverted nodes or squares can have little directional sense and extroverted nodes can have a clear sense of direction and

connection. Landmarks are physical objects such as buildings, structures or natural landscapes and being another type of reference, they can be located within nodes. They can symbolise direction and are used as clues for identity or even symbolism and can vary in scale. A sharp separation of paths from main nodes or elements can cause confusion and path intersections should be well designed to lead to destinations. This can be achieved by the termination of an axis or path with a well – defined element, such as a clock tower or the high point in a building. People make decisions at nodes and these should be well designed and defined as points of reference in people’s movement routines.

These elements of the linkage theory are proposed to be applicable to the design of micro environments such as buildings and are seen to be important in buildings especially designed for children. Since small children constantly need reassurance, architecture needs to be easily legible to them to avoid feelings of confusion or making them think that they are lost. This is where the elements of paths, edges, nodes and landmarks come into play. They can be effective in helping children understand their surroundings so that they can navigate through them effortlessly. Kinaesthetic and perceptual experience is important to the understanding of landmarks in order for people to remember them. Small children and disabled people who easily identify landmarks and their locality boundaries may have trouble understanding the spatial connection between them if this aspect is weak in design. Blind people form spatial concepts which help them to further their sense of navigation within space, through the use of tactual maps. These help them to locate landmarks within the environment and some even use the sun to find their way around (Tuan, 1977: 75). Therefore spatial skill and orientation within the architectural environment is directly influenced by the clues picked up through the senses, especially for people who have been disabled and Tuan (1977: 30) states that a child who is three years of age can recognise landmarks in space, no matter how small these landmarks are. For the disabled and all people, for that matter, the concept of wayfinding has been a major problem in many buildings because, „(t)he built environment is responsible not only for physical but also for psychological barriers“ (Arthur and Passini, 1992: 10).

Siegel, Kirasic and Kail (cited in Altman and Wohlwill, 1987) examine the concept of wayfinding in architecture and its importance and relevance to children, in particular.

Their findings suggest a conclusive link between wayfinding and the figurative drawing of cognitive maps. Cognitive maps or spatial representations are constructed on a foundation of successive activities or experiences and perceptions that emerge from this. Baird and Lutkus (1982) and Siegel et al (1987) stated that landmarks and routes are predominant in children's cognitive mapping and route formations are defined when a significant landmark has been identified (Plate 3.18). Therefore, it can be assumed that the underlying process of spatial representation is the same for children and adults. Since the purpose of natural



Plate 3.18: A decorative tiled wrap – around element in this school is an easily identifiable visual and tactile landmark (Dudek, 2000).

cognitive maps is to allow a person wayfinding in large scaled environments, it can be assumed that such a process would work equally well in micro environments designed for children, specifically blind children (cited in Altman and Wohlwill, 1978: 223 – 227). Most importantly, cognitive mapping allows a person to plan and execute actions and events much more easily and efficiently. The identification of landmarks increases as children develop but this is insufficient for the construction of cognitive mapping unless there is an identifiable way of getting from landmark to landmark. Routes or paths are thus sensorimotor modes of access from one landmark to another and they hold the spatial representation together (Pick and Lockman, cited in Baird and Lutkus, 1982).

Wayfinding, legibility and orientation can be achieved successfully in environments for children and the blind, if the above concepts are applied with careful consideration. However, they need to be enhanced in their capacity to actively engage the user in understanding their specificity and intentions for direction. Legibility in architectural

environments is defined as buildings and spaces that are easy to identify in terms of their uses. For example, monotonous rows of buildings in schools are not clear frames of reference to children and thus portray an institutionalised image to them. Studies (Arthur and Passini, 1992: 37) suggest two factors that determine architectural legibility which enhances people's memories of buildings and they use these factors as significant landmarks to navigate around the urban realm.

- Firstly, the form of buildings, including size, shapes and architectural uniqueness.
- Secondly, visibility, access and ease of movement around a building.

Wayfinding is important to consider for the blind and deaf (Salmi, p. 3). Signage plays an important role, however, for blind people, it would not be particularly useful. Passini and Arthur (cited in Muhlhausen, p. 1) describe wayfinding as a process which involves people solving problems in architectural and urban spaces by formulating a plan and executing it, as Tinnish (2007: 2) suggests:

“Wayfinding is the process of using spatial and environmental clues to navigate through an environment. Properly designed, a wayfinding system integrates with the surrounding architecture, landscape, interior design and lighting, making it easier for people to access and understand the environment (Tinnish, 2007: 2)”.

Wayfinding design can have a major impact on all users of the built environment, affecting their emotional state and involving issues of accessibility and safety. Design of built environments should allow people to detect logical movement patterns and signs cannot be an alternative aid to poor design because wayfinding involves a clear understanding and manipulation of spaces. However, people should not be bombarded with too much of information because they might not be able to process it. Blind people use their senses of hearing and touch to navigate around environments by perceiving sound sources in the environment or perceiving sounds produced by cane – tapping and lastly, by perceiving sound that is reflected by certain objects in the environment, which is called echo – location (Arthur and Passini, 1992: 36). However, if there is background noise, it can be disorienting to a blind person making it hard for them to localize sound sources. For people in wheelchairs, their wayfinding abilities might be hindered by inaccessible control panels to lifts, stairs, steep ramps and heavy doors. For example,

signs which are located up a flight of stairs are useless to the mobility impaired if these signs are not duplicated at the bottom. Besides the use of sensory clues and signage, the planning of spatial layouts is the first step to ensuring successful wayfinding. Arthur and Passini (1992) cite three phases of spatial planning that can be implemented for wayfinding purposes and legibility of environments:

- Identification and distinction of different spatial units. Distinctiveness of each spatial unit can be achieved through the incorporation of architectural elements.
- The grouping of these spatial units into destination zones.
- Lastly, organising and linking these units and zones using paths and landmarks. Form and circulation are intricately related, influencing each other and circulation systems are composed of paths, cores and axes. These can be designed to create focal, concentric or spiral circulation systems (Arthur and Passini: 1992: 85 – 89).

The articulation of paths (Fig 3.5) is the most fundamental aspect to wayfinding and they can be enhanced by the use of textured materials, columns, light, vegetation, water and structural or decorative elements on walls or doors (Fig 3.6). Subtle clues in the design of paths can indicate whether they are public or private and the scale of paths can also indicate this. Markings in paint or tape can draw attention to potential hazards but these can fade and disappear over time.

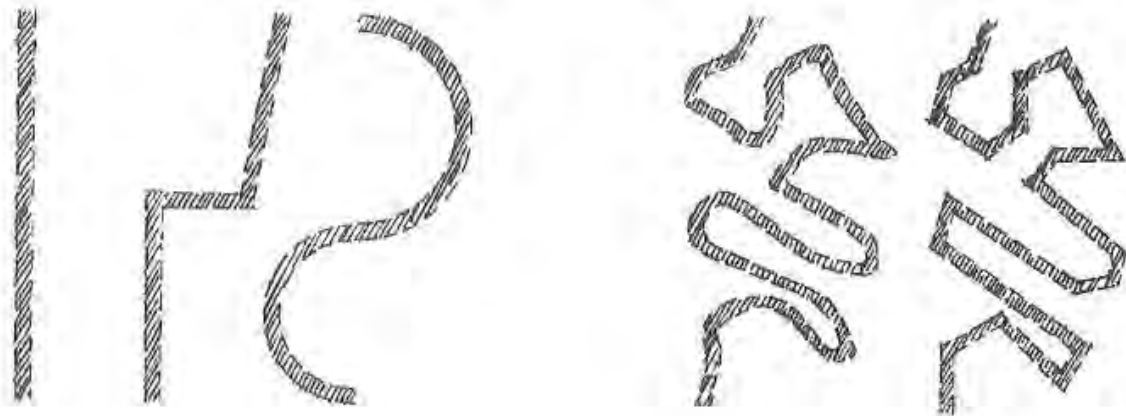


Figure 3.5: Ordered and random paths used in spatial organisation, all of which have different effects on people's wayfinding capabilities. Ordered paths are easier for the blind and those in wheelchairs, while random paths might prove to be more difficult. However, random paths can also be exciting and not as monotonous as straight paths (Arthur and Passini, 1992: 90).

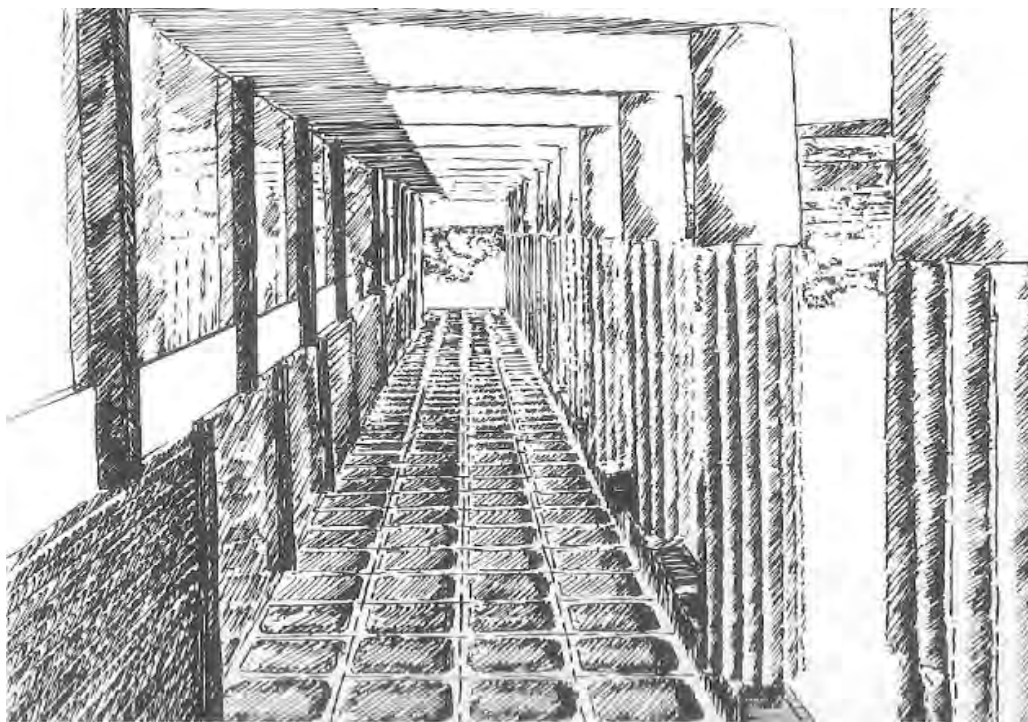


Figure 3.6: Articulating paths using different materials and textures (Arthur and Passini, 1992: 129).

Blind people using canes do so by following shorelines and trails in the paths, such as curbs and paving. These prove to be efficient in helping them to find their way around. Architectural wayfinding clues that are well executed can furnish a person's cognitive

map quickly and with ease. These clues can be limitless in their design capabilities but some of these clues, according to Muhlhausen, include:

- Defined arrival and exit points.
- Convenient, accessible parking and the location of paths close to the main entrance.
- The use of landscaping to further define entrances and certain parts of buildings.
- Consistency in lighting and finishes on all public corridors.
- Situation of memorable landmarks (including audible ones, such as water fountains) at intervals of movement through public pathways and at chosen key destination points.
- Using lighting and finishes to distinguish public and private corridors.
- Select letterforms and colour combinations which comply with disability acts.
- Provide generous signs to be viewed from a distance.
- Code specific areas using colour, textures or memorable graphics.
- For children, use pictures in place of words.
- Design trails into floor finishes between destinations using alternating materials.
- Design raised letters and braille.
- Interactive audio – tactile maps at information desks, entrances and other key destinations (Muhlhausen, p. 1 – 2).



Figure 3.7: Baroque and Rococo entrances and archways were defining elements in buildings (Arthur and Passini, 1992: 124).

Spatial organization is the first and most important aspect to consider for wayfinding. Architectural features such as archways can be used to define spaces, transition zones or pathways (Fig 3.7). Distinction in architectural features helps to create orientation frames of reference. Designing destination zones in buildings can be useful for orienting people, retracing a path or providing shelter from the rain. These can be food courts, atriums or cafeterias. The overall layout of the building should in itself be easy to understand and navigate and not be a confusing maze of corridors and rooms. Symmetrical buildings can prove to be confusing unless the facades have been articulated coherently. Colour and lighting are both equally useful for wayfinding, but should never be used as the primary source of wayfinding information. There are various aspects to consider when adopting wayfinding principles into the design of buildings, especially for children and the disabled. Colour, lighting, textural elements and audible elements are all extremely important and should be carefully considered to create a coherent atmosphere and environment which is easy to navigate.

An Analysis of the Hazelwood School in Glasgow

An example of successful wayfinding techniques has been implemented in the design of the Hazelwood School for the multi – sensory impaired in Glasgow. The school was designed by architects Gordon Murray and Alan Dunlop and it provides curricular and life skills facilities for children aged two to nineteen. It is located in a residential area on the edge of a park and conservation area. The design focuses on eliminating the institutional feel of many schools and does so by creating a safe and stimulating environment for the disabled children.

Firstly, the design responds to the site’s natural landscape because it curves through the site, around the existing trees, thus keeping them intact. This creates a long, low,



Figure 3.8: Site plan of the Hazelwood School, showing how the building wraps around the trees, adhering to the original site and enhancing it (Rodger, 2007: 29).

curving, flowing plan which is seemingly organic in relation to the surrounding park and conservation area (Fig 3.8). Small, intimate garden spaces and external teaching environments are thus created enhancing a sensory connection to nature in the design of the school. The materials used in the construction of the building include local Siberian Larch, which will age and blend with the site as well as traditional Glasgow tenemental roof slate, thus keeping with a critical regionalist aspect to the design.

Since most of the children attending the school are disabled and mostly blind, navigation and orientation was one of the most critical aspects to the design. In order to understand how to design for these children, the architects consulted with various organisations for the disabled, specialists, other schools and hospitals. This allowed them to learn that



Plate 3.19: The textured cork wall which runs through the centre of the school has trails rails which the children feel, thus using this to navigate their way to their classrooms. Trail rails on the floor are used by the children with canes (www.nikiomahe.com).

some students „can see above and others below certain horizons, while others can see only in zig – zagging patterns“ (Rodger, 2007: 27). The resulting design of the school is in the form of a long, sinuous plan which is organised around the circulation space (Fig 3.8). This space can be described as a type of street which lies between the classrooms on the north side and the garden spaces on the south. In order for wayfinding to be made easier to the children, this central circulation space is defined by an irregular shaped cork clad wall which runs along the north side of the school. This sculptural wall provides easily identifiable sensory and tactile clues for the children to find their classrooms and their way around the school (Plate 3.19). What is most interesting is that the wall has also been designed to serve another function; it doubles as cupboard and storage space for

the teachers. The way that the wall acts as a navigation aid is in its textured finishing and in the undulating heights and angles of its profile. So – called trail rails at differing heights have been inlaid into the cork finish so that the children can feel their way along the wall. The other aspect of wayfinding includes threshold markings on the floors and walls. Subtle changes of light were also found to be extremely important for people with vision – related disabilities and thus, large and small windows and rooflights were designed to accommodate this. For this reason, all of the classrooms are arranged along the north side to escape strong daylight, but the roofs are tilted to allow maximum daylight to enter (Plate 3.20).



Plate 3.20: High level lighting and clerestory lighting reduce the amount of light in some of the classrooms so that the children who are blind do not get affected by too much of sunlight (www.nikiomahe.com).



Plate 3.21: In order to prevent monotonous facades, a juxtaposition of the classrooms creates alternating spaces which is also a resemblance of the contextual architecture (www.nikiomahe.com).

In order to escape a monotonous appearance to the classrooms, the architects designed some of them to jut out, creating an alternating effect similar to the residential context (Plate 3.21). This creates small courtyards which allow a transitional access space into the playgrounds. The west end of the building houses the gymnasium, hydrotherapy and swimming pool, which can be closed off from the rest of the school after hours and this gets used by the public (Rodger, 2007: 25 – 33). In general, the Hazelwood School is an exemplary building which boasts intuitive aspects of wayfinding and legibility, which works well for the users of the building. Other aspects such as colour and light are also related to wayfinding but are more important to be considered as they have psychological implications and effects on people. Light, colour and the different moods created by these aspects in spaces are discussed henceforth.

Light, Colour and Spatial Mood Qualities in Buildings

Humans are photo – centric beings; drawn naturally to light and it can be stated that the amount and quality of light can affect how people relate to the world and their immediate

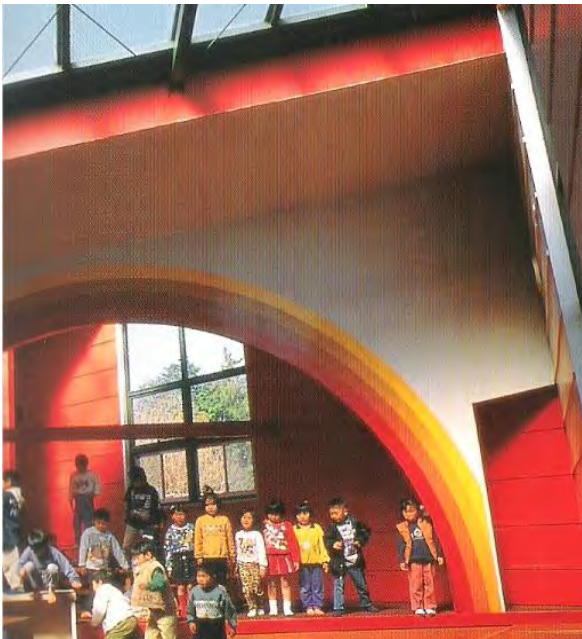


Plate 3.22: Dark and light spaces in a colourful play environment provides opportunities for small children to create many fantasies (The Images Publishing Group, 2004: 29).

surroundings. Light aids mental clarity to the extent that students in well day – lit classrooms typically progress twenty per cent faster in maths and twenty – six per cent faster in reading (Day, 2007: 100). Light is associated with energy and can be seen to energize and uplift one’s mood. Thus light is therefore good for running around play whereas shade can be seen as being secure and sheltering for children. Bright interiors help people to feel awake and this is essential for teenagers. Small children, however, tend to live in worlds that are filled with imagination and the clever use of light can induce these

moods, adding to their creative play and development. Buildings for smaller children need to be lit in a cheerful way but they should also have spaces which are dreamy and

slightly dark because darkness has just as many qualitative variations as light does (Plate 3.22).

Architecturally, light and shadow is important in highlighting forms and shapes of buildings, thus changing the moods of a building throughout the day. Daylight and



Plate 3.23: These clever light box windows at a kindergarten as well as the light patterned wall allow a diffusion of light into the space enhancing a child's imaginative experiences (Mostaedi, 2006: 198).

shadow can subsequently vary in colour, direction, inclination and intensity. The careful design of fenestrations and according to orientation can change the mood qualities of rooms, making them seem liberating or stuffy, cold and gloomy or warm and invigorating.

Colour and its reflection of light can create different moods and feelings, also helping to create an

ethereal and magical essence to spaces, increasing opportunities for children to create fantasy filled worlds in their creative play (Plate 3.23). Constantly varying light is also essentially good as it nourishes and relieves the eyes and skin.



Plate 3.24: A brightly coloured play room, with a glossy finish on the floor and fluorescent lighting can have a hyperactive effect on children, reducing their attention capacities and concentration (Mostaedi, 2006: 125).

Shiny materials such as glossy paint or varnished floors reflect glare into the eyes (Plate 3.24). Rooms which are lit from more than one direction are more visually interesting and healthier and the play of moving lights and shadows fascinates children. Curtains, translucent pictures and leaf foliage can add to the textures of light and paper screens can cast intriguing shadows, drawing children's interest to explore. Windows can have developmental and educational implications for children affecting their attention and feelings of security within buildings or spaces (Plate 3.25). They should not be designed to draw children's attention out of the room, when they are in a learning space, as this



Plate 3.25: Natural lighting in spaces has many educational implications (Mostaedi, 2006: 125).

will easily distract them to wonder what is happening outside (Plate 3.25). Interestingly, the careful use of roof lights can be seen to provide „fly – away“ opportunities for children's imagination. Day (2007) points to evidence which suggest that windows opposite one another can bleed children's attention and window walls can create confusion in differentiating between outside and inside. There is also the greater risk that small children could run into window walls and seriously hurt themselves. Large windows can offer no psychological comfort and security for smaller children as they limit a

sense of enclosure in spaces. Glass which is undivided can have a clear simplicity and liberation for older children while sub – divided windows can feel protective and enclosing.

Fluorescent lighting is flat, even and dead and artificial lighting can disconnect the connection to the outdoors, making spaces seem clinical and boring instead of alive and this could have the implication that education has no connection to the real world, a debilitating image that should not be portrayed to children. It can also be seen that fluorescent lighting can induce hyperactivity (Plate 3.25), whereas in contrast, soft lights can gently illuminate a whole space (Plate 3.26) and hard spotlights can focus a child's interest on particular objects. Creating pools of light which are surrounded by levels of darkness can make places seem dramatic for play purposes and ambient lighting over a

large area can encourage group activity. Different activities and rooms need different lighting qualities and this is also dependent on the type of materials which are being used

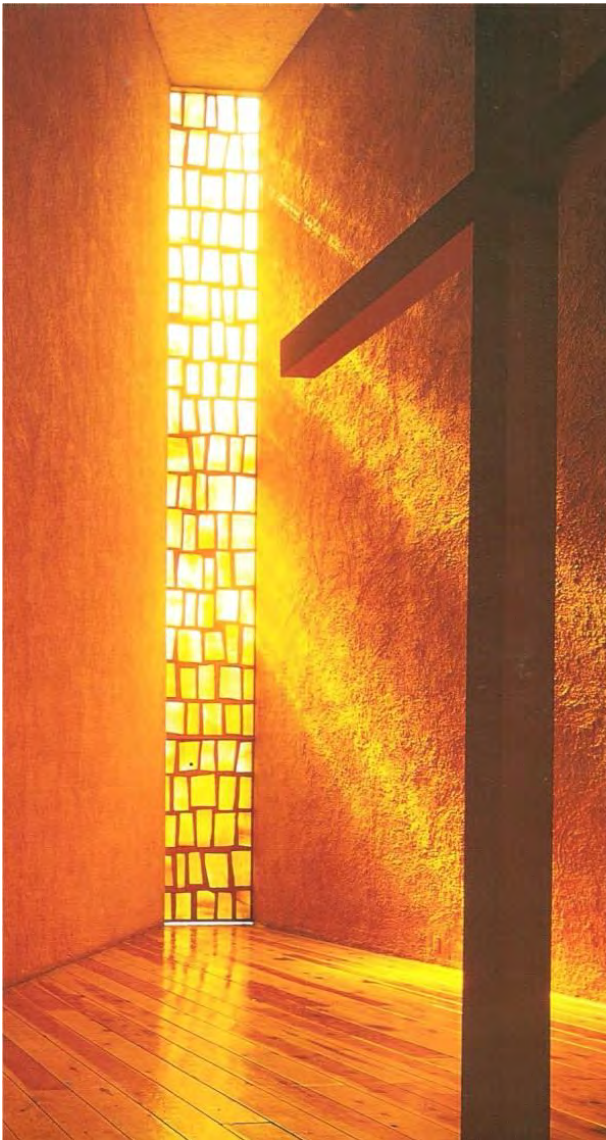


Plate 3.26: The ethereal effect of gentle lighting in combination with colour enhances one's experience at this church (Zanco, 2001: 235).

(Day, 2007). Everything that we see in the world is coloured and light and colour are closely related to each other, enhancing people's spatial experiences (Plate 3.26). Evidence suggests that colours can affect the nervous system as well as mental abilities. Colours are more known to affect people's moods, feelings and emotions and the psychology of colour and related theories has been widely researched and documented (Popow, 2000: 1). Since colour belongs to the environment, it is therefore a means of information and communication which is necessary for the interpretation and understanding of the architectural environment. Perceiving colour carries associative, syneasthetic, symbolic, emotional and physiological effects for people (Sternberg, 2009: 38). It is commonly known that colour preferences are individual and can reflect certain personality traits in people. Colours

can be classified as rich, fresh, warm or calm and mood effects associated with colours are culturally or universally shared.

Mahnke's research on colour and its relation to psychology led him to formulate a colour pyramid which indicates the levels of reactions that people have to colour and how they

are related to one another. Summarizing the extensive research which has been done on the effects of colours, Day describes certain colours and mood effects, described below:

RED: exciting, stimulating, defiant, hostile, hot, passionate, fierce and intense Plate 3.28 and 3.31
ORANGE: jovial, energetic, warm, welcoming, exuberant, forceful and hilarious Plate 3.28 and 3.30
YELLOW: inspiring, vital, life-filled (sun), cheerful and joyful Plate 3.28
BROWN: cosy and earthy, suggesting security Plate 3.29 and 3.31
GREEN: peaceful, serene, quiet, calming and refreshing – associated with nature Plate 3.30
BLUE: soothing, tender, secure, calm, comfortable, melancholy and contemplative Plate 3.29
PURPLE: stately, dignified or mournful and mystical Plate 3.31
BLACK: strong, unhappy, dejected, ominous powerful
WHITE: youthful and pure (Day, 2007: 115) Plate 3.30

Table 3.1: Colours and their associated emotions.

With reference to synaesthesia, there is no doubt that a unity exists between the senses. Gestalt psychology looks at the human body as a unity of senses and colours seem to be the most related to synaesthesia. They may evoke memories with smell or taste and also give tactile impressions at the same time. Colours may even have volume and temperature associations. Light or pale colours can make spaces appear bigger and airier, while darker hues decrease the apparent size of a room. The use of high illumination levels will enlarge the appearance of volumes. Cool colours such as light blue or green can make things appear shorter or smaller and colour decisions in architecture should be made with consideration of the whole picture. For example, ceilings painted in lighter colours can make them seem higher than they actually are, while heavier colours have the

opposite effect. Colour also has the capability to indicate warmth or coolness but this depends on people's individual associations with colour. Yellow, red and orange are associated with the sun and can make people feel warmer (Plate 3.27), whilst blues and greens are associated with water and can thus make people feel cooler (Mahnke, 1996).



Plate 3.27: The use of strong, bold shades of red and yellow on the main façade of this children's museum aims to define the entrance to the building but also highlights the planes and forms of the architectural composition. Simple rectangular blocks have been transformed into playful elements (The Images Publishing Group, 2004: 138).

The tone and intensity of colours can affect the proportions and therefore perception of rooms. Walls which are darker below and lighter above can emphasize height; however, rooms which are darker in colour higher up can make spaces feel too enclosing. Simple colours can make spaces feel bigger than they actually are and colouring areas so that they fade into each other can exude a sense of quiet and unification. Colours which are bound to certain forms or planes to highlight them become more meaningful in their architectural composition but this also emphasizes separateness from unity. This aspect of colouration in architecture can be seen in the architecture of Luis Barragan. His

principles of design included blending in with nature as well as using colour to highlight certain aspects of his buildings, an evocation of the rich cultural history of Mexico, where most of his architecture is placed.

The Cuadra San Cristobal Horse Ranch in Los Clubes at the outskirts of Mexico City provides an atmospheric environment where the contrast of colour allows for a heightened experience of the architecture. Here Barragan plays with a mirage of natural earth and water against the backdrop of solid walls softened by the use of daring pinks, purples and oranges. The colours serve to enhance the experience of nature in this environment and are quite pleasing to the eye (Plate 3.28). However, even though the colours are used in one sense, to soften the visual solidity of the walls, these walls appear too artificial in contrast with the natural surroundings and the colours add some vibrancy to them.



Plate 3.28: Luis Barragan's skilful use of colour which highlights every plane in the architecture and its connection to water or earth (Zanco, 2001: 172, 173 & 177).

Every colour also has a complementary colour but if these two are used in conjunction with one another in the same room or space, they should not be equal in weight and area. Natural elements such as leaves and flowers are constantly changing their colours and this makes them a sign of life and a significant element of time, in changing seasons and weather (Plate 3.29). Traditionally, most buildings were constructed of earth, stone or timber and they unconsciously respected their context in that way. These earthy colours brought an element of the natural world into the architecture, whereas superficial colours which are added onto buildings can sometimes feel plastic and unreal to children's senses. As most children's toys are usually painted in bright, primary colours, it is

assumed that these colours are what they love and enjoy; however, these can be over – stimulating in large spaces where children play for hours, leading to hyperactivity and sore eyes.



Plate 3.29: The Steiner Nursery building incorporates a grassed roof and natural walls imitating the natural surroundings (Dudek, 1996).

Different parts to a building can be coloured in a deliberate sequence, which can be matched to age and each colour can represent a step on the staircase of developmental



Plate 3.30: Colour for children used on simple architectural elements (Ligtelijn, 1999: 184).

growth and achievement (Plate 3.30). Day's research (2007: 115) points out that children up to six years need warm, clear, motherly colours, such as reds, yellows and oranges, since they are led by activity and not by feelings. Older children however prefer tones of blues as these are seen to be more calming on people's moods. Since smaller children are not yet fluent in words, they express themselves through art and the colours they use express how they feel, similarly it can be seen that the colours that they absorb can also have an influential effect on how they feel. **ORANGE** shows good adaptation to life and society, **RED** displays an uninhibited love of life but also defiance and hostility, **YELLOW** shows timidity, **BLUE** indicates conformity and obedience and **GREEN** can show balance or emotion suppression. Elements in rooms such as hooks, beams, tables, chairs and rails can dramatically transform room moods through the use of colour, and



Plate 3.31: Extruded coloured walls from classrooms provide orientation and identification clues to children as well as being textural, delightful elements (Mostaedi, 2006: 165).

lighting can be used to enhance spatial quality. This can best be seen in Aldo Van Eyck's design of a home for single parents and their children in Amsterdam (Plate 3.31). Here, colour is used as the primary architectural indicator and is especially interesting in the detailing of door frames, column, wall and beam junctions and balustrades (Ligtelijn, 1999). A place which support children's many mood needs is what colour for children in architecture is all about.

The use of colour in learning environments needs to be carefully considered as in the past professionals believed that schools (especially for younger children) needed to be very colourful. Colour is vital to the psycho – physiological aspects of studying and appropriate colours are important in creating the correct studying environments as well as

for the physical and mental health of children. The main question to ask is; what do children need? The answer is that they first and foremost need security, a feeling which develops when they feel understood and nurtured. Day (2007) and Mahnke (1996) assert that psychological colour tests on children have shown that the acceptance or rejection of colours is an indication of their development. In general, smaller children prefer red, orange and yellow, while nine and ten year olds like red, red – orange and blue – green. Thirteen and fourteen year olds prefer blue, ultramarine and orange. Mahnke then goes on to suggest aspects of colour which are best suited to the different stages of child development. For children of kindergarten age, natural colours are best complemented by warm, bright colour schemes. For accentuation, colours of opposite temperatures should also be introduced and lastly, for older children, subtle and cooler colours are best as they are considered to aid in concentration.

Perceptions of colour are also connected to the sensation of noise. Strong colours such as red and orange are seen to be louder and in noisy factories, the use of red can heighten the noise experienced. Similarly, colours can be linked to people's associations with taste and smell. Those colours which have pleasant associations with taste include coral, peach, soft yellow, light green, flamingo and pumpkin as they are pleasing to the eye. Pink, lavender, pale yellow and green are indicative of pleasant smells. Mahnke also indicates a list of colours and their associative odour/taste implications: **RED** is sweet and strong, **PINK** is sweetish and mild, **ORANGE** is strong, **BROWN** is musty, **YELLOW** is sour, **YELLOW – GREEN** is sour and tangy, **GREEN** is sour and juicy, **GREEN – BLUE** is fresh or salty, **BLUE** is considered to be odourless, **VIOLET** is narcotic, heavy and sweet and **LIGHT PURPLE** is sweetly tangy (Mahnke, 1996: 75 – 76).

Colours can also give the impression of textures, such as brown which can give the impression of wood and earth and therefore stability and strength. Mahnke (1996) argues that colour also has healing implications for the health and well – being of people. Ancient man had symbolism and magic in mind when colour was used and since the beginning of recorded time man has believed in the healing powers of colour. Many ancient cultures revered the sun and believed that without it there would be death to all.

The ancient physicians diagnosed through colour and many coloured minerals were prescribed as they were seen to have healing properties. Nowadays, colour healing or therapy is based on the human aura, which can be explained as the essence of a person which surrounds the body.

Colour and light are intrinsic elements to the shaping of architectural environments, having many health and well – being implications. For children, they become the most essential components to consider as children readily understand and appreciate colours and light effects, which can enthrall them if used cleverly. They are considerably linked to other aspects of architectural design, such as scale, proportion and shape, all of which have direct implications on the effects of light and colour.

Anthropometry: Scale, Proportion and Shape

In order for one to be a successful designer, an understanding of the different types of human physique is essential. Evidence suggests that there is a variance between the physiques of people from different nations, cultures and sexes (Brebner, 1982, Croney, 1980 and Licklider, 1965). Systems of measurement and proportions have been fashioned on the human body, which is seen as being fundamental to scale and this science of measuring the human body is referred to as anthropometry. Anthropometry is used by industrial designers, engineers, architects, interior designers, town planners and medical practitioners and has a particular relevance to the design of buildings because the principal way to achieve good design is through the application of anthropometric data. This data includes aspects such as body sizes, reach capabilities, range of joint motion, strength as well as visual field data, for children as well as adults. In architecture, anthropometry is the basis for the requirements related to accessibility of the disabled, children and fire safety. Thus, anthropometric measurements are used to develop standards for human clearances and manoeuvring space between furniture or other objects. For the disabled, sizes of wheelchairs become the determining factor to paths, passages, doors and ablutions, to name a few. The anthropometric measurements of children are extremely crucial to take into consideration if an environment is specifically designed for them. The shape, scale and forms of buildings are also equally important

when designing for children, since they are smaller than adults, some buildings or spaces may seem daunting and scary in their eyes.

The period of Renaissance architecture during the early fifteenth and seventeenth centuries was influenced by *the ideal order*, which was pioneered by Vitruvius (1960). It was based on dimensions of the human physique so that architecture could be harmonious to people and nature. The Ken system is a measurement technique used in Japan, which is also based on the human body. In this system, all of the structural members are designed around one standardized unit – the traditional tatami mats of Japan. The use of this mat as a measurement unit brings a more intimate scale to the built environment because its measurements are roughly that of a person lying down on it. Le Corbusier developed the Modulor system of measurement, which was based on Leonardo Da Vinci's Vitruvian man (Plate 3.32) and the Golden Section. The Golden Section is considered to be a Law of Proportionality and is an important proportional relationship in which the smaller of two perpendicular dimensions relates to the larger in the same way that the larger relates to the sum of the two. This golden mean can be expressed as 1:1:618 and is said to create an ideal proportion between two objects or two parts of a whole (Craft, 2003; Croney, 1980 and Orr, 1985).



Plate 3.32: Leonardo Da Vinci's Vitruvian man (www.wikipedia.com).

The Latin word *scala* meant a ladder or flight of stairs and architectural scale refers to the size of something; a building or room as it relates to something else. Scale in architecture makes buildings intelligible to people and gives a sense of how people relate to buildings. Orr maintains that there are only three sources for scale in architecture. These are; the scale – giving qualities in materials, nature and the human body (Orr, 1985: 13). Materials such as wood provides easily understood scalar clues due to its textural

dexterity. Concrete allows for variety and flexibility and it can express scale with clarity. The sizes and shapes of columns, beams and trusses are also important to consider for scale, especially with children (Plate 3.33).



Plate 3.33: The design of columns, beams and the height of ceilings need to respect the small size and scale of children, not appearing too dominating to them (The Images Publishing Group, 2004: 35).

Every aspect of building design in terms of scale and proportion needs to be carefully considered for children, including little details such as the height of doorknobs to the



Plate 3.34: Every aspect of building design needs to reflect the scale of children (Kroner, 1994: 15).

sizes of toilets (Plate 3.34). Scalar elements speak to us at different distances and the closer one gets to a building, the more intimate the levels of human physical relationship then become (Orr, 1985 and Wilson, 1984). Shapes of spaces have to deal with proportion and this also depends on the functions of the particular rooms. The spatial organization of the human body is reflected in how architectural elements and proportions affect us. Proportion in

architecture brings about a balance and relationship of order. The relative size or ratio of two or more elements in an architectural composition is essential to establishing proportion and it has the potential for strong effects on people's perception of architecture.

The qualities which are important to consider when designing appropriately scaled buildings are as follows. The first and most important quality is context; the setting into which the building is placed. Finding a balance in terms of scale in an existing context



Plate 3.35: Aldo Van Eyck's design of a home for single mothers and their children respects the scale and composition of the surrounding context, forming its own identity through the use of colour (Ligtelijn, 1999: 185).

means to establish an appropriate relationship between the old and the new. There either needs to be a balance between the buildings, or one should be more dominant than the other or others. Contrast or similarity then becomes important in the new building's connection to the context.

The different parts of a building are also a crucial

quality when it comes to scale, for example, a library might need to be differently proportioned and scaled in comparison to the teaching rooms, in order to aid clarification in the architectural composition and its legibility. Also, the proportioning of solids and voids in architectural arrangements is a tool which benefits the impression of scale. Monumentality is an element of architectural scale which is not appropriate for children as monumental buildings may seem too scary to them, however, they could also seem awe – inspiring, but this is dependent on the use of materials, colour and juxtaposition of parts (Plate 3.35). Orr maintains that a hierarchy or sequence in the scale of buildings is useful to highlight certain aspects of a building such as the entrance or exit (Plate 3.36). Hierarchy signifies a range of sizes and scale can help to establish the sequence of hierarchy, creating varying degrees of compression and releases in architectural space (Orr, 1985 and Licklider, 1965).



Plate 3.36: This spacious and large atrium would appear scary and intimidating or awe – inspiring to young children and out of scale to them (Dudek, 2000).

Orr refers to various principles, relating to scale, which need to be considered and the variables of these principles affect scale in a multitude of ways. The first principle he refers to is line and edge, which can be created by changes of colour or material and/or by the addition of elements such as handrails. Line may also be found in the visual boundary of a form seen against its background. Edges and lines provide visual clues about distances from and size relationships to materials and surfaces (Plate 3.37). Form and mass are thus closely related to line and edge because the form and massing of the building in its major parts are made up of lines and edges. Therefore, treatment of lines and edges produces a composition of form and mass and the human body relates better to the smaller aspects of buildings than to the entire form of the building (Plate 3.37). Space in itself produces particular scalar experiences which can either be pleasing or disorienting. Texture is one of the most important elements to take into consideration when designing for direct



Plate 3.37: Lines, edges, form and scale (The Images Publishing Group, 2004: 134).

human response as it is most useful for establishing a sense of scale in buildings. Different textures can be understood in both visual and tactile terms and the textural aspects of buildings can make them appear bigger or smaller or even more complex than they actually are due to the scale of the materials used.

One way that we can understand the role that space plays in the lives of children is through scale, because changes in size can impact a person's interaction with space (Plate 3.38). Large environments offer the viewer many different perspectives from which they



Plate 3.38: Child – scaled elements such as tables and chairs make an environment much easier to use and manipulate for small children, making them feel as if a space is suited especially for them (Mostaedi, 2006: 241).

can learn about the objects which are present in those spaces and those which offer an array of opportunities for the acquisition and integration of spatial knowledge will be influential in developing an internal representation of spatial quality. Internal representation is dependent on different frames of reference, spatial relation, structure and size.

Features such as horizontality, verticality, different angles and shapes are all influenced by scale and proportion. Horizontality in buildings can imply the effect of being visually calm and strong as horizontal planes echo the ground line and thus, they appear anchored.



Plate 3.39: The strange angles formed in this classroom might seem conflicting and confusing to children (The Images Publishing Group, 2004: 25).

This can make parts of buildings seem modest and undemanding, however if the horizontal planes are too large or long they may seem too dominating or even boring. Deep roof overhangs provide shelter, whereas flat roofs and walls don't seem sheltering or inviting, particularly to children. Day (2007) refers to

the design of corners and their angles as having specific meanings and effects to children; right angled corners can be seen as colliding or conflicting and acute angled external corners may look like aggressive arrows (Plate 3.39), but obtuse angles seem to be more welcoming. Curves are gentler than straight lines, squares or rectangles and they can bring planes into gentler meetings with each other. They also seem more natural and organic by echoing the movement of living things, although, curved spaces provide difficult mini – spaces which are unusable and inflexible, if not designed successfully. Spaces should also not be designed for only one purpose because that tells children and people exactly how the rooms should be used, whereas if a room's design allowed a person to determine in what way he or she wants to use it, this gives a sense of responsibility, confidence and self – identity. Three metre walls or fifteen metre high buildings can seem daunting to small children and walls which have creeping plants or vegetation can soften building appearance and make them seem even smaller (Plate 3.40). On larger buildings, enriched texture, detail and delight on a low level can draw attention down thus reducing the experienced scale to one which is more suitable for children.



Plate 3.40: Plants can soften the appearance of large scaled elements in buildings, such as the roof in this image (Mostaedi, 2006: 186).

Patterns and Textures in Architectural Detail

Patterns and textures are found everywhere around us; in clothing, jewellery, cars, technological equipment, artwork and buildings, to name but a few. The most basic of patterns are based on repetition, periodicity and symmetry. Visual patterns such as dots, zigzags and stripes are the most common. The Golden Section (refer to section on anthropometry), which is found frequently in natural fractals is itself considered to produce pleasing patterns. It is soothing to look at patterns which are mathematically similar to ones which occur in nature, such as fractals. Textures and patterns are closely related because many textures form visual and tactile patterns on building facades.

The patterns and textures that we see and touch influence us psychologically and complicated patterns can be exciting or too stimulating. Smaller patterns make small spaces seem larger and daunting. The mental state induced by different patterns has been found to spur creative, high – quality mental activity (Day, 2007: 64). Orr (1985) stated that patterns and textures used in or on buildings can be established by the ordering of other principles and elements from form, to texture to colour (Fig 3.9). Symmetrical

forms are more relaxing than asymmetrical ones but variations need to be used with care

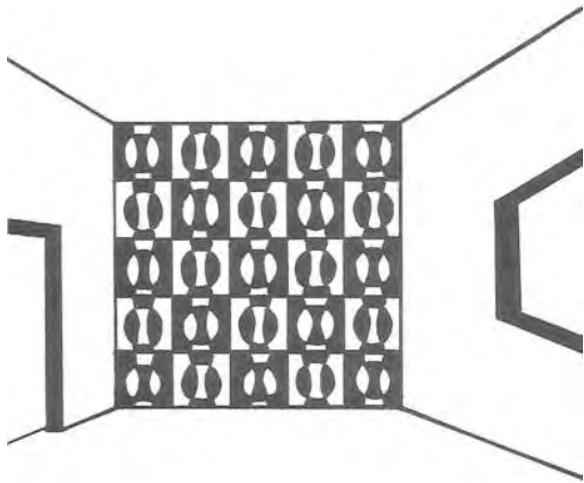


Figure 3.9: Too much of pattern on a vertical plane can be very distracting (Mahnke, 1996: 25).

because symmetry can be monotonous. Whether lines that we see are straight or curved, the direction in which they are oriented and the number of lines in place influence us psychologically through their symbolic connotations. Straight horizontal lines are calming while multiple horizontal lines around a space can make people feel tense. Straight vertical lines are an indication of stability while straight diagonal lines indicate activity. V shapes draw our attention faster than any other

as they signify threat or danger. In general, patterns with curved features are preferred to those with pointed features and sharp angles (Augustin, 2009 and Day, 2007). The



Plate 3.41: The use of lines, shapes, colours and forms in this space for children creates a bright and stimulating play environment, where the patterns formed are interesting and fascinating (The Images Publishing Group, 2004: 140).

elements of spaces can be arranged so that they take on particular patterns. This can be achieved by the use of texture, rhythm, symmetry, balance and harmony, which all contribute to the visual quality of a space (Plate 3.41). All of these are judged in reference to a focal point. Rhythms can be found in systems of colours as well as shapes and forms because colours lead to impressions of size and weight. A rhythm can lead people visually through a space (much like a landmark) and is thus related to the way elements are repeated or gradually change through a space. Spaces need a sort of rhythm in order to send out a cohesive symbol or message to the users who then feel more comfortable rather than distracted. Balance can be achieved by the use of a focal point which adds certain stability to a space.



Plate 3.42: Patterns created by cobblestones and pavers on the ground can indicate direction as well as scale (Source: Author).

Patterns found in pavements can enhance movement and indicate visual distance (Plate 3.42). When using patterns on vertical and overhead surfaces, one needs to consider that patterns may make these planes appear to advance or retreat. Mahnke also explores the effect of visual patterns and textures on people and he states that trends are constantly fluctuating but this depends on the fashion trends in interior design or architecture at that particular time. Similarly to Augustin and Day, Mahnke asserts that too much of visual pattern can be distracting and fatiguing and vividly designed patterns can impair productivity and concentration. However, under – stimulated environments which are monotonous can be inapt for the users psychologically (Mahnke, 1996: 25). Another

aspect of architecture which creates patterns is the tectonics of building design. The construction of features such as columns, beams and joints can be innovative in their design, producing details which can be enhanced by colour and light to create fascinating patterns and forms. Therefore, patterns on building can be designed in countless ways and the possibilities are endless.

Similarly, the textures that are created on the external and internal parts of buildings can be done so in a myriad of ways, due to technological advancements. Materials used create textures, some subtle, others more pronounced and effective in their patterning and design. Wood, concrete, plaster, glass, steel and aluminium are just some of the materials which create all kinds of textures and smaller aspects such as paving, stonework and tiling can be designed to fashion intricate patterns (Plate 3.43). Textures can be used for the visual and tactile stimulation of children, who would be marvelled and constantly



Plate 3.43: The use of different textures on buildings can create patterns (Source: Author).

fascinated by them. For blind children, they are particularly important because materials and their textures form the crux for wayfinding processes. For that reason, the inclusion of specific textures on building surfaces becomes an integral part of the building design

and ornamentation, giving the designer opportunities to explore different types of textures. Patterns, textures, colour, lighting, scale and shapes of spaces and their relation to the site and context are all equally important in creating a unifying effect, especially for children's environments.

Conclusion

In conclusion, it can be argued that architectural environments have a direct psychological impact on people's everyday life, health and well – being. It is necessary to understand the psychological implications of colour, light, scale, shapes and forms on people and architecture should function as a positive medium between people and their environment. Designing any environment for children requires, on the part of the architect, a dedicated understanding of human perception. Physically disabled children's development is directly influenced by the use of their senses and environments can have a lasting impact upon their emotional and social capabilities. Factors that are normally taken for granted by adults, such as colour, scale and patterns can become the focus of young children and in the case of one who is partially blind, colour provides an important means of communication. Colour, light, patterns, textures and materials in accompaniment with other architectural features, form the basis for basic wayfinding abilities, therefore becoming more important than simply being sensorially appealing to children. Therefore, it can be concluded that the architectural environments of children have a direct and lasting impact on their growth and development, including; most importantly, their personal identity. A part of developing a strong sense of identity means having to experience the essence of one's cultural and contextual conditions and this can occur successfully if there is a strong sense of place identity. This will be explored in relation to the concepts of critical regionalism and phenomenology of architecture.

CHAPTER FOUR

THE INFLUENCE OF CRITICAL REGIONALISM ON CHILDREN'S FORMATION OF PLACE IDENTITY

“Adult experience centres on how we use places; we know what they are there for. For children, it's more about what places say, how they meet and experience them.”

(Day, 2007:3)

CHAPTER 4 THE INFLUENCE OF CRITICAL REGIONALISM ON CHILDREN'S FORMATION OF PLACE IDENTITY

Introduction

Early functionalism stated that the purpose of architecture was to produce buildings whose function was the sole determinant to building size, mass, spatial grammar and form. A common belief amongst functionalist architects was that ornamentation served no purpose and aspects such as context, culture, memory and experience were neglected in the design process and thus, buildings were not meaningful to the people who used them. With architecture trends and school of thoughts continuously shifting, the current focus is on the idea of creating a sense of place. This leads to the philosophies of Christian Norberg – Schulz and others who pioneered theories of critical regionalism and phenomenology of architecture. These architectural theories are rooted in creating meaningful and significant built environments which have positive psychological implications on people, by addressing issues such as genius loci, culture, memory and context.

The Embodiment of Place in Built Environments

The notion of Critical Regionalism is a theory which has been around for more than two decades and it was taken as an alternative approach to the architecture of Postmodernism. Many modernist buildings were seen as being universal formulas that were imposed on sites all over the world. Image was the most important factor rather than individual situations and the concept of regionalism indicates an approach to design which gives priority to the identity of a place (Nesbitt, 1996; Pallasmaa, 2005).

An awareness of architecture having a distinct identity goes back as far as Ancient Greece where, in the context of the politics of control, they used architectural elements to represent the identities of the groups who occupied pieces of land. Ionic and Corinthian were not simply decorative terms; they originated in the context of regions and identities. Vitruvius (cited in Lefaivre and Tzonis, 2003: 15) acknowledged regional architecture as being shaped by specific external and internal physical constraints. Just as climate and physical conditions influence buildings, so too do they influence human beings.

Architecture should owe its attraction to the naturally given qualities of a place, rather than attempting to impose its own aesthetic values on a place. The regionalist architecture of the Romans incorporated elements which represented power and authority. Early eighteenth century regionalist architecture in England aspired to develop spatial strategies which identified ethnic groups, while later eighteenth century regionalism – termed romantic regionalism – laid an emphasis on incorporating characteristics of ancestors and shared origins. Memory and the use of artefacts played an important role in maintaining identity in people and the nation. Lefaivre makes a reference to Goethe’s writings, who stated that architecture has the power to make people aware of their common past and to allow them to participate in their collective memory.

In terms of the ideas of memory and regionalism, the Coyote Canyon Elementary School in California; America, is an example of a school design which incorporated the rich



Plate 4.1: The Native American village courtyard to the right and the mission style courtyard to the left (Sanoff, 1994: 54).

history of the community so as to teach the children on a daily basis about their cultural heritage. This school features four themed courtyards with each one reflecting a major period in the history of the city. The Native American courtyard is the focus for the kindergartens and grade ones and a traditional village courtyard and Spanish – Mexican courtyards serve the second and third graders (Plate 4.1). A Mexican – Spanish rancho courtyard is the last one, planted with grapevines. This serves as a remembrance to the children of California’s first vineyards; which was a major part of the area’s history (Sanoff, 1994: 53 – 56).

Therefore, critical regionalism's theories of acknowledging local environments has a particular relevance as the world is facing an ever growing ecological crisis, one which the children of today will have to face. If children can be taught to be sensitive and understanding of their surroundings, they will appreciate it later in their adult lives, thus facilitating a movement towards sustainable living rather than one which completely negates the natural environment. Alexander Tzonis (cited in Nesbitt, 1996: 20) in his writings states: „The task of critical regionalism is to rethink architecture through the concept of region. Whether this involves complex human ties or the balance of the ecosystem, it is opposed to mindlessly adopting the narcissistic dogmas in the name of universality, leading to environments that are economically costly and ecologically destructive to the human community.“

Kenneth Frampton's (2002) critique of critical regionalism offers an architecture which is based on what he states are two essential aspects; an understanding of place and tectonics. These ideas translate into; accentuation and engagement with the topography of the site, the use of local materials and responsiveness to light and climate. Frampton (2002) and Tuan (1977) stated that these aspects of design can produce architecture which is spatial and experiential and not simply image – oriented. The advancement of mankind has constituted a subtle destruction of traditional cultures and values that were the creative nucleus of great civilizations such as the Greeks and Romans. They argue that man has approached a consumer culture and has stopped at a subcultural level. Critical regionalism thus involves a more direct relation to culture, society and nature rather than simply attempting to create abstract forms of nature. Since modern technology has afforded architects with machines such as earth – moving machinery, sites are being totally flattened and this bulldozing of an irregular topography into a flat site can indicate the loss of a sense of place. This can be called placelessness, because the site has lost its original and natural form, which gave it its identity and meaning. Architecture is thus imposed onto this flat site and the architecture creates an individual identity which has no relation to its context or region (Relph, 1976). By in – laying a building into the site, one can create an architecture which has many levels of significance, having the ability to embody the history of a place as well as its transformation across time. The natural elements of light and climate have the capacity

to create architecture which has a character that is recognised within a region thus expressing a sense of that particular place.

Tadao Ando's (cited in Frampton, 2002) architectural focus has always been nature as his main inspiration, with an intimate use of light and climate. He states that the forms he



Plate 4.2: The clever interplay of cascading water to represent the lake below and the use of still water as a symbol which represents the surroundings (www.panoramio.com).

creates acquire meaning through nature as they indicate the passage of time and changing of seasons. His design of a Children's Museum in Hyogo was done so on a spectacular site, overlooking a lake and mountains. Sheets of shallow water cascade down the side of the museum, towards a panorama of the lake and it almost seems as if the water is flowing towards the lake and is a part of it. The strong use of concrete planes in the building is a symbolic reminder of the mountainous backdrop and it conveys a message of the awe of nature. However, since it is a children's museum, at first glance, one would not say so and the scale of the building almost seems to defy the small stature of children. Nevertheless, the monumentality of this building is awe – inspiring against its backdrop and serves as a compelling symbol of nature to children, exuding a strong sense of place and genius loci (Frampton, 2002). The approach of tactility in the building design makes the hard concrete walls seem soft to the touch through the use of light, water and an aura of stillness (Plates 4.2).

Regionalist architecture should also be portrayed in the tectonics of the architecture, in the revealed elements of construction and the ways in which the structure resists the actions of gravity (Plate 4.3). The word tectonic is derived from the Greek work *tekton*, which means carpenter or builder. It cannot be seen as being separate from the word



Plate 4.3: The tectonic elements of buildings can be designed to relate to the architecture and culture of a particular place (Source: Author).

technology and in this regard it is then possible to identify three conditions relating to the tectonics of architecture. The technological object arises out of meeting a fundamental need, the scenographic object eludes to an absent or hidden object and the tectonic object, which can be seen to appear in two forms. An ontological tectonic is an element of construction which is shaped to emphasize its role and cultural status and the representational tectonic is an element which is present, but hidden. These modes of tectonics in built form can be used to personify buildings by making them seem akin to the human body so that a building may be perceived as though it

were literally a physique (Frampton, 2002). It is in this way that children can identify with buildings, because they learn and understand through their bodies, thus identifying with the human form first, than with anything else. Architecture can be made to be decipherable to children in this way and it can also be alluring to their senses at the same time.

The Seabird Island School in Agassiz, British Columbia is an elementary and secondary school providing for four hundred children and is an interesting example of Regionalist architecture (Fig 4.1). It is sited on the Northern edge of an existing village square and is situated on a delta, surrounded by breath – taking mountains. The architect’s, Patkau Associates, felt that the building should have an animated persona and be perceived as a



Figure 4.1: Site plan of the Seabird Island School showing its relationship to the site (Dudek, 2000: 138).

being or organism of some sorts. Timber post and beam construction is used in the building as it was the traditional structure of the Natives of the region. The walls are clad in white – stained plywood panels which are a reflection of the snow – clad mountains



Plate 4.4: A front elevation and section through the Seabird Island School with the powerful roof form (Dudek, 2000: 139).

and much of the building was constructed by the local community members (Dudek, 2000: 138). A large protective roof form echoes the surrounding mountains and prevents

strong winds from funnelling into the building. This aspect of the design creates dynamism in the architecture, mimicking the wind and the natural backdrop (Plate 4.4).

Frampton (2002: 88) and Pallasmaa (2005) stated that architecture should not be designed to be purely enjoyed in its visual form; the tactile qualities of architecture are an important dimension to people's perceptions of built form. Thus the importance of tactility in built form can be explained in terms of experiencing architecture, rather than simply gathering information about it. Cocking (2007) commented on Frampton's theory of critical regionalism and his interpretation of this theory is that it is the assertion of local particularities within and against modernistic building forms. According to him, it investigates combining the new and the traditional. Architecture which is designed to be critically regionalist is sensitive to climate, geography and local traditions and he states that it should appeal to all of the human senses and not just sight. Douglas Kelbaugh (cited in Cocking, 2007), on the other hand argues that critical regionalism is two – handed. On the one hand he refers to architecture responding to its own region and the other aspect is the addition of a characteristic that is common to regionalist architecture elsewhere. He has identified five aspects which he says contributes to creating the identity of a place and these are:

- Sense of place: This refers to respecting the *genius loci* of a place, honouring climate, vegetation, building materials and practices.
- Sense of nature: Regionalist architecture should look towards environmental science and ecology for inspiration. Site – specific design is fundamental to a sense of nature in architecture.
- Sense of history: Design principles should evolve from the history of a place as this is valuable to the cultural aspects of a place.
- Sense of craft: Architecture should promote local craftsmanship.
- Sense of limits: Human scale and psychological boundaries are essential to freedom, liberating and constraining at the same time (Cocking, 2007, 45 – 47).

In former times, buildings were made from the earth creating a rich, humane physical environment. The built environment currently offers no sensory experience of the

elements of nature and without these, people lack a sense of nourishment, wholeness and balance. Architecture has lost a connection to the distinct cultures of places and when people have lost a sense of whom they are and where they come from, they lose a part of their identity. The loss of a sense of culture affects children more so than anybody else, because they lose a connection to language, religious values and social norms. If buildings are rooted to their environments, they feel „right“ in terms of a time and cultural continuum. The siting of a building will only feel right if it has been designed to flow with the meandering characteristics of a particular place. Deepening a connection to time creates an aura of authenticity (Day, 2007; Frampton, 2002 and Mules, 2005).

Day (2004) stated that every place has a unique land form which gives structure, integrity and identity to the world that we perceive and this in turn influences the formation of who we are. To ensure that buildings appear to be rooted in earth, the connection between the building and ground thus becomes critical. Instead of changing the land to fit the design of buildings, they should be designed to fit the land, an element which is critical to what Frampton suggests in his writings of critical regionalism. This can be seen in the design of a Kindergarten in Vaduz, Liechtenstein. The gently sloping site and the concept of



Plate 4.5: The Kindergarten in Vaduz's sloping roof forms which meet the ground in a seamless transition between architecture and nature (Mostaedi, 2006: 115 & 117).

creating a garden for children suggested that the building rise out of the topography of the site (Plate 4.5). Therefore, the concrete sides of the building cut into the meadow and the boundaries of roof and ground disappear. The facade of the building is constantly changing depending of the cycles of nature, sometimes it is decked in flowers and sometimes it is covered in snow, appearing to merge seamlessly into its landscape. A

grass covered roof reduces temperature fluctuations and light floods the building in a myriad of fascinating ways. Since the building follows the slope of the land it allows the children to walk over it, under it or through it (Plate 4.5) and this gives them an enhanced experience of the building through its connection to nature (Mostaedi, 2006: 114).

The types of materials used are a great influence in the contribution to the creation of rooted places, for those materials that don't seem to change with time appear to not be life – responsive. Another aspect of materials and regionalism is the cultural connections that they can create. Cultural associations are deeply embedded in places and they act to enhance people's lives and rootedness to places. This connection to culture asserts the spirit of places which defines how we act and who we are. Buildings that are disconnected from place, community, culture and ecology disconnect people; those that are shaped by a place allow people to become a part of it, interwoven with moods and values. Day (2004) wrote about the truth and integrity of architecture, referring to many modern buildings which have been built out of a material which is made to look like another. He argues, on this point that these buildings create a sense of untruthfulness which is sensed by people because materials that are closely related to a place manifest sensory messages about that place to people. The assertion of truth in architecture is related to people trying to make sense of their personal development, surroundings and society, because if things are not what they appear to be, the world can seem untrustworthy and this is easily sensed by children. They are naturally drawn to understanding the truths of the world and if architecture is decipherable and true to them, it fosters a sense of security and trust which is essential to their psychological development. Buildings that are designed according to local climate, social pattern, culture and response to site and context exude a strong sense of authenticity and sense of place (*genius loci*).

The Spirit of Place: Phenomenology and Genius Loci

Christian Norberg – Schulz (1979) identified phenomenology as having the potential in architecture to make the environment meaningful through the creation of specific places. He refers to the Roman idea of *genius loci* or spirit of place that he says, can provide opportunities for man to dwell in harmony with his surroundings. For this to occur, importance is based on basic architectural elements such as the walls, floors and ceilings being experienced as horizons, boundaries and frames for nature.

In addition to focusing on site, phenomenology also places an emphasis on the tectonics of building and the detail that is manifested. In his seminal writings on phenomenology and existential space, Norberg – Schulz argues that theories of perception and psychology related to understanding architecture, are somewhat irrelevant and do not convey a precise relationship between man and the environment. However, he implies that there are five space concepts which relate to our interaction with the world, these are; pragmatic space, perceptual space, existential space, cognitive space and abstract space. Firstly, pragmatic space is described as that which assimilates man with the natural environment, perceptual space is essential to the creation of personal identity and existential space creates connections to social and cultural totalities, for people. These three are important because they relate to a person's direct experience with the environment. Cognitive space is a product of the three types of space mentioned above, allowing a person to actually think about space and lastly, logical space provides tools for a person to describe the other types of spaces. Norberg – Schulz claims that existential space forges the relationship between man and his environment and this concept is divided into space and character in accordance with the functions of *orientation* and *identification* within space (Norberg – Schulz, 1971: 11). This being said, perceptual, existential and cognitive space and orientation and identification are all related to perception and psychology of the environment and perhaps, Norberg – Schulz is refuted and contradicted in his argument that perception and psychology theories are far removed from a true understanding of architectural space. Instead, it is proposed that these theories, as well as that of existential space and *genius loci*, form a fundamental part in understanding how to create spaces for people. The question then arises, how can this be achieved, from a phenomenological standpoint? The answer to this begins with the

concept of dwelling. Dwelling is the word that Norberg – Schulz (1979) and Bognar (1985) use to describe the purpose of architecture where man can orient and identify himself to an environment, thus deriving meaning from it. In that sense, dwelling implies something more concrete than just shelter, it implies that life occurs in places and therefore a place is a space which has a distinct character by providing the setting for human living (Thompson, cited in Menin, 2003: 69).

Norberg – Schulz (1971: 18) refers to Kevin Lynch's concepts of node, path and district, which denote the basic objects for orientation, asserting a good environmental image and leaving people with a sense of emotional security. If an orientation system is weak, man becomes confused or lost leading to a poor image of environmental character and thus the existential meaning within the environment becomes tainted. Dwelling is derived from wanting to feel secure and if a person feels lost, which is the opposite of secure, then the purpose of dwelling has vanished. True belonging to a place requires both orientation and identification to occur. The objects of identification are environmental properties which are concrete in their existence and people's relationships to these usually develop during childhood. Piaget states that a child uses his or her body (and thus the senses) to identify with the environment and he or she will develop perceptual schemata which will determine that child's future experiences. Therefore, it can be argued that environmental orientation and identification is inherently vital to children in this regard because the identity of a person is defined in terms of these schemata and human identity is a function of places and things because „(i)dentify, thus, is closely connected with the experience of place, especially during the years when personality is shaped“ (Norberg-Schulz, 1971: 25 and Sharr; cited in Menin, 2003). Identification means to become well acquainted with the natural settings, such as a man living in a desert who has to learn to live with the burning sun and endless sand. His settlements protect him from these natural forces and thus complement the natural situation, implying that this environment has been experienced as being meaningful. Understanding the genius loci of a place means respecting its underlying environmental factors. Thompson (cited in Menin, 2003) suggests that one of the aspects which relates to respecting genius loci is the re – use or recycling of materials that are found on a site or if new materials are to be used, they should be sourced locally. By adhering to this principle, the resulting aesthetic quality of

the building will be one which identifies with a local character, fitting into the place within which it has been placed. Man – made places and nature are related in three ways; firstly man wants to visualise and express nature and therefore builds what he sees. This is done by an interpretation of natural forms. For example, if an area in nature is suggestive of centralization, it follows that man would build a central gathering space. Secondly, man has to complement what he has been given by what is lacking and thirdly he has to symbolize an understanding of nature and the purpose of symbolization is to create cultural objects which then become a representation of man. These three relations indicate that man gathers experienced meanings to create an image which helps to concretize his world. Architecture which visualises, symbolizes and gathers creates a unified whole to a person, thus giving a place character. The Greek columns; Doric, Ionic and Corinthian are an example of visualization and symbolization. The Doric column represents the proportions of a man's body, strength and beauty, the Ionic column represents female slenderness while the Corinthian imitates the figures of maidens. This type of articulation in architecture is not purely for aesthetic purposes; rather it makes a particular statement and character and this concept of creating such character, determined every architectural feature in the buildings of Greek architecture. Berleant (cited in Menin, 2003) argues that places have a sense of identity which is conveyed through topographical features or a central reference point, such as a monumental building. Cultural values, human sensibility and physical location are all considered to be aspects which can impart meaning and identity to a place but, argues Berleant, the aesthetics of a place can be considered to provide a much more special meaning to places. As mentioned before, the word aesthetics literally means sense perception and there can be no understanding of aesthetic qualities without the human body and experiences. Aesthetics of places cannot only be appreciated through visual means only; the other senses also play a role because perception occurs in a synaesthetic way. Place, according to Berleant is „a complex field of perceptual experience involving person and setting, together with the range of historical and cultural influence, knowledge and meaning that invariably imbue that field“ (cited in Menin, 2003: 46). For meanings to be derived from places, they need to be aesthetically effective by appealing to all aspects of the sensory systems (Plate 4.6) (Dengle, 2009).



Plate 4.6: Buildings can be designed to entice all of our sensory systems, such as this school which incorporates textures, patterns, shapes and planting to appeal to one's visual and tactile senses (Kroner, 1994: 18).

With that in mind, materials and colour contribute to characterization in the sense that they express the way that buildings relate to earth. Spaces possess variations in enclosure, places are seen as being enclosed entities and landscapes are seen as continuous extensions. Norberg – Schulz reasons that settlements and landscape therefore have a *figure – ground* relationship and a settlement can lose its identity if this relationship is interrupted. He also refers to centralization, direction and rhythm as being concrete properties of spaces (Norberg-Schulz, 1979). Order, character, light, time and things (furniture and objects), according to Norberg-Schulz (1979) are the categories of a human's natural understanding of their environment. Order and things are considered to be spatial while character and light indicate the general atmosphere of a place. The concept of character is a dimension of human life; while order and light can be determined by the sky and time implies constancy and change, making space and character a living reality, which gives a particular place its *genius loci*. The Christian religion, for example, is founded on the idea of the *spirit* which is evident of an existential reality. Light is therefore seen as being a divine manifestation and some churches were built with light being the element which gives the architecture its character. Just as natural forms have shape, colour and texture, so to can architecture

mimic these elements to give itself a character which can be derived meaningfully from the environment.

Place is an integral part of everybody's existence, for it is within *places* that everyday lives of people occur. The word place denotes something more than just a location, it refers to the totality of things which have material substance, shape, texture and colour. When these elements work in conjunction with one another, they create an environmental character which forms the essence of place. Everyday experience also tells us that different activities require different environments and functions, even the basic ones such as sleeping and eating take place in very different ways. All places exude a certain type of character and this is the basic mode that people use in understanding and enjoying the world and in some cases character is a function of *time*, changing with the weather, the day or night and even with social, political or cultural events. The character of a place or places is determined by how people experience the spaces and phenomenology of places is therefore related to the basic modes of construction and their inherent relationship to formal articulation, appealing to people's sense perception and experiences (Dengle, 2009 and Norberg – Schulz, 1979).

Berleant (cited in Menin, 2003) and Norberg – Schulz (1979) stated that *genius loci* was a Roman concept because the Romans believed that every person and place held its own *genius* or guardian spirit, which gave life to people and places. They believed that this spirit accompanied them from the time they are born to the time that they die and was ultimately a determination of their character. The spirit of place or *genius loci* arises from the special character or quality of a particular locality. The significant aspects to determine this can range from spatial structures, topographical patterns, textures, natural or climactic conditions, people and the pattern of human events. An example of this is the city of Sassi (stones) De Matera, in South Italy, which is an outstanding example of a settlement which has been perfectly adapted to its terrain and ecosystem. Archaeological evidence suggests that this zone was inhabited over 9,000 years ago. This ancient city is the only place in the world whose inhabitants can boast that they are living in houses that were built by their ancestors. The houses are dug into the rock itself, which is characteristic of that area in Italy and streets in some parts of the city are located on the



Plate 4.7: The city of Sassi De Matera, in Italy (Vogler and Vittori, 2006: 9).

rooftops of other houses (Plate 4.7). Vogler and Vittori state that the genius loci of this city was established and maintained through the symbiosis of culture and the topographical characteristics of place (Vogler and Vittori, 2006: 9 – 10).

Bognar (cited in Seamon & Mugerauer, 1985) elaborates on the theory that human beings are unquestionably spatial, environmental and architectural and are thus inseparable from genius loci. He states that we build to grasp and concretize the universe, structuring the world into an understandable whole. The homes and buildings that we erect are miniature universes, microcosms which help us to understand and remember who we are. Thus a sense of place implies both a micro and a macrocosmic dimension, being rooted in the perceived unity of material, spiritual, tangible or intangible. The multiplicity of one's experience is closely tied to the experiences within our environments, since perception and experience are coincidental. With this in mind, it is then easy to understand that a phenomenological insight aims to create environments which are multi – layered with meanings and this acts as a catalyst generating imagination, memory, association and differentiation. This then evokes the spirit of a place (Dengle, 2009 and Seamon and Mugerauer, 1985).

On a similar note to Bognar and Norberg – Schulz, Relph (1976) explored the theories and concepts surrounding the meaning of places and place – making. He refers to the theories of Lukermann who has defined the concept of place as:

- The idea of location is fundamental. Location can be described in terms of internal features (site) and external connectivity to other locations (situation), thus places have a spatial extension as well as an inside and an outside.
- Place involves an integration of nature and culture and this implies that every place has or will have a unique identity.
- Even though every place is unique, they are all connected by a system of circulation in the form of paths and roads.
- Places have a distinct historical component.
- Places have meanings and are characterised by the beliefs of man (Relph, 1976).

A place is thus a location plus everything that occupies that location, which is seen as a unified and significant phenomenon. Space is amorphous and intangible and an entity which is difficult to analyse and describe. Various forms of space lie within a continuum which has direct experience at one end and abstract thought at the other. Relph (1976) referred to the term primitive space and declares that it is the space of instinctive behaviour and unselfconscious action within which people always act and move without reflection. In a way this can be used to describe the playing of children. Primitive space is considered to be that which is rooted in concrete and substantial things. It is structured by basic individual experiences, beginning in infancy, associated with the movement of the body and with the senses. This understanding of space provides the fundamental dimensions of left and right, above and below, within reach and beyond reach. The experiences in primitive space are common to everyone and must be understood as being part of the basic spatial context of all cultural groups. Space is not empty, instead it is filled with content and substance derived from human intention and imagination which is the character of spaces and „(f)or children in particular, places constitute the basis for the discovery of the self. Childhood places frequently take on great significance and are remembered with reverence.“ (Relph, 1976: 11). The essence of a place can only be sensed through a chiaroscuro of setting, landscape and personal experience in order for the place to evoke a sense of meaning to people. Places occur at all levels of identity and they overlap one another, thus being open to interpretation. The true spirit of a place lies in its landscape and the importance of particular associations of physical features, natural or man – made, in defining place cannot be denied.

Proshansky and Fabian (cited in Spencer & Blades, 2006) theorised that over time, people change in the patterning of their physical, biological, social and cultural characteristics. With that in mind, the question arises of how children derive meanings and purpose from the physical environments they grow up in? Proshansky and Fabian's (cited in Spencer & Blades, 2006) answer to this question results from an understanding of place identity, which is perceived of as being a substructure of a person's self – identity that is comprised of cognitions about the physical environment that also serves to define who the person is. This is where the term individuation arises from, which begins



Plate 4.8: Exterior view of the Fawood Children's Centre (Mostaedi, 2006: 214).

with infants and evolves through sensorial and perceptual experiences. The relationships that children form with other people and objects indirectly defines who the child is to him or herself and to others as well. Therefore, we must assume that these identity formations are also rooted in the child's experience with spaces and play objects, such things that support its existence. Certain spaces or objects can feel familiar or controllable to children, almost as if they own them and this satisfies the integrity of the child's sense of self – worth just as Ismail Said (p. 1) suggested that „buildings designed by architectural students are final, that is, leaving little room for children to change or manipulate the architecture. According to the theory of childhood cognitive development and literature on children's perceptual psychology, such architecture may not generate a sense of place

attachment". Most importantly, a person's childhood place cognitions can have the most profound effect on their subsequent place identity later in life. Children look to the environment for ways in which to satisfy their needs. An example of this would be a child learning how to walk, if they are confronted with a multitude of surfaces and changing levels on which to practise and perfect their walking skills, this would help them to develop a higher sense of confidence and self – esteem about the success of their own development. Within a mass of stimuli, children recognise and identify meaningful spaces and places as well as the comprehension of how to use them. As this process of development continues, children will develop associations to spaces and places, some positive, and some negative or even neutral (Altman & Wohlwill, 1978; Day, 2007; Dudek, 2005 and Spencer & Blades, 2006). For example, the Fawood Children's Centre in London is a building which was designed for nursery school children, autistic and special needs children and also incorporates spaces for community education workers (Plate 4.8). Through the use of colour and texture, the spaces are child – orientated,



Plate 4.9: Interior spaces of the centre (Mostaedi, 2006: 220 and 241).

allowing for these spaces to be used in multiple ways. The various aspects of the design allow for the children to explore their environment in an uninhibited way, thus learning as they move about during the day. This allows them to develop meaningful associations to their school and community, through an interaction which occurs via the built environment. The design integrates internal and external play and learning spaces, including a water garden, willow tunnel, soft play area, tree house,

outdoor stage and climbing platform (Plate 4.9). Part translucent, part solid walls (Plate 4.8) composed of rippling curtains of lightweight mesh as well as elliptical acrylic coloured lozenges create an ever – changing atmosphere within the spaces of the building, adding to the children's phenomenological sense of place (Mostaedi, 2006: 212). Therefore, when the built environment affords spaces for children to find sanctuary

from their parents or stressful situations, this allows for places of significance in the child's development of place identity and therefore in self – identity. Aspects of the built environment, such as outdoor play spaces and indoor playrooms should include adaptable elements so that children can engage in their own forms of place – making, building forts, castles and houses and in that way, architecture can be more meaningful to them, connecting time, emotions and experiences to the memories of place. Memory itself is a paradigm of place attachment and positive memories from a place of play allow children to appraise that place with values and „experiencing the environment is an essential, critical and irreplaceable dimension in the growth and functioning of children“ (Said, 2006: 4).

The early self – perceptions and place – identity cognitions that children have will determine the kind of experiences the child is likely to have in later settings. Children sometimes use place – making as a way of looking inward, of establishing something of their own, thereby developing a sense of self. Forts and other special places become important for escaping and clearing the mind, especially for children who need to take some space and time out. Family relationships help to ground children in the place that they live, particularly social spaces which have a cultural history. Children, who experience culture as a part of the place that they live in, learn lessons that are tied to a way of life and a larger landscape. The narrative forms of memory are more closely associated with personality frameworks because stories help us to understand who we are and the social relationships that children have as they are growing up provides them with a sense of attachment to place and when this is absent, they lose important nurturing and mentoring experiences.

Conclusion

It is clear that creating a sense of place, or aptly responding to the genius loci of a site, can have an impact on the psychology of people, in various ways. Even though architects face many technical and financial challenges when designing within built environments, there should always be a consideration and appreciation of local cultures, materials, people and the history of a place. It is these aspects which connect people to their roots and traditions and if this is lost, then people will lose a sense of humanity and identity.

Forming identity is vital to the development of all children and personal identity is linked to place identity which is a component of critical regionalism as well as phenomenology. Another aspect which is proposed to be an important factor to child development is nature, which has been mentioned as being a fundamental connection point for regionalist architecture, in order to mould its phenomenological and sensory aspects. The psychological benefit of natural elements to the well – being of people has been recognised for centuries and it is believed to be particularly didactic to children of all ages. It is for this reason that the importance and benefits of nature to children will be explored in the following section. This will include an outline of the significance of playing for child development, especially playing in natural environments.

CHAPTER FIVE

THE ROLE OF NATURE IN CHILD DEVELOPMENT AND ARCHITECTURAL PSYCHOLOGY

“Wind – stirred leaves set high – light patterns and light – scatter in motion. They dance in a restful, visually undemanding way – each species differently: aspen almost always aflutter, horse – chestnut more sluggish. Trailing plants over windows swing and caress; vine leaves on pergolas ripple.”

(Day, 2007:106)

CHAPTER 5 THE ROLE OF NATURE IN CHILD DEVELOPMENT AND ARCHITECTURAL PSYCHOLOGY:

Introduction

Environmentalism is the belief that nature affects human beings and it is a thought that has been around since the time of Hippocrates. There have been countless studies documenting the importance of nature to the survival, adaptation, health and well – being of people, especially children (Wilson, 2008). It is a realistic understanding because when we are placed into tranquil, natural settings, we tend to feel more refreshed and relaxed. Water, plants, flowers, and animals are all components of natural life cycles and they are the most beautiful aspects of life on earth. Nature is seen to be important to children’s development in every way; emotionally, intellectually, socially, physically and spiritually (Wilson, 2008). However, inner – city children are considered to be disadvantaged because their capacity to enjoy and benefit from nature has been severely diminished due to the technology revolution (Slade & Wolf, 2004). The consequences of this can only result in serious health effects and diminishing life spans. Many children of the current generation prefer to spend their time indoors, watching hours of television, playing mindless, violent computer games and munching on unhealthy junk food and sweets, instead of partaking in spontaneous outdoor play and culture – enhancing traditional games. Interestingly, children show a natural predisposition to want to play outdoors, in the garden, with animals or simply playing with plants and flowers. Anita Rui Olds (cited in Day, 2007: 172) stated that:

“Trees, gardens, animals, water and views provide many physically and emotionally healing benefits, in addition to enhancing a child’s knowledge of the natural world. Indeed, if we are to save this planet, exposing children to the wonders of nature at a very young age is essential”.

Imagination and Play – The Wonder of Nature

Play is natural for young children and they can be seen engaging in play from the moment that they are born. It is an experience of creation, uniting time and space, bonding outer and inner experiences. Rudolf Steiner (cited in Day, 2007: 16) considered it to be „the work of childhood“. Playing with objects helps children for what they may do and experience in life, thus serving a multitude of developmental functions; physically,

emotionally and cognitively. They test their courage by playing and taking risks and this helps them to build their self – esteem by also practising co – operation with others, thus enhancing their social capabilities. Cognitively, play helps children to develop creativity, logic and problem solving, which is essential to learning about life and coping in certain situations. Exploring, experimenting and discovering also contribute to their emotional development, as they experience joy, togetherness and accomplishments. This is important in the development of a positive sense of self and a zest for life, all of which is important for the development of the senses, especially for disabled children (Slade & Wolf, 2004, Wilson, 2008 and Wolff, 1979).

Creative play allows children to set their own agendas and is the type of play that is most engaging and valuable to the development of children. Wilson (2008); Moore and



Plate 5.1: Children are naturally interested in plants and insects (Keeler, 2008: 16).

Marcus (2008) stated that children explore creative play in natural environments quite freely and happily. For them, there can be so much to do in the outdoor world; explore creek beds, chase butterflies, and play with sand or plant gardens (Plate 5.1). These are only a handful of planned activities that children can engage in and the most

important notion is that this type of play should be chosen freely by children, engages all of their senses and involves degrees of problem – solving and imagination. By making sense of things, playing also helps to link experiences and unravel a tangle of emotions eminent in children. There is also strong evidence which suggests that nature increases intelligence in children (Tai et al, 2006: 11). Playing creatively can have many benefits for young children, especially in environments that are natural and some of these benefits are (Wilson, 2008: 3):

- Play is an active form of learning which unites the mind, body and spirit.
- Play helps in reducing stress and tension in young children.
- It provides a healthy avenue for working through emotional aspects.
- Play engages all of their senses.
- It helps children to gain confidence and competence in moving through the larger world.

The United Nations Convention on the rights of the child recognises the right to play as one of the basic rights of children. They also state that children have the right to play in an environment that stimulates their healthy development (www.unicef.org). Nature can therefore be seen as an essential component of children's daily environments. The following qualities of nature can explain why it is a rich resource for children's creative play, helping them to develop their mental states and personalities:

- Nature is timeless and universal.
- It is an unpredictable environment, providing a variety of experiences.
- Nature is bountiful and alive with numerous sights, sounds and smells.
- Nature is real and it nourishes and heals (Wilson, 2008).

One of the benefits of playing in nature includes a deeper understanding and appreciation of nature and this is an important factor in teaching children about the world and also how to preserve the earth's natural environments and resources. Wilson (2008) refers to the following descriptions of children who have naturalistic intelligence, stating that they display keen and acute sensory skills, readily notice elements of the natural world, enjoy being outdoors – exploring natural phenomena, easily notice patterns in nature and display a natural interest for plants and animals. They also naturally express an awareness of and concern for the well being of the natural world.

Wilson (2008) and Kellert (2005, 65 – 67) remarked that children's experience of nature encompasses three types of contact; direct, indirect and symbolic. Direct refers to interaction with self – sustaining features of nature such as ponds, forests and caves and it is spontaneous. In contrast, indirect experiences are structured and planned by adults.

This includes encounters with domestic pets, household plants and gardening. Symbolic experiences do not refer to a direct or indirect experience but rather an image or metaphorical expression of nature, such as toys, television programmes or architecture.

With the advancements of technology, television, video games and the internet, children prefer to spend time indoors, rather than outdoors and this can have serious consequences on their natural development. Nature helps to refresh the soul and in hard – edged urban environments, trees, gardens, animals and water can have tremendous benefits for children and „(d)irect, often spontaneous contact with nature appears to constitute an irreplaceable core for healthy childhood growth and development“ (Kellert, 2005: 81). Teaching children about the natural environment and also allowing them to have a fun



Plate 5.2: The front view and manta ray inspired roof of the building (www.archdaily.com).

time is the aim at the Children’s Ecological Centre in Koh Kood Island, Thailand. This activity and learning centre was built for the island’s hotel and provides a place for visiting children to engage with the different forms of nature while playing. It incorporates an auditorium for films, lectures and plays on nature, an art room, music room, fashion room and a library with books on permaculture and the local traditions of the island. The roof of the building was inspired by manta rays (a type of sea animal) and it is perched in an elevated position so that it almost seems as if it is going to launch itself into the nearby ocean (Plate 5.2). All elements of the building are made of local materials such as bamboo and wood, creating a building which seems to have metamorphosed from its ecological location. There is also a vegetable garden for the

children to learn how to cook their own food, going a long way to teach children ecological awareness and sensitivity (www.archdaily.com). The building design also responds to the site and can thus also be referred to as an example of critically regionalist architecture. The consideration for creating a phenomenology of place at this Children's Centre, allows the children to create a deeper understanding to the architecture and what they can learn from it.

Gardening has been proven to be a good therapeutic tool for young and old (Day, 2007) and it can teach children patience, achievement and responsibility. It can also teach the importance of multifunctionality, inducing movement, posture, moods and aspirations.



Plate 5.3: Gardening for children has many benefits
(Keeler, 2008: 65).

Different levels and scales of space in the outdoor environment can suit different types of play. Garden activities can also be seen to balance fine and gross motor movements but most importantly they teach children about nature's sustainable cycles which is central to understanding environmental cause and effect as well as a wholeness of the world (Plate 5.3). Human damage to the environment has had appalling effects and teaching children to live sustainably can provide measures

to ensure that they don't make the same mistakes, when they grow up, as they learn to love and appreciate nature from a young age. Charles, Louv, Bodner, Guns and Stahl (2009: 27) referred to studies which focused on green space and children's well – being. These studies proved that children with more natural elements near their home received lower ratings on measures of anxiety and depression, which indicates that they were less psychologically distressed than peers with no natural elements near their home. In addition, Anita Rui Olds also argues that restful, natural settings can reduce the

physiological effects of stress. She even goes as far as to say that biofeedback studies have shown that the earlier in life and the more often such environments are experienced, the more likely it is that the stress of modern life will not take its toll later on (Weinstein and David, 1987). Nature is a dominant theme in the stories, fables and myths of childhood and it can be a major teaching and therapeutic tool in the first stage of cognitive development. Therefore gardens, playgrounds and schoolyards should be created as special places specifically for children. These spaces should be child – centred and memorable, above all.

An example of this is the Garden of the Senses at the Botanical Gardens, Durban. It is not specifically designed for children but it is a small, interesting space which incorporates many sensory elements which are fascinating to children. There are four themed statues, each sitting on a different textured ground surface (Plate 5.4), a coloured mosaic covered seat and a fountain in the centre which has a large, silver ball that water flows from. It is a delightful garden and also incorporates various indigenous plants of Durban to entice one’s sense of smell.



Plate 5.4: Paving texture variations and sculptural elements at the garden (Source: Author).

Designing Stimulating Schoolyards and Playgrounds

Playing for children takes place in innumerable places; backyards of homes, gardens, parks, playgrounds, nature reserves, sports fields, pavements and streets. Most of these areas include specialised play equipment, usually slides, swings, sandpits and see – saws. In recent times, however, there has been a shift in the design of outdoor play environments for children, reflecting the attitude that these places should be more stimulating to their development. This includes the integration of unusual play equipment, water, vegetable or herb gardens (to be grown by the children themselves) and different types of themed spaces. There is a subtle difference between gardens and playgrounds and this will be explored henceforth, including a description of ideas which can provide stimulating spaces for children of all ages.

Lady Allen of Hurtwood describes children’s play as a kind of research that they undertake, in order to find out about themselves and the world. She asserts that if, during the early years a child is deprived of the opportunity to educate his or herself by taking risks and by making friends; they may lose confidence as well as a desire to be self-

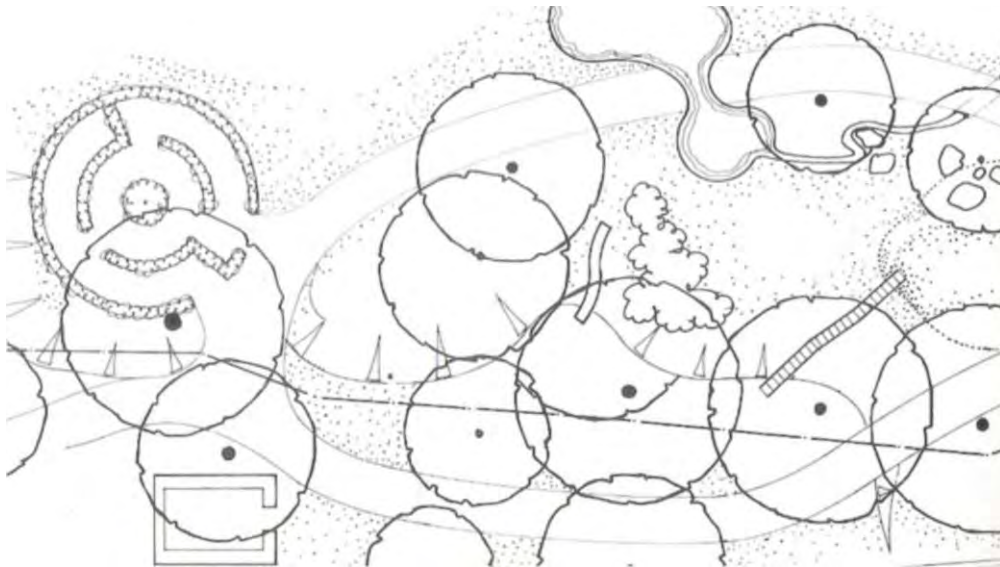


Figure 5.1: A design for an adventure playground (Lady Allen of Hurtwood, 1968: 128).

reliant. She then goes on to list ideas for designing successful playgrounds, research which she has gleaned from investigating play spaces. Lady Allen suggests that curved shapes for playgrounds are more suitable for younger children and this area should have some form of containing boundary to deter older children who are more robust and active

in their games (Fig 5.1). She also suggests that play spaces for the smallest children should be kept free of draughts and whistling winds as they scare these smaller children. The use of large trees in playgrounds may seem an exciting prospect, however, they cut out the sun, tend to drop a lot of leaves and they make paths slippery when wet. Lady Allen also suggests that for disabled children less formal equipment is required (Lady Allen of Hurtwood, 1968). She states that for children who have various forms of disabilities, adventure playgrounds are places which can have beneficial effects because their sensory experiences are often lacking. An adventure playground should have various materials and floor levels, so that disabled children can get used to all types of surfaces (Plate 5.5).



Plate 5.5: Children who are disabled prefer adventure playgrounds because of the manipulative possibilities that these offer. There is no formal play equipment and the children are encouraged to manipulate various materials to create and build different things, such as a fortress, tree – house or castle (Lady Allen of Hurtwood, 1968: 128).

On the other hand, Leland G. Shaw (cited in Weinstein and David, 1987) goes further in his exploration of playgrounds for both able and disabled children and through his

research, he points out key elements which are important to remember. He first outlines the importance of creating a sense of place, that every playground must have its own unique spirit and stresses that the formation of the initial design concept and the organization of the parts within an ordered theme creates a playground's sense of place. Since this impacts imageability and cognitive mapping, it is extremely important for children as it would seem even more special and memorable to them. A sense of place implies that the individual parts of an environment are created for their specific functional use and all of these parts must be shaped together to create an overall order.

A plaza space should be provided at the centre as this proves to be an effective organizing device (Plate 5.6), similar to a city square. Connecting the parts of a playground spatially



Plate 5.6: A pavilion provides the central element to this playscape (The Images Publishing Group, 2004: 87).

and physically allows play to flow freely and smooth transitions thus occur. Shaw (cited in Weinstein and David, 1987) emphasises that there needs to be a key play element as well as retreat and break away points. Another way of contributing to the environment's unity is by providing a large roof which covers the centre. He also suggests that juxtaposed spatial situations are necessary to support a rich pattern of play behaviour as a playground's spaces are not

always used in predictable ways. Key play spaces will be dominated by a major element and they should be surrounded by a simple juxtaposition of spaces and pathways (Plate 5.6). The most important aspect is that children need to be provided with a variety of choices which can anchor the play environment (cited in Weinstein and David, 1987).

Children's gardens can be designed to be any shape, size or theme and they can make a space very special. Small themed gardens can act as landmarks to children in a large

scale open environment or they can serve to be quiet, symbolic spaces with spaces for resting. Many types of gardens can be designed and this is dependent on the site location as well as the local cultures of a particular place. Tai et al (2006) suggest a series of themed gardens which are popular for children and these will be discussed below:

- Adventure gardens are those within which children get to choose and plan their play and are not limited by static equipment and pre – planned activities. Natural materials such as wood, earth, water and plants are essential elements as they can be manipulated in a carefree manner. These types of gardens are best suited for older disabled children as it allows them to be as carefree as possible. Adventure gardens incorporate the theory of loose parts whereby loose materials are left around for the children to use at their will and imagination.
- Edible gardens; food for human consumption was one of the first gardening incentives in history and one cannot underestimate the relationship between humans and the plants that we eat. These gardens are those which allow children to grow their own vegetables, fruits and herbs and it exposes them to the physical, mental and emotional well – being which results from growing, harvesting and eating fresh fruit and vegetables. They thus become connected to the natural world that helps to sustain all living things.
- Music gardens (Plate 5.7) can serve both an educational and recreational function, appealing to children’s senses in nature. Musical gardens are a new concept and they incorporate play structures which also serve the function of being specially designed to be musical instruments.
- Storybook gardens are those which incorporate a specific theme from a story or fairy – tale into the design of the garden.
- Water gardens; children love water in any form and it is one of the most appealing elements in playgrounds, however it is rarely incorporated successfully. Providing water basins with measuring cups, vessels and sponges can occupy and teach children while reflection pools and fountains can be quiet and soothing (Tai, et al, 2006: 97 – 125).



Plate 5.7: A musical instrument in a children's garden (Keeler, 2008: 85).

An Analysis of the Boston Children's Museum

The Boston Children's Museum is located in Boston, along its harbour line, thus occupying a prominent location in the city (Plate 5.8). It is surrounded by hotels, convention centres, galleries and a courthouse, creating a defined cultural district in the area and it is easily accessible by subway and within walking distance from residential districts. The museum was formerly a warehouse and it now aims to help children understand and enjoy the world in which they live. Some of the exhibits/activities at the museum include art studios, construction zones, an authentic Japanese house, theatre performances, a recycle shop, play – lab and science playground. The outdoor plaza/play area is an interesting new addition to the museum and includes various sensory aspects which were designed specifically for children in mind.

A huge, iconic milk bottle, which was an advertising gimmick of a milk company, provides a landmark at the corner of the site (Plate 5.8). This milk bottle was on site before the museum was built and it was integrated into the design of the plaza play space. The landscape design includes a harbour – walk with bleachers, a native plant garden, water taxi landing, marble boulders, events plaza, and plant beds with seat walls, outdoor café, and a maze plaza (Fig 5.2). Marble boulders included in the design are an

indication and demonstration of scale, gravity and geology and were intended for the children to climb over and play with (Plate 5.9). This provides a learning experience which is physical, spatial and environmental. Planter boxes provide informal seating as well as balance beams for children. A dead – end maze path leads to the main entrance of the museum and is used as an informal scooter track. Trees and a native garden housing local species provide a connection to nature for the children and desensitises the urban environment.



Figure 5.2: Plan of the Boston Children’s Museum, showing the landscaping intentions, all of which aim to stimulate and excite the children (Carlock, 2008: 89).



Plate 5.8: View of the Boston Children's Museum. The huge milk bottle acts as a landmark and the maze pathway is meant for the children to run along (Carlock, 2008: 87).



Plate 5.9: Maze path and large boulders provide unusual and interesting features in the outdoor entertainment areas of the museum (Carlock, 2008: 88).

Creating Healing Environments for Disabled Children

Inspiration, motivation, meaning and fulfilment are essential to human health and basic needs. Bodily health itself is borne out of a state of inner well – being, involving wholeness and balance of every level in the human body. To heal one’s body and mind, every level must thus be addressed and nourishing environments can be a source of this. Rhythms, harmonies and sensory delights can be used to nourish people’s feelings of life, thereby supporting their values and individual identity. Incorporating the energies of life into the built environment includes creating regular contact with nature and its many forms. Living organisms in nature tend to be mobile and are structured by invisible principles which accentuate their growth processes and through time, they develop and metamorphose, similarly to the growth of children (Day, 2002: 184). In order to de – stress or heal people, their feelings need to be targeted and this is related to their senses, each of which works in a different way. For example, if a person sees a large, red, flashing object approaching them at high speed, the feeling that is brought about in them is one of fear and danger. In contrast, if a person saw a green meadow, filled with flowers and the sound of gurgling water, it would make them feel calm and serene within. With this in mind, the senses are incredibly important to creating feelings and emotions within people and are thus vital to creating environments which act as healing spaces for the mind, body and soul. This becomes equally relevant to the lives of physically disabled children whose senses are the windows to their world of feelings and emotions. Places which are transformative in their appearance in terms of how they inspire, motivate and give meaning to people are places which heal one’s soul. These places need to be formed out of the direct needs of people and their circumstances.

Development over time, metamorphic transformations, cyclic rhythms and cosmic energies are all a part of daily life and they are vital to the support of life – energies. Form, shape and rhythmical relationships are easy to incorporate into buildings. The rhythms of nature sustain us and support the regenerative forces within people. Metamorphosis is found in everything that is alive and time related. Day states that surroundings which indicate levels of metamorphosis bring the idea of mobility and life – energy to people. Healing environments can thus be created; places which help to heal people (Plate 5.10). Day postulates that it is the spirit of places that contributes to the

healing of people and this spirit is formed by people's values. The spirit of a place is fed by how that place is used and thus what values become imprinted onto it. Children can



Plate 5.10: The ethereal qualities of nature are inspirations for healing environments (Keeler, 2008: 189).

sense the spirit within a place and behave accordingly to it, because they are so innocent. Therefore, it is essential to create healing, spirited places for disabled children. The feeling of security, especially from psychological burdens, is central to the creation of spirit in places. Tranquillity in places does not necessarily mean places which are calming, serene and quiet. They can also be places which are spacious to the eye, comfortable and free from clutter. Creating places which rehabilitate children requires careful attention to the entry and exit points.

Most importantly, creating healing environments requires a sense of truth to be imprinted into the architectural message, the more the levels of truth, the more meaningful the experience becomes. The spirit of a place is supported by its moods, which is in turn supported by the flow of experiences and relationships (Day, 2004).

The solid and sterile urban environments of modern man has reduced people's free access to nature and this has greatly influenced people's lives in a multitude of ways; people have become more stressed and prone to diseases than ever before. Health is a multi – level process which includes the well – being of a person's physical, mental and social state. Physically disabled children are in an altered state of physical health but are usually of sound intelligence, because their mental health has been maintained despite their physical impairments. Hygiene and well – designed environments can aid in the general health of people and the term sick building syndrome has become widely known; indicating the levels at which building design can actually make people feel sick. Day

(2002) and Venolia (cited in Sternberg, 2009) stated that buildings which inspire calm also reflect a sense of health to people.

“When considering the range of issues encompassed by the interaction of children and their environment, two worlds come into play: the very tangible world the child is touching, tasting and experiencing daily and the future world into which the child is growing.....(i)ssues that seem predetermined – how we build over forests, open space and farm land; protect source water and ensure drinking water; lay out housing subdivisions, transport people and goods; build schools; and ensure walkable neighbourhoods – are children’s environmental health issues as well (Cummins and Jackson, 2001: 1243 – 1244)”.

Spatial gesture in architecture influences a person’s physical and mental state and we experience shapes in relation to body scale and proportions. This in turn can induce different types of feelings in people, for example, Gothic architecture can serve to be awe – inspiring, while Romanesque architecture can make one feel nostalgic. Indoor air quality is an important factor because the large volumes of air that we consume daily mean that we cannot avoid its chemical effects. Fresh air is important for body invigoration and many buildings are designed to prevent the natural flow of fresh air into the buildings. Rooms that are stuffy can cause concentration and vigour to fade and much building sickness is due to ducting and air – recycling. Sunlight is essential to life on earth and has a major influence on mood. The sun is incredibly powerful and its light reaches earth moderated by clouds, leaves and buildings. Day (2002: 200) states that the soul craves sunlight and he argues that sunlight’s disinfecting and prophylactic effects have been recognised for decades. Sunlight is thought to accelerate toxin elimination, calcium assimilation, vitamin D production and liver processes. The physiological and aesthetic effects of sunlight striking buildings can delight people’s senses in a myriad of ways. Daylight’s changing qualities is an important element to incorporate within buildings as it connects people to time and the energies of life (Day, 2002: 200).

Mazuch and Stephen (2005) claimed that humanistic, healing architecture places human welfare at the heart of building design. To understand how to create healing environments, they have developed three hybrid design tools: sense sensitive design, emotional mapping and design prescription. Sense sensitivity enables one to understand how and why spaces can become therapeutic. This aspect is related to people’s perceptions of the environment through their senses and is thus quite appropriate when

designing for children. Aspects such as artwork, aroma, modulation, the arrangement of furniture, movement through space and time and plantscapes can all have healing benefits. Emotional mapping is a tool which can be used to understand the emotions, feelings, sentiments and sensations of people in relation to environments in order to determine how to design for them and design prescription involves the identification of optimal healing spaces by addressing each sense individually. An understanding of the dimensions and limitations of the senses can bring about an environment which is truly responsive to the individuals using it (Mazuch and Stephen, 2005).

Horsburgh (1995) talked about similar aspects in healing environments but he refers to orientation, connection and symbolic meaning as being the most important in creating places which heal. He states that orientation is the property of space which conveys to people its physical connection to other spaces. This includes access and the ability to find the entrance to a building. Labyrinthine buildings are confusing and alienating to people and thus do not cater to their needs. Blind children, for example are more susceptible to information overload and are dependent on the assistance of others. These children can be easily frustrated by confusing spatial configurations. Horsburgh (1995), Lynch (1960) and Norberg – Schulz (1979) all recommended the use of landmarks to aid in orientation, which can be used as reference along a path. This can be achieved in a variety of ways using sculptures, fountains, colours or even trees. He then speaks about connection, which describes the quality of interaction between people and their environments. Connection with people and nature is very important in this regard. Creating a connection to people involves a link between community and privacy allowing a transition between these two. Buildings also convey symbolic meanings to people in the form of associations to culture. For example, the statue of liberty in New York represents freedom and is an important symbolic element to the people. In a similar way, the overall message that a building conveys can have a significant effect on the experience of the users. Making spaces less impersonal is a way to indicate that the building's focus is on individuals (Horsburgh, 1995).

The central aspect to creating healing environments is a growth towards wholeness, which includes an integrated balance of body, soul, life – energy and individuality. The

life forces of nature are a powerful therapeutic element in any building and this implies the creation of harmony in the built environment. To be in harmony means that we need to be in the right mood to undertake a certain activity. Different spaces and places need different characteristics and this is dependent on the types of activities which occur there. When places are built with love and care, they impart this sense to the users of the building, who then feel nourished by this. Venolia (cited in Sternberg, 2009) implied that healing environments need to incorporate the following essential qualities:

- Healing environments need to stimulate a positive awareness of self.
- Need to enhance connections to nature, culture and people.
- Allow for privacy and do no physical harm.
- Encourage relaxation, balance and flexibility.
- Be beautiful.

In her view, healing environments also incorporate the elements of orientation, colour, light, sound, symbols, form, materials, climate and activities. Healing environments and architectural psychology study the environmental requirements of places in which we can feel good or bad, happy or sad and it can be argued that certain natural environments can be elemental in transforming healing processes and emotions. Throughout history, gardens have been used to aid in the healing process and their purpose is to revive one's mind, body and soul, rather than just simply alleviating a person's symptoms. Therefore, the goal of a healing garden is to make people feel safe, less stressed and more invigorated.



**Plate 5.11: A healing garden for children
(Marcus, 2003: 84).**

A children's healing garden (Plate 5.11) at the Legacy Emanuel Children's Hospital in Portland, Oregon is an exemplary example of a healing space, in an environment which

can be seen as being potentially scary to children. Designed by landscape architects, the garden is in a triangular courtyard, surrounded by glass walls, so that patients can see outside. It consists of a figure eight path which winds through planted landscapes. Five sub – areas are partially or totally screened from one another through the use of planting or benches and each one of the areas serves parents, staff or children. Elements of the garden include plant labels, bird feeders and nesting boxes, sculpted frogs, snails, a smiling face and edible plants (Plate 5.11 and 5.12). The tactile elements in the garden and water fountain are soothing to children, allowing them to explore and discover things while engaging with others and having meaningful experiences in this way (Plate 5.12) (Marcus, 2003: 85 – 88).

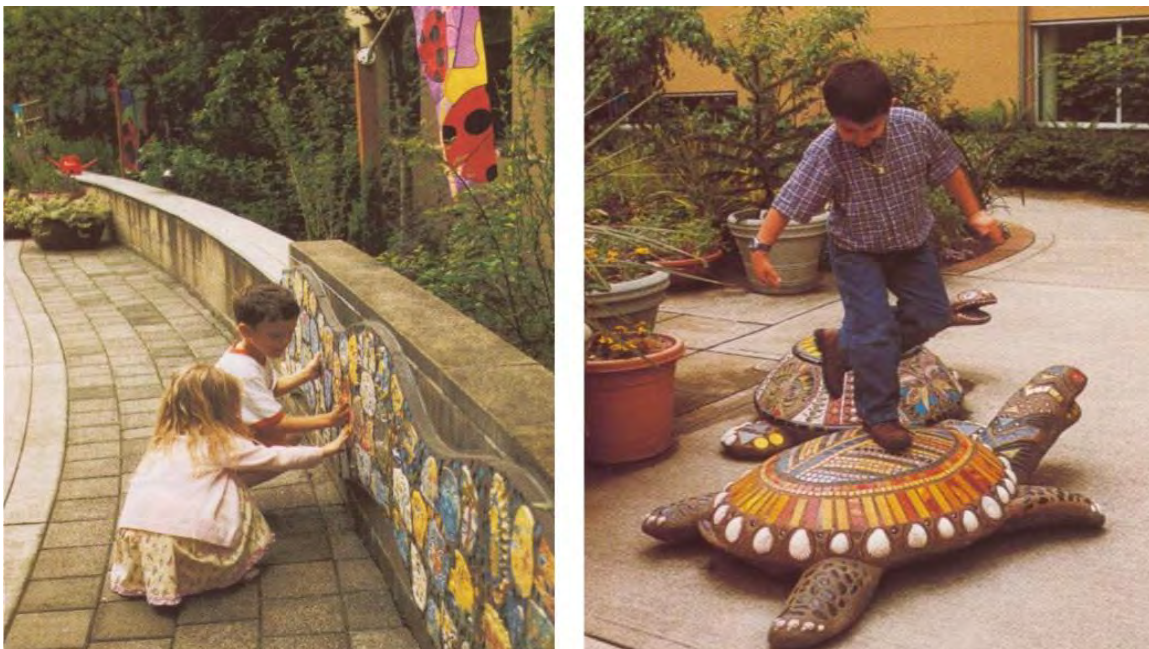


Plate 5.12: Children enjoy the tactile elements of the healing garden (Marcus, 2003: 86 & 88).

Conclusion

Designing environments which serve to stimulate, calm or de – stress should be considered for all types of buildings. Healing environments don’t necessarily have to target the ill or patients in a hospital. As long as there is an adherence to respecting the senses, nature, culture, context and people; these buildings can contribute to the creation of sustainable cities, encompassing all aspects of human life, social, physical, emotional and intellectual. Creating healing environments also includes ensuring that building design does not cause negative effects on people, such as sick building syndrome, a

common issue with many buildings. Sick building syndrome is the psychological or physical stress that a person feels (usually in work environments) in a building. Even though buildings cannot make a person extremely ill, factors such as certain colours, inadequate lighting conditions, poor air circulation, technological equipment, toxic paints or materials and cramped conditions due to a lack of space, can all cause adverse stress in some way or another. For this reason, healing, stimulating environments is vital for all people, including and especially, children. Another factor which can cause stress to children, particularly, is if they do not feel safe and protected and this can be caused by the design of buildings, as well. Crime is a major problem in South Africa and the discussion that follows will predominantly deal with issues of safety in buildings for children, thus looking at the principles of defensible space.

CHAPTER SIX

CREATING SAFETY FOR CHILDREN IN THE BUILT ENVIRONMENT

“Observation has revealed that children particularly enjoy defensible space. Defensible spaces are usually small and quite enclosed with only one entrance – exit.”

(Weinstein and David, 1987:195)

CHAPTER 6 CREATING SAFETY FOR CHILDREN IN THE BUILT ENVIRONMENT

Introduction

Throughout the history of man, crime, violence and war have plagued cities all over the world and the earliest towns and cities were designed and built so that they were defensible to outsiders and attackers. This ensured the safety of the people, their livestock and wealth and most importantly, the securing of land and space. Fortresses, high city walls and castles deterred aggression by their mere appearance. Medieval military cities displayed defensiveness by the building of massive, tall walls around the

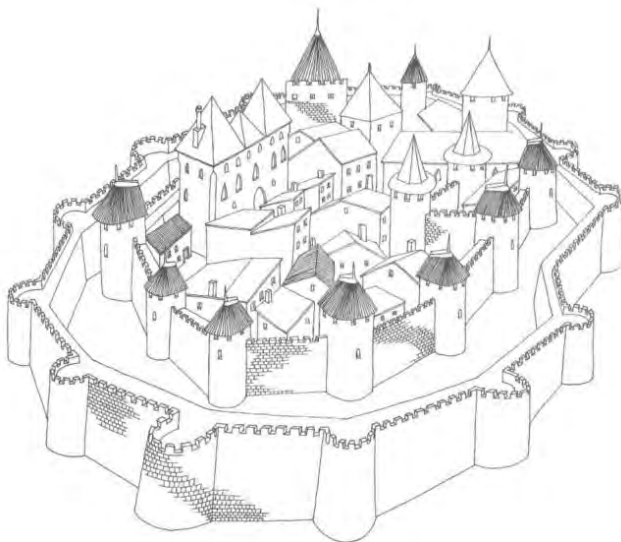


Figure 6.1: Medieval fortress cities were defended by the walls around them (Wilson, 1984: 218).

cities, with towers to act as lookout points. These walls thus became symbols of these cities and they were a sign of the confidence of the people to defend their boundaries (Fig 6.1). Even the planning of the cities within the walls coincided with efficient measures for defence if they were attacked; streets led soldiers to defensive walls, and towers were situated according to the range of longbows and crossbows. However,

the invention of iron cannonballs saw the destruction of these walls and thereafter, cities and towns were designed and built without them as these fortress walls could be destroyed easier than they were put up (Wilson, 1984: 212 – 221).

Today, many countries around the world face the serious problem of high crime rates, which are devastating societies and people's attitudes to the places that they live in. People live in constant fear, which impacts on their everyday lives and routines. South Africa is no exception and the high crime rate has caused many people to flee the country as they have no hope or positive attitude for change to occur. There has been extensive research into the causes and effects for high crime rates and issues such as poverty,

starvation and unemployment are some of the common reasons for people to commit crimes. Societies have lost their sense of community and shared belief systems, which has crippled the ability for people to agree on the action that is required to maintain social frameworks thus negating the opportunities for crime to occur. The only recourse that people see for escalating crime is a total lockup of their houses, properties and businesses and self – restriction of movement, all of which impair the social and cultural links that people have.

Oscar Newman: Defensible Space Principles

The research of Oscar Newman (1973) outlines the *New York University Project for Security Design in Urban Residential Areas*. This project is interesting as it studies the pattern, nature and location of crime in urban residential areas across America. Their

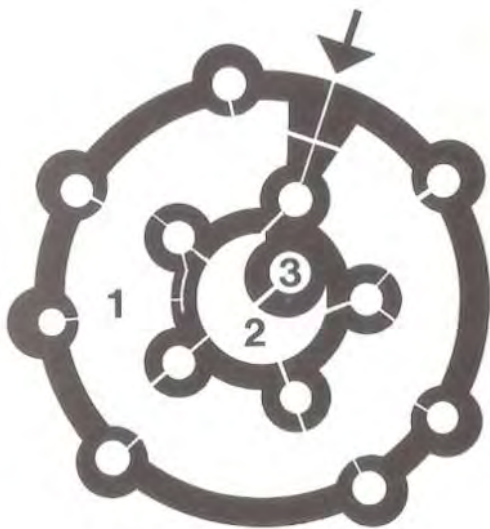


Figure 6.2: Concentric circles of defensible space (Wilson, 1984: 221).

conclusion after such an extensive study was that the new physical form of urban environments is possibly the most cogently that criminals have. With this in mind, Oscar Newman's theory of defensible space is an attractive model which poses to inhibit crime by creating the physical expression of a social fabric which defends itself, through the careful design of buildings and their surrounding spaces (Fig 6.2). The creation of a sense of territoriality and community can be translated into a sense of

responsibility by people thus ensuring a safer living space. Over thousands of years, almost every culture in the world has developed devices in terms of architectural expression to define the territorial realms of their dwellings and these traditions have been lost in the cities and towns of today (Newman, 1973).

The poorer areas and low income families cannot afford security measures such as alarm systems and security guards and these areas are more susceptible to crime. Newman states that there are four elements of physical design which can contribute to creating

securer environments for people. First is the territorial definition of space which reflects the areas of influence of the inhabitants, second is the positioning of apartment windows to allow the residents to naturally survey the exterior and interior public areas of their living environment. Third is the implementation of building forms which avoid the stigma of peculiarity that allows others to observe the vulnerability and isolation of the inhabitants and lastly, the heightening of safety by locating residential environments in areas which are adjacent to activities that do not provide a constant risk, such as shopping centres or offices.

Streets can provide security in the form of prominent paths for pedestrians and vehicular movement and the surveillance which is provided by passers – by is an important deterrent to criminal activity. When people do not use the public grounds surrounding their apartments, these become vacant, unused and prime spots for crime to fester. Interestingly, as building height increases, so does crime, as people become more and more dislocated from the activities of the street level, which do not draw their attention to participate. Larger housing blocks can foster feelings of anonymity, isolation and a lack of identity with the surroundings. Newman (1973) believes that certain kinds of spaces and layouts foster the activities of criminals and he advocates that when buildings are confusing in terms of their corridors, fire stairs and exits, police find it hard to locate apartments and subsequently criminals. The root causes of criminal activity lies in the social structure of nations and there are no direct and immediate resolutions to combat the statistics which are continually on a rise. For young, helpless and defenceless children, especially those who are disabled and have no ways of protecting themselves, the principles of defensible space theories become increasingly important in creating environments where children can be naturally safe and are not exposed to the harmful elements of crime which can have debilitating effects on their development. When there are feelings of insecurity about one's residential environment, people can adopt negative, uncaring and defeatist view of themselves. Newman states that children who live in high – rise buildings seem to have poorly developed perceptions of individual privacy and very little understanding of territory and this can lead to low self – esteem and a lack of confident personal identity. Evidence also suggests that the physical form of residential

environments can play a significant role in shaping the perception of children and in making them recognise the existence of zones of influence as well as the rights of others.

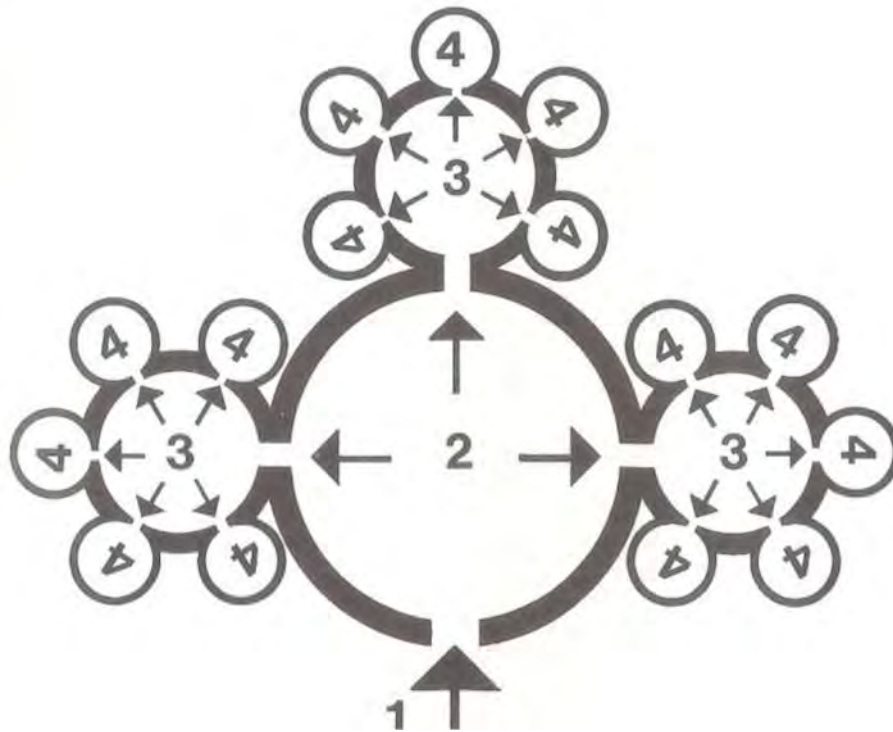


Figure 6.3: Schematic diagram showing the hierarchy of defensible space from public to private (Wilson, 1984: 223).

Territorial Definition:

The single family house has always been given architectural expression and is symbolic of people having a stake in the social system and this statement in itself is a definition of territorial claim and personal space (Wilson, 1984: 262). Gardens that surround these houses, shrubs, fences, high walls, gates and the positioning of lights and windows which look out onto these spaces, all act in staking territory. Row houses and similar denser agglomerations offer no opportunity for individual efforts at defining territory. Newman's theory states that buildings which are defined and reinforced with grounds and gardens can become an increasingly potent form of territorial expression as this projects the image of the building and its property as an organic interrelated whole. Boundary definers can be seen as a language of symbols which can be used to create transition zones from public to private (Newman, 1973 & Wilson, 1984). There are real and symbolic barriers and these can be explained as follows: real barriers are u – shaped buildings with a courtyard in the centre, high walls, fences, locked gates and doors

whereas symbolic barriers are open gateways, short runs of steps, planting and changes in the texture of walking surfaces. These barriers can serve to inform that one is moving from a space which is public, where one's presence is not questioned, to a space which is private and where one's presence requires validation.

Natural Surveillance:

The ability to observe the public areas of one's residential environment and to feel that one is under observation by other residents can have a profound effect in securing the environment to prevent crime. Surveillance can be seen to reduce the fears and anxieties of residents and this can be achieved through the relative juxtaposition of windows with stairs and corridors, as well as with the outside, thus ensuring that all public and semi-private spaces and paths are under continual and natural observation. This image will then be perceived by the potential criminal who might feel deterred from considering the building as an easy target. Design which facilitates the surveillance of outside areas from within apartments can be accomplished in many ways and this involves designing buildings so that people within them will naturally view the communally used paths, entries, play and seating areas of spaces during their daily activities. As adults spend a good portion of their time in the kitchen and dining areas, these spaces provide natural surveillance points for children who are playing outdoors. Many residential buildings look almost the same from every angle and nothing that the tenants do to their apartments can modify this image to impart a sense of identity and thus territoriality.

Image and Milieu:

Therefore, the image that buildings project is incredibly important to the theory of defensible space. Good materials and furnishings which are maintained properly assert an image of care and identity thus reinforcing the idea of territory. Aesthetic considerations assume the importance for the ways that it contributes to the definition and subdivision of the environment as well as to the psychological state of the inhabitants. Urban areas, streets or paths which are recognised as being safe allow the adjoining areas to benefit from this safety in a real sense. The continuing increase of vandalism, burglary and crime in schools has led to the frequent use of security patrols as well as electronic surveillance systems. This fear of crime in schools has led designers to produce fortress

– like schools which seem like institutions to young children. These schools are often unstimulating environments for children.

Poyner (1983) refers to patterns of design which can be used to keep schools and residential areas safe from crime. He refers to Newman's book on Defensible Space and expands on his theories, suggesting that these theories have a good base for designing against potential crime. His patterns for the design and maintenance of schools include:

- If a school is well maintained and clean, there appears to be less risk of break – ins.
- If schools are located in busy areas, near thoroughfares with commercial and public buildings, there appears to be less risk of crime.
- School buildings should be located close to the street, and they should be unobstructed from view.
- Schools should be as compact as possible.
- All means of climbing onto the roofs of school buildings should be eliminated (Poyner, 1983).

Conclusion

The safety of children is an incredibly delicate and serious matter to deal with in any setting. Protection is a need which every person experiences and if children feel vulnerable to any sort of bad element (which scares them) they can lose confidence and self – esteem. This can have negative effects, especially during their adult lives. Even though the concepts of defensible space are geared towards residential environments, it is proposed that these ideas can be adapted and applied to other building typologies, as Poyner (1983) mentions when he talks about defensible space measures in the design of school buildings. In a place like South Africa, with exorbitantly high crime rates, building design needs to be defensible to deter any sort of crime, but it is noted that defensible space is not the only solution. Children, who feel safe in environments which are not their home, also tend to appreciate those places just as much. In that way, these places can become much more meaningful, contributing to their development in a positive way.

CHAPTER SEVEN

CASE STUDIES

CHAPTER 7 CASE STUDIES

MACRO CONTEXT BACKGROUND – DURBAN

The city of Durban or eThekweni is the third largest city in the country of South Africa and it is the busiest port city in the country (Fig 7.1). Durban is also a major tourist destination, famous for its long stretch of golden beaches and warm weather all year round. The city dates from 1824 when twenty – five men arrived from the Cape Colony and established a settlement on the northern shore of the Bay of Natal. During 1835, it was then decided to

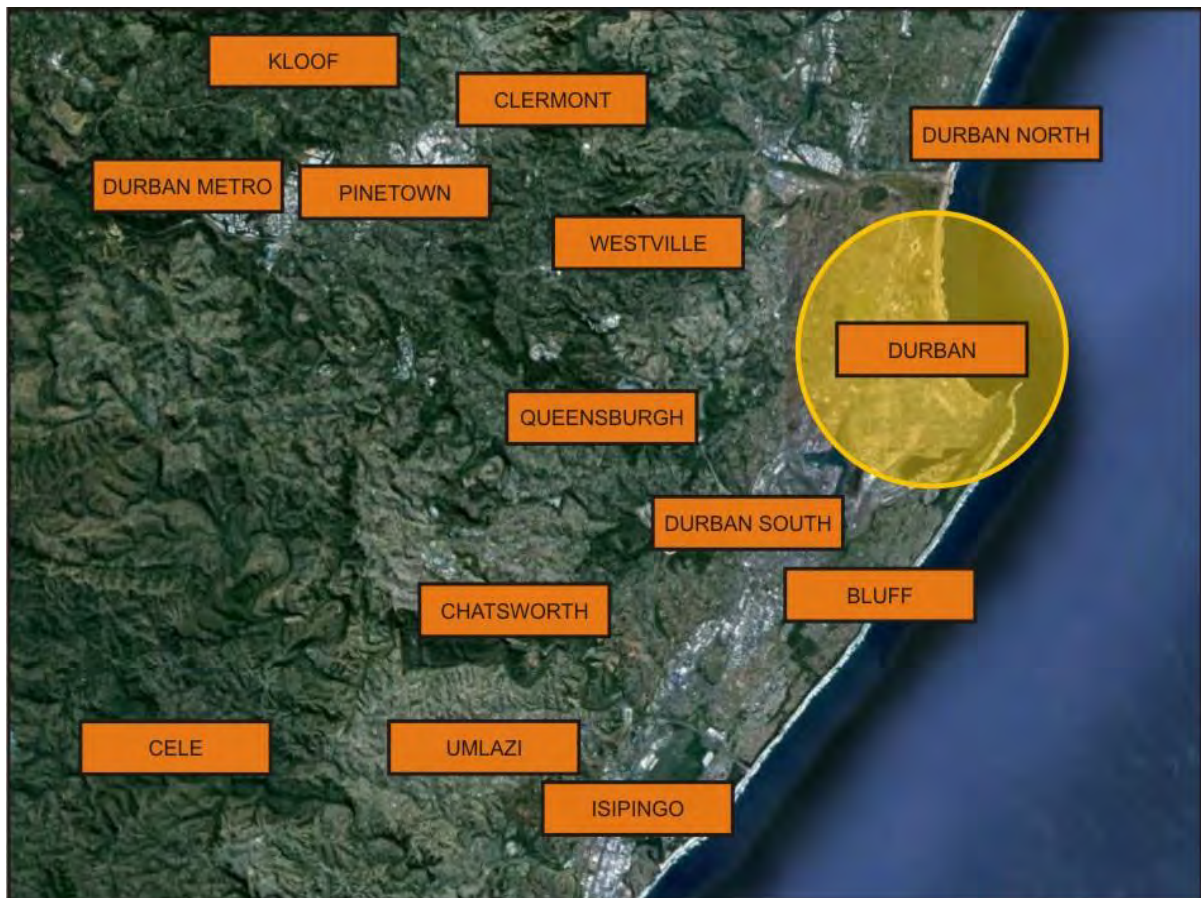


Figure 7.1: An aerial view of the city of Durban and the major suburbs (www.googleearth.com, altered by author).

build a capital town and they named it d'Urban after the governor of the Cape Colony, Sir Benjamin d'Urban (Smith, 1992). The historical legacy of the Apartheid era was a major influence on the planning of South African cities and this resulted in them having a low – density sprawl pattern. South African cities such as Durban can be described as being fragmented where development occurs in pockets bounded by freeways and open spaces. Sprawling cities generate an enormous amount of movement and Durban is dominated by its

transportation systems. Many housing areas are away from the city centre and these constitute poor living environments, also becoming quite inconvenient to the poorer people who do not have cars. The ways in which these housing areas have been fragmented from the city centre has led to the people living in them receiving poor service and little access to adequate medical and educational services (Smith, 1992). Many of the children in the disadvantaged areas do not in some case have access to education at all and have to travel extreme distance to get to their schools. There are also high levels of crime within the city centre and the suburbs due to the high rate of unemployment. The main transportation system within the city is the road network, through the use of cars, buses and taxis with the rail system being secondary transport (Smith, 1992). Considering this in mind, the following case studies which have been chosen are all located within Durban and they illustrate various architectural design principles which are important to understand when designing for disabled children.

AN ANALYSIS OF THE SEVEN FOUNTAINS SCHOOL IN TERMS OF SENSORY AND PHENOMENOLOGICAL DESIGN

Introduction

The Seven Fountains Primary School was designed by East Coast Architects, who practise in Durban. It is a community school which involved a great amount of community empowerment. It has become a renowned building in South Africa as it was built partly by an organisation that is run by American talk show host; Oprah Winfrey (Oprah's Angel Network). The design of this school won the architects the following awards: the KZNIA Award for Architecture (2009) and the SAIA Award for Excellence (2010) (www.eastcoastarchitects.co.za). The school was not designed specifically for the disabled but does include aspects of accessibility.

Justification of the Case Study

There are various reasons that this case study has been chosen. Firstly, and most importantly, it is one of the very few schools in South Africa where the design approach included creating a building as a pedagogic tool for children and the local people, by employing sensory and passive principles into the design of the building. Secondly, community empowerment, use of local crafts and materials and the incorporation of sustainability implies a critical regionalist approach. Lastly, the site and context formed an integral part of the design process, hence the aspect of genius loci. All of the above mentioned factors are theories which were examined in the literature review and for that reason; the Seven Fountains School is an interesting case study. Analysing these aspects in built form will help to understand their pros and cons, further strengthening the main argument and providing a solid foundation to bridge the gap between theory and practise.

Location

The school is located in a township called Shayamoya which borders a little town called Kokstad, situated in the Sisonke district, KwaZulu Natal. This picturesque little town is built on the outskirts of the infamous Drakensberg Mountains. It can be described as a Transkei trading, dairy and beef farming town and has an extreme climate with snow falling on the

higher grounds annually; during winter and the hot summers are frequented by thunderstorms and hail.

Historical and Social Context

Historically, the school has only been in use for roughly four years (it opened in 2007) and therefore does not have an extensive history. The community of Shayamoya saw the building of 4 500 RDP houses, causing a massive boom in the population. A small school community of fourteen students rose rapidly to two hundred and fifty in 2003, when this occurred and the school, which was housed in a host farm called Seven Fountains, was evicted from the premises. An abandoned hostel was then converted to a make – shift school for the children but this saw them in dire circumstances. There were few windows, leaking roofs, no water, electricity, sanitation, trees or shade. This was not a pleasant environment for the children to learn in and unfortunately it is the situation that many rural villages and townships find themselves in. The surrounding community was and still is severely stressed economically, with high levels of unemployment and migrancy. Since the township is located on the outskirts of the main town, there was a sense of separation and alienation, which contributed to the low morale of the people living there. Water sources were also unreliable in the area, as it was constantly being shut off. The design team were thus faced with many issues surrounding the school before it was even built, but it was evident that this was an area which was in great need of an upliftment (Raman, 2009: 30 – 34).

Empirical Data

SITE ACCESS AND ENTRANCE:

The school is located on the outskirts of Kokstad and the township is hard to get to because many of the roads are narrow and there is an absence of street names. It is set in the heart of the RDP housing area, closely surrounded by these, to the point where one could almost miss the school (Fig 7.2). There appears to be only one entrance to the school and this is a small, narrow driveway leading to a small parking lot. From the street there is a large, noticeable sign and the architectural form and language is somewhat defined to a passer – by, which is achieved by use of materials and textures. Once inside the parking lot, there appears to be no well – defined entrance, except signs leading one to the administration and staff offices.

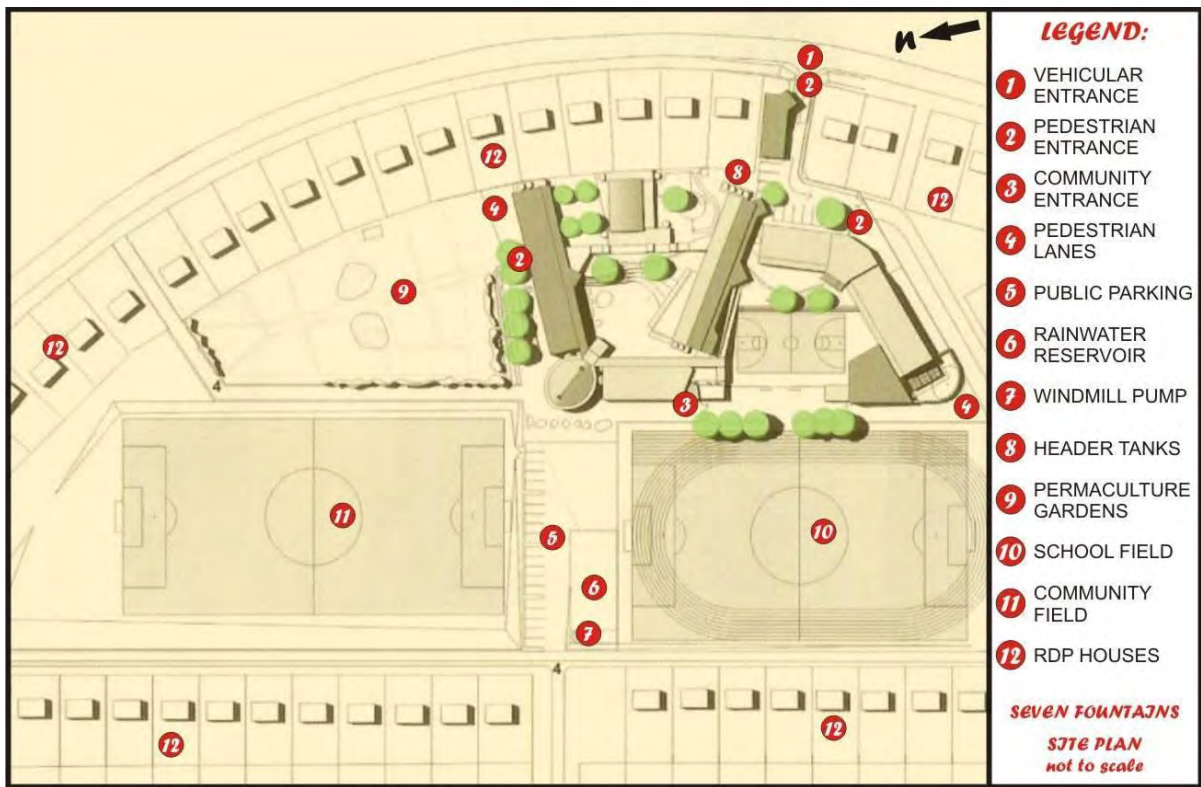


Figure 7.2: Site plan of the Seven Fountains School in Kokstad (Raman, 2009: 30, altered by author).

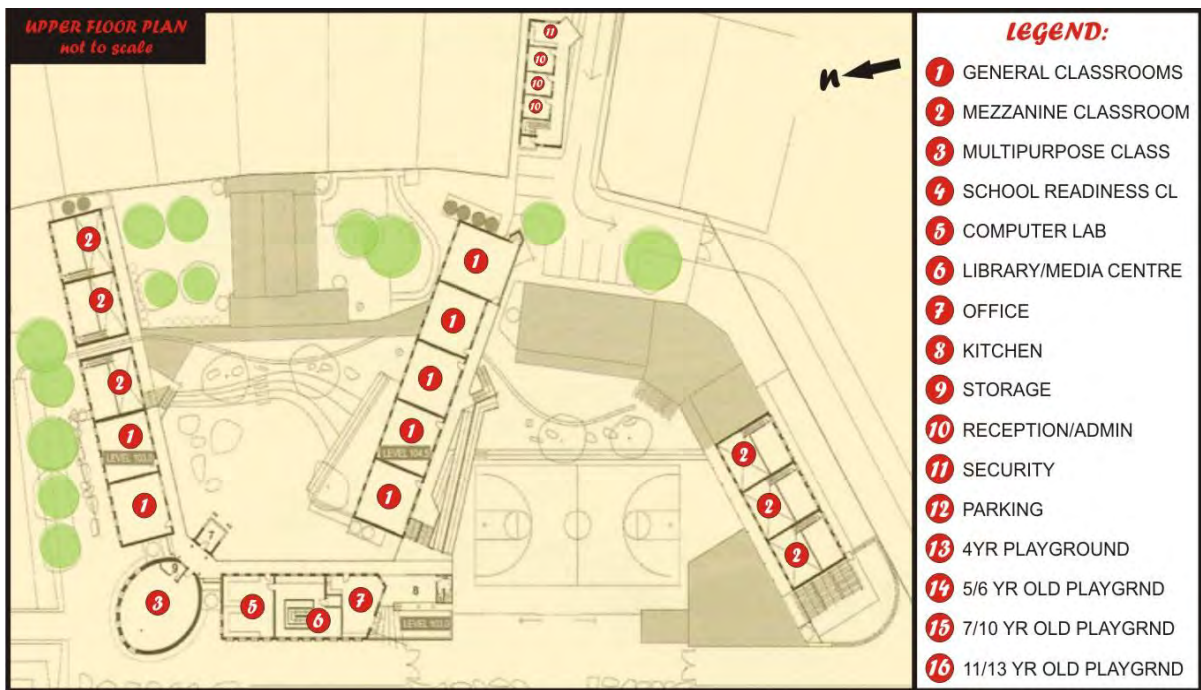


Figure 7.3: Ground floor plan of the Seven Fountains School in Kokstad (Raman, 2009: 31, altered by author).



Figure 7.4: First floor plan of the Seven Fountains School in Kokstad (Raman, 2009: 31, altered by author).

SPATIAL ORGANISATION:

The school is only a primary school, catering for 4 – 13 year olds and thus does not include a high school. A community square – type, open space forms the pivotal point for the layout and the rest of the spaces are connected to this in some way. All of the classrooms have their own playground so that the children can socialise with those of their own age groups and this also prevents the older children from hurting the younger ones, during play. The main central space, which doubles as the seven to ten year olds playground, is a large space, which is accessed via a curving set of steps, so that an informal amphitheatre is formed. A basketball court, which also doubles as the eleven to thirteen year olds playground, can also be used as an amphitheatre, with a set of steps also leading down into it (Fig 7.3). There are ramps for any disabled children to get down to these spaces. Some of the classrooms have mezzanine levels, particularly for the older children and there are also general/multi – purpose classrooms of different sizes so that they can be used for any type of activity. Adding a mezzanine level to classrooms is an interesting aspect as this allows a secretive nook for children to engage in quieter activities by themselves or with others. An oval shaped multi – purpose classroom sits at the bottom of the plan, at one corner of the open central space and appears to be the focal point of the entire ensemble. The layout is not traditionally a rectangular grid form but instead, the square classrooms have been offset to

differing angles to create interesting or somewhat awkward spaces. There is also the provision of a media centre, library and kitchen (Fig 7.3). Some of the classrooms are located on the second floor, being accessed from stairs or an interesting ramp situated near the basketball/amphitheatre space, however this ramp is slightly far away from some of the classrooms, but close to the entrance (Fig 7.4). It also serves as a place for the children to stand and watch if there is anything happening in the basketball/secondary amphitheatre space.

About seventy per cent of the teaching spaces are north – facing, having walkways on the south side so that over – shading in winter is avoided. Solar shading is further assisted by light shelves made of galvanised metal, which reflect light much deeper into the classrooms. Furthermore, blackboards in the classrooms have been positioned on the south side so that glare from them is reduced. All of these efforts were made so that the use of artificial lighting can be reduced. The architects believed that natural lighting is more conducive to learning conditions than artificial lighting, a fact which has been studied and proven all over the world. A building study and post – occupancy evaluation carried out on the school (Haw, Carew and Matyeni, 2008: 2) shows that the above – mentioned efforts in reducing the use of artificial lighting has been successful as there is a sufficient amount of natural light coming into the classrooms. The lights installed in the classrooms are hardly used, except on the occasions when there is hardly any sunlight. This has a positive impact, because the electricity consumption is greatly reduced and in a poverty – stricken area such as Kokstad, this is a great relief for the financial upkeep of the school.

In summary, the layout and spatial considerations for the school provides an architectural composition which allows for the free play and movement of the children and this is further enhanced by the aesthetic treatment and tectonic detailing. The angular layout allowed for the formation of intimate playgrounds/courtyards, which is ideal for young children’s privacy and feelings of safety. This planning is also a shift from the institutional planning of many schools, creating an architectural juxtaposition which enables the children to move about freely, yet safely, so that they appreciate their environment even more (Fig 7.3 and 7.4).

SENSORY AND TECTONIC DETAILING:

One of the main reasons for analysing this school as a case study was for the conceptual approach taken by the architects; the main concept was the design of an environment to serve as a pedagogic tool for children and this is achieved through the application of sensory and tectonic detailing. The sensory approach is simple, but carefully considered and appears effective. A building study conducted on the school (Haw, Carew and Matyeni, 2008: 2) states that at the previous premises, the children were regularly absent from school, however this absenteeism record has dropped from fifty per cent to almost zero per cent, since the children have moved into the new premises. This can only conclude that the children feel more positive about their current environment and enjoy being at school, every day. Part of this would be the positive attitudes of the educators but mostly, this can be attributed to the child – friendly environment of the buildings and spaces, which entice the children through the use of sensory variations.

The first aspect, which strikes a person entering the school, is the use of different materials, textures and colours. These appeal to the visual and tactile senses of the children, creating different atmospheres to the spaces and buildings. Corrugated sheeting, pleasant shades of brickwork, adobe construction, dolomite stones, gum poles and thatch all form part of the material palette used in the aesthetic finish of the school (Tab 7.1). The architects conducted a materials survey of the area and concluded that adobe construction was the most prevalent. The multi – purpose classroom was the only part of the school built out of 16 000 adobe bricks. All of the materials are used in such a fashion that not only do they complement each other, but they enhance the sensory experience of the building. Each one has a different texture, colour and finish, some hard, some cold, some rough or smooth, yet all appealing to the touch. Colour has been used to enhance the walls and the colours used are not the bright primary colours of children’s toys. Instead they are shades of yellow, green and blue, all of which are not too stimulating, yet they brighten up the facades. These colours also serve as a form of orientation, with different blocks and spaces being different colours, so that the children can remember that they belong to the classroom of the block which is coloured green, for example (Table 7.2). Another unique aspect to the design is the incorporation of murals on the spaces between windows. These were painted by the local women and are in pleasing colours with simple patterns (Table 7.1).



Table 7.1: A sensory map showing the materials palette used in the construction of the school (Source: Author).

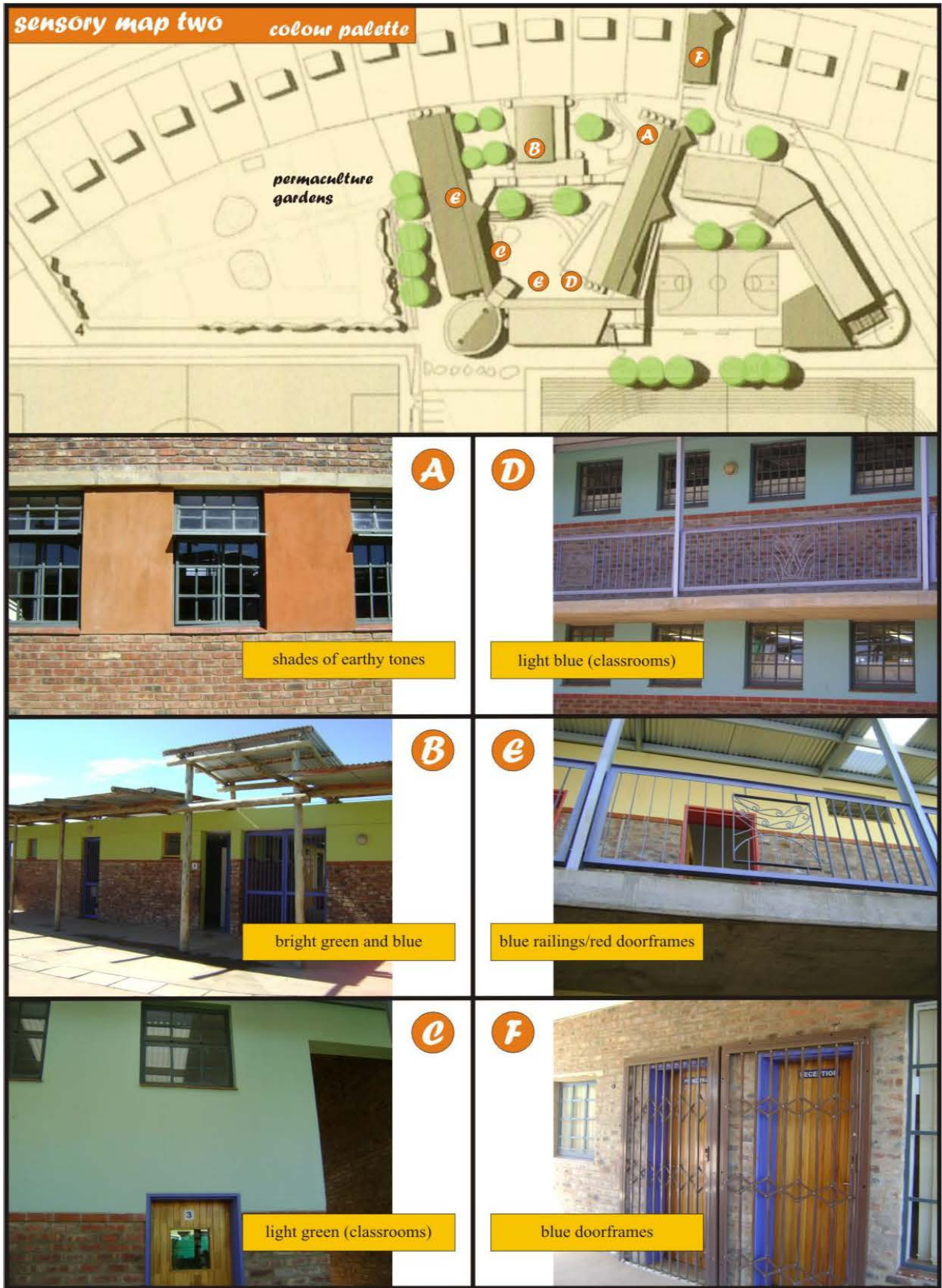


Table 7.2: A sensory map showing the colour palette (Source: Author).

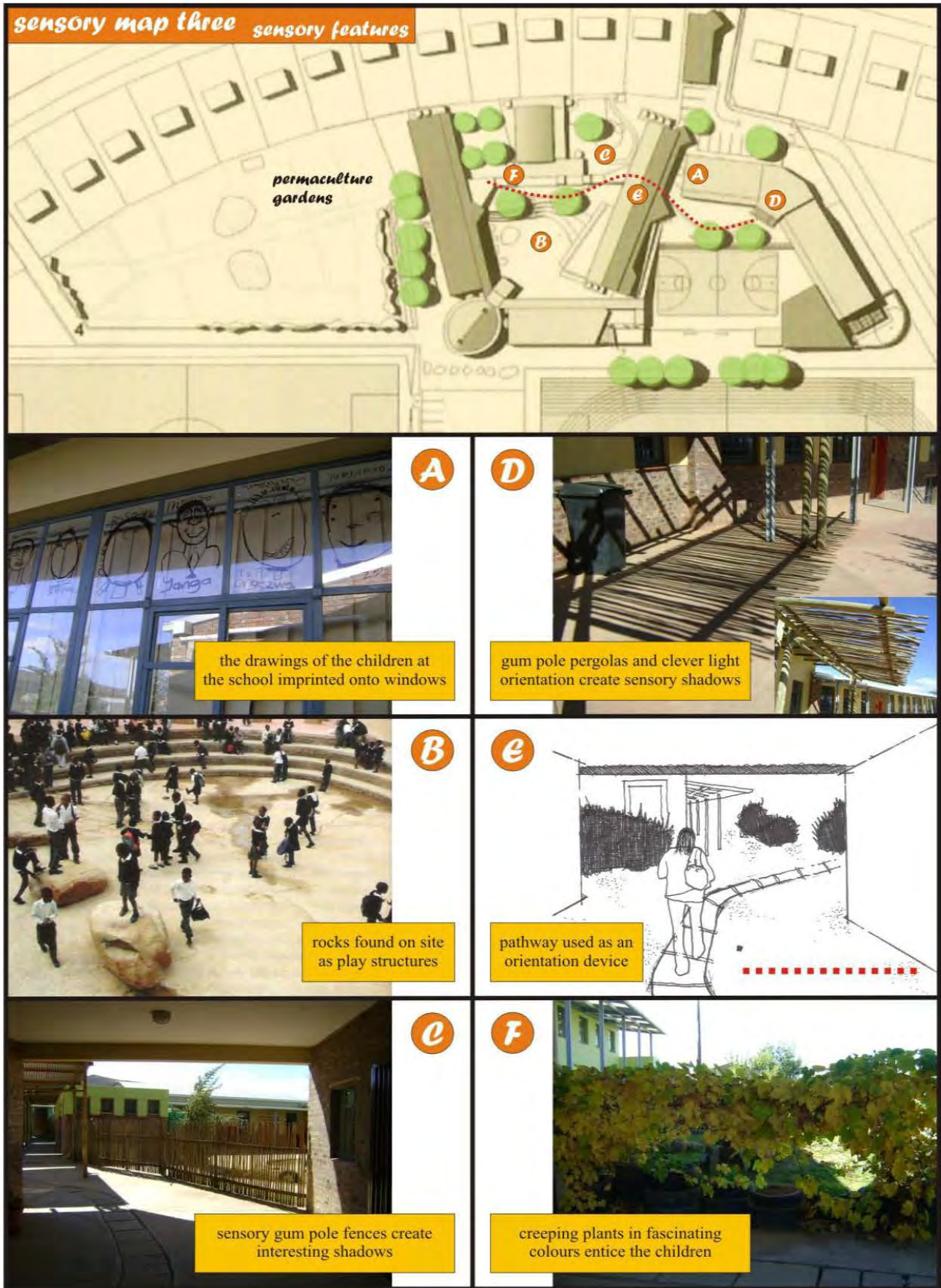


Table 7.3: A sensory map showing the sensory elements at the school (Source: Author).

The second floor has walkways which look out onto the main central space and these have railings (for safety measures) and the architects shied away from the usual railing construction opting to design them in a way that proved to be much more interesting, both in visual and tactile ways. They used different patterns on each set of railings, in – between columns, and from any angle one looks, there is always something different to be seen (Table 7.2: E). Children were seen running their hands along these railings, proving that it is a functionally unique element which catches their interest and continuously fascinates them. The main central space itself is quite bare, without the addition of any play equipment; however, the implementation of large, textured rocks adds a sensory element which is unusual (Tab 7.3: B). The rocks are used for jumping on, running over, climbing on and sitting and they encourage the children to move in a variety of ways, strengthening their muscles and bodies in ways that some play equipment cannot. There is also a single paved pathway which runs past all of the classrooms, acting as a line of directional movement for the children; it was observed that it is actually useful in its simplicity, as one wants to naturally follow its meandering path (Tab 7.3: E). For the children, it provides a lot of fun and some of pavers have been painted to add much more interest.

One of the most fascinating sensory components is the imprinting of the children’s drawings onto the glass of the windows (Tab 7.3: A). A simple technique, it is effective because it shows the children that they are important and unique individuals, whose drawings will remain on the architecture as a sign that this is a building for children. The positive psychological effect that this can have on the children is unmatched to any part of the sensory design, particularly in a school community whose morale had been so low. Another aspect of the design which enhances the sensorial experience is the use of gum poles as a fence material or pergola. The visual effect of the gum poles is incredibly appealing, but moreover, it creates shadows on the pavements, allowing for a play on diffused light. The pathways are experienced in much more enduring ways because the shadows created constantly change with the rising and fading sun (Tab 7.3: D). Translucent and solid corrugated sheeting has been used on all of the walkways (except with the interspersions of gum pole pergolas here and there) and this alternating effect allows some light to filter into the walkways so that they are not totally dark. This creates pools of light every now and then, which is constantly changing with time and weather, enhancing the sensory design and

detailing even further. Lastly, the tectonic detailing in the construction of the building has not been hidden, but is rather celebrated with intricate architectural details which allow the

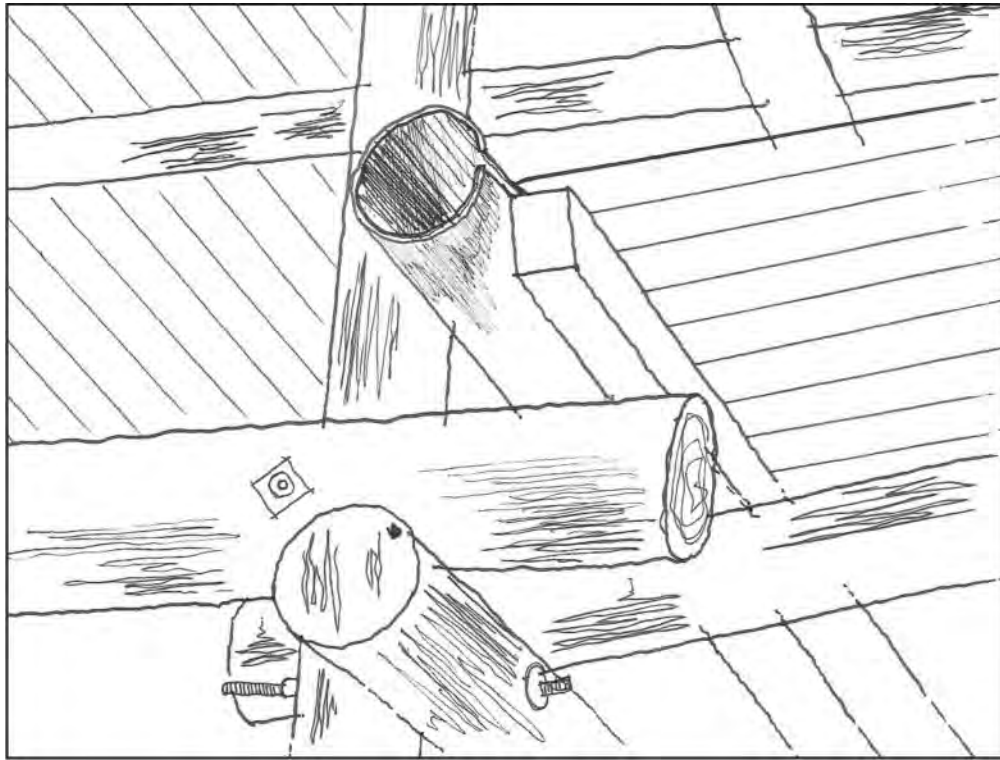


Figure 7.5: A sketch showing the innovative gutter detailing at the school. This particular detail was designed by the architects and it is used to channel water away from the low pitch roofs that cover the walkways (Source: Author).

children to be further fascinated. Column connections, ceiling fixtures, gutter attachments, roof connections and many more form a myriad of patterns created through the attention to detail in the tectonic aspect of the design. These details enrich the sensory experience of the buildings as children learn through discovering how these various aspects work. For example, a simple hollowed out pipe serves to channel water out from a low pitched roof (Fig 7.5) and even though this detail is simple, it is innovative, teaching children, indirectly, the powers of one's imagination and innovation.

CREATING A SENSE OF PLACE:

A critical regionalist and phenomenological approach to the design formed the secondary concept. Beginning with the site; it is surrounded by RDP houses, the Drakensburg Mountains in the backdrop and the near – by rural villages. The site is tightly packed by houses on three sides and sports fields on one side, appearing almost impenetrable, as if the school is defended by the surrounding houses. Thus, the site appears naturally defensible

and safe. The mountains form the backdrop for the school and views out to them have been



Plate 7.1: The Drakensburg Mountains form the backdrop for the school, providing picturesque views from the classrooms (Source: Author).

respected by the design (Plate 7.1). All of the school buildings do not appear in contrast to the mountains nor do they even appear out of place in this community. The use of local materials and labour has allowed the creation of a sense of place which truly respects its genius loci. Fifteen local women were trained to produce the adobe blocks used in the oval shaped multi – purpose classroom. The clay bricks used on the rest of the buildings was sourced from local suppliers, as were the thatch and gum poles. Dolomite stones excavated from the site were used in the construction of plinth terraces (Tab 7.1: F), further enhancing and respecting the genius loci. The spatial layout reveals how the buildings seem to almost grow out of the site, sitting happily in the terrain and intensifying the sense of place. Traditional architecture of the rural and peri – urban villages served to inspire aspects of the design, state the architects (Raman, 2009: 34). The round adobe building was inspired by the initiation huts and *umuzis* (households) of these traditional villages.

SOCIAL SUSTAINABILITY AND THE INCORPORATION OF NATURE:

The design approach for the school was also driven mainly by passive techniques, such as orientation, insulation, vegetable gardening, rainwater harvesting and solar power. In a community where many of the people are poverty – stricken, it is a benefit to the school that the cost of running the building does not exceed what they are capable of maintaining. There

is also the integration of many plants, trees and natural features in the site, so that a close relationship to nature is always sustained. Many of the materials used in the construction of the building are natural themselves, such as the gum poles, thatch, adobe and wooden poles used in the roof construction. Some of the plants that have been used creep on the fences and gates, creating sensory atmospheres combined with a play on light and materials. In terms of passive design, climatic conditions were greatly taken into consideration and these will be discussed and analysed henceforth.

Optimising orientation provided opportunities for passive solar heating. Insulated walls and ceilings, the reflection of natural light and the placement of fewer learners in classrooms all ensure a comfortable thermal temperature in winter and teachers have recorded a drop in absenteeism in winter, stating that they believe the classrooms are much warmer than the children's homes (Haw, Carew and Matyeni, 2008: 2). A building study found that a typical classroom's (optimally orientated) temperature was ten – fifteen degrees warmer than the outside temperature (in autumn). Non – north facing classrooms were about five – ten degrees warmer and classrooms not designed with passive principals were only about three – five degrees warmer. Thermal comfort ensures that the students are relaxed enough to concentrate on their work.

The water supply to Shayamoya is limited to two hours in the morning and evening and to work around this problem, various strategies were put into place for the school. Surface water runoff is collected by a large reservoir (seasonal storage) and the water is then pumped via a wind pump to daily storage tanks. These tanks are connected to a mains and borehole which feed wash hand basins, drinking fountains, toilets and solar water heaters. The water runoff from the roofs are collected separately and used for garden irrigation (Raman, 2009). However, some of these tanks were observed to be leaking and a swampy, wet patch has been created, which is not a very safe area for children, who have access to it via a gate which was observed to have been left open. The solar water heaters supply hot water to the entire school. Non – potable water sources has reduced the need to use potable water sources from the mains supply thereby decreasing this cost. In general, the building study conducted on the Seven Fountains School shows that the passive design principles

implemented have been cost – effective, having had a positive outcome on learner comfort and most importantly, performance (Haw, Carew and Matyeni, 2008).

SITE OBSERVATIONS, SKETCHES AND PHOTOGRAPHS:

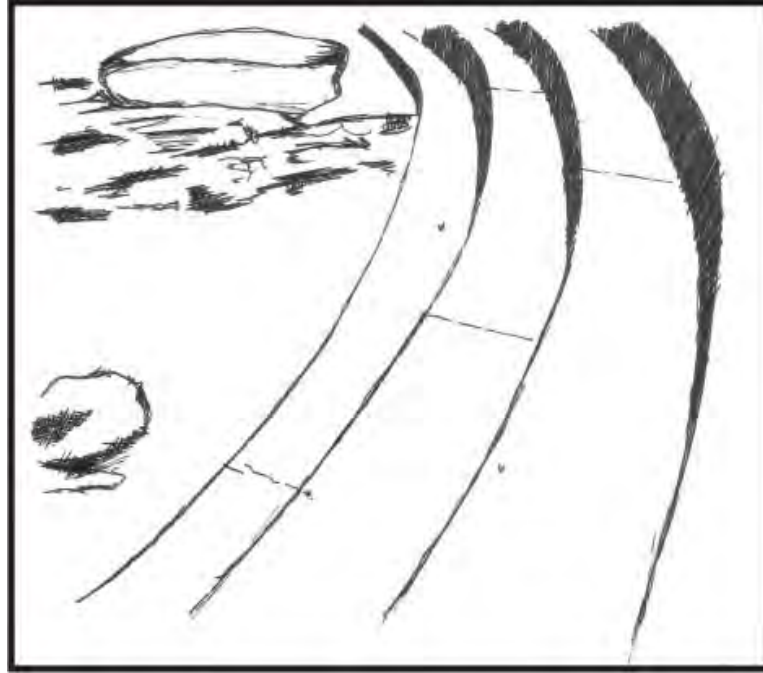


Figure 7.6: Sketch of the curving steps and textured stones in the main central space/playground of the school (Source: Author).



Figure 7.7: Sketch of window detailing. All of the windows at the school are surrounded by a thick concrete plaster band which enhances the aesthetic effect of the facades (Source: Author).



Plate 7.2: Child scaled water fountains in all of the playgrounds (Source: Author).



Plate 7.3: Simple playground equipment used in the younger children's playground (Source: Author).



Plate 7.4: Interesting column and roof details (Source: Author).



Plate 7.5: A multi – purpose classroom acts as a focal point (Source: Author).



Plate 7.6: The older children's classrooms looking out onto the basketball court (Source: Author).

Conclusion

The Seven Fountains School was much needed in this rural community and it was designed with ample success. In terms of the sensory aspects of the design, the buildings are innovative in this respect. Colour, textures, materials, scale and light are all factors that were deeply interwoven into the design process, bridging the gap between spatial and three – dimensional form. The result is a pedagogic environment which is rich with many things; culture, history, nature and a sensitive environment which caters to the educational needs of the learners. On observation, children were seen to be happily frolicking around the spaces, using their imaginations and senses to explore their surroundings and as stated before, the educators feel as if the children are more comfortable at the school than they are in their own homes. The improved performance of the children (Haw, Carew and Matyeni, 2008) indicates that the passive and sensorial aspects of the building design greatly contributed to this, as the educators in the school were employed before the school was built. By teaching the educators how to properly use lighting controls and water sources, they were successfully able to use these to their full capacity (Haw, Carew and Matyeni, 2008). The children at the school were observed to be playful, happy, and positive, comfortably engaging with their environment at all times. Therefore, it is concluded that sensory and passive design, incorporation of nature and creating a sense of place are all fundamental factors for children’s environments, affecting them psychologically, in various ways.

POSITIVE ASPECTS OF CASE STUDY

- Buildings serve as sensorial stimulants to the children with the effective use of colour, textures, patterns and materials as the main sensory features.
- The scale of children has greatly been taken into consideration.
- There is an incorporation of natural elements (plants and natural building materials).
- The inherent sense of place has been respected.
- Inclusion of permaculture gardening is a rich learning tool for the children.

NEGATIVE ASPECTS OF CASE STUDY

- Courtyards and play space could have included much more stimulating design features and play elements.
- The water storage tanks leak.

AN ANALYSIS OF THE BROWNS SCHOOL IN TERMS OF BARRIER – FREE DESIGN

Introduction

The Brown's School is a special needs school for children with cerebral palsy and autism. They provide specialised classrooms for autistic children, as their learning needs are unique and the school also offers a programme which allows for the facilitation of these children into the working world. They have a staff of 122, including teachers, administrative staff, teaching assistants and therapists. A workshop on the school premises provides items designed to assist the specific needs of certain students, such as trays fitted to wheelchairs and repairs to equipment. In terms of sporting activities, the school offers tennis, action cricket, athletics, swimming, bowls for the disabled and boccia.

Justification of Case Study

This case study has been chosen for a few reasons. Firstly, it is located within a well – built residential environment and claims to have a strong connection to the community. Secondly, it was built specifically to cater to the needs of the disabled. Thirdly, the school appears to have a wide range of facilities for the children and is therefore an interesting case study to observe what has been provided and how well every aspect of the design works.

Location

The school is located in a residential area in Pinetown, Durban. Pinetown lies between the areas of Kloof and Westville and is about ten minutes away from the city centre. The area was regarded as a predominant industrial area but the residential areas have been sufficiently built up and it is now one of the most sought after areas in Durban (Fig 7.8).



Figure 7.8: The location of The Browns School in Pinetown, Durban (www.googleearth.com, altered by author).

Historical and Social Context

In 1943, a spastics committee was formed by parents in order to draw attention to cerebral palsy and on the 24th of November 1958, the pre – school Cerebral Palsy Therapy Centre was born in Durban. A Durban mother called Mrs Brown persuaded housewives to raise funds for a holiday home for cerebral palsied children and a committee was formed in 1955 called “The Browns”. Their aim was to give the children a holiday away from home and allow their mothers some time to rest. By 1957 enough money had been raised and in 1959 construction had finished on what became known as The Browns Rest Home for Cerebral Palsied Children. Nursery school classes, organised play and speech therapy and an advice clinic formed part of the organisation and as time went on, it was agreed that the Department of Education, Arts and Science would take over the running of the centre, so that it would now become a special needs school. As the demands grew, the school was moved from Sherwood to Pinetown in 1968. The stables on this site were converted into classrooms and

prefab classrooms were also erected. Demands on the school began to grow immensely and it was then decided that a new school should be built and this was done so by 1979, the architects involved being Hesketh, Driman and Partners in association with Olaf Pretorius Peckham and Partners (www.brownsschool.co.za).

The school is surrounded by houses and is in a quiet neighbourhood, being close to many relative functions for support. An annual fete is held at the school and this has become immensely popular as the community gets involved in the organization and running of it. A cerebral palsy association affiliated with the school is located close by and this also lends support to the school in whatever way possible. There are no problems of noise disrupting the school and there are also a lot of green spaces surrounding the school which act as buffers to the noise that emanates from roads and traffic (Fig 7.8).

Empirical Data

SITE, ACCESS AND ENTRANCE:

The school is accessed from Mariannridge Road, in a residential area of Pinetown and the site is surrounded by large shady trees. Seeing into the school is difficult from the road, which can be a deterrent to criminals as a sense of territoriality is created in this way, therefore the site has been designed to be defensible (Plate 7.7).

Upon entering, there is a large parking lot and the main entrance to the school is located here. It is a welcoming, spacious entrance with a large amount of seating outside. The entrance foyer itself is also light – filled and airy and the exposed coffered slab ceiling is quite high.

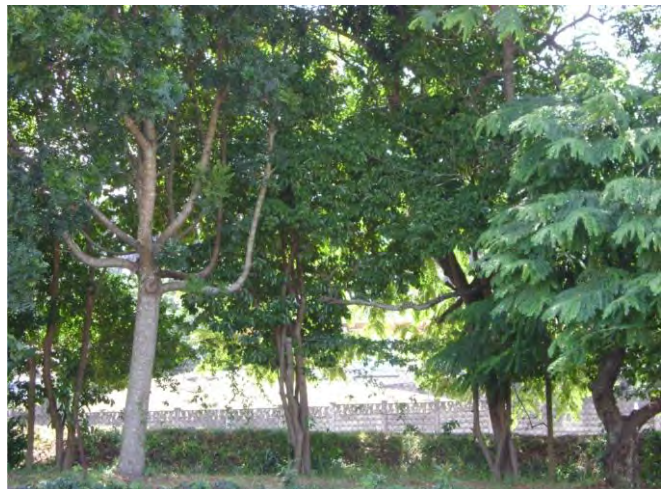


Plate 7.7: The trees lining the edges of the site, providing defined boundaries and shade (Source: Author).

To the right of the entrance foyer is the administration offices, in front of the entrance doors is the school hall and to the right are the seating areas. This entrance foyer has a large wall spanning from the roof to the floor and it is used for the display of the children's work, which is a positive symbol for the children at the school. Having the hall so

close to the entrance is a useful idea as people do not have to move through the entire school to get to it. Since the site was levelled to accommodate school facilities, a steep bank was created between the school and sports buildings. To access the sporting facilities, a long, winding ramp was thus built. In spatial terms, the bank severs the connection between the classrooms and the sporting facilities and they only end up being used during sports events and not every day, leaving a large piece of the site under – utilised and slightly neglected (Fig 7.9).

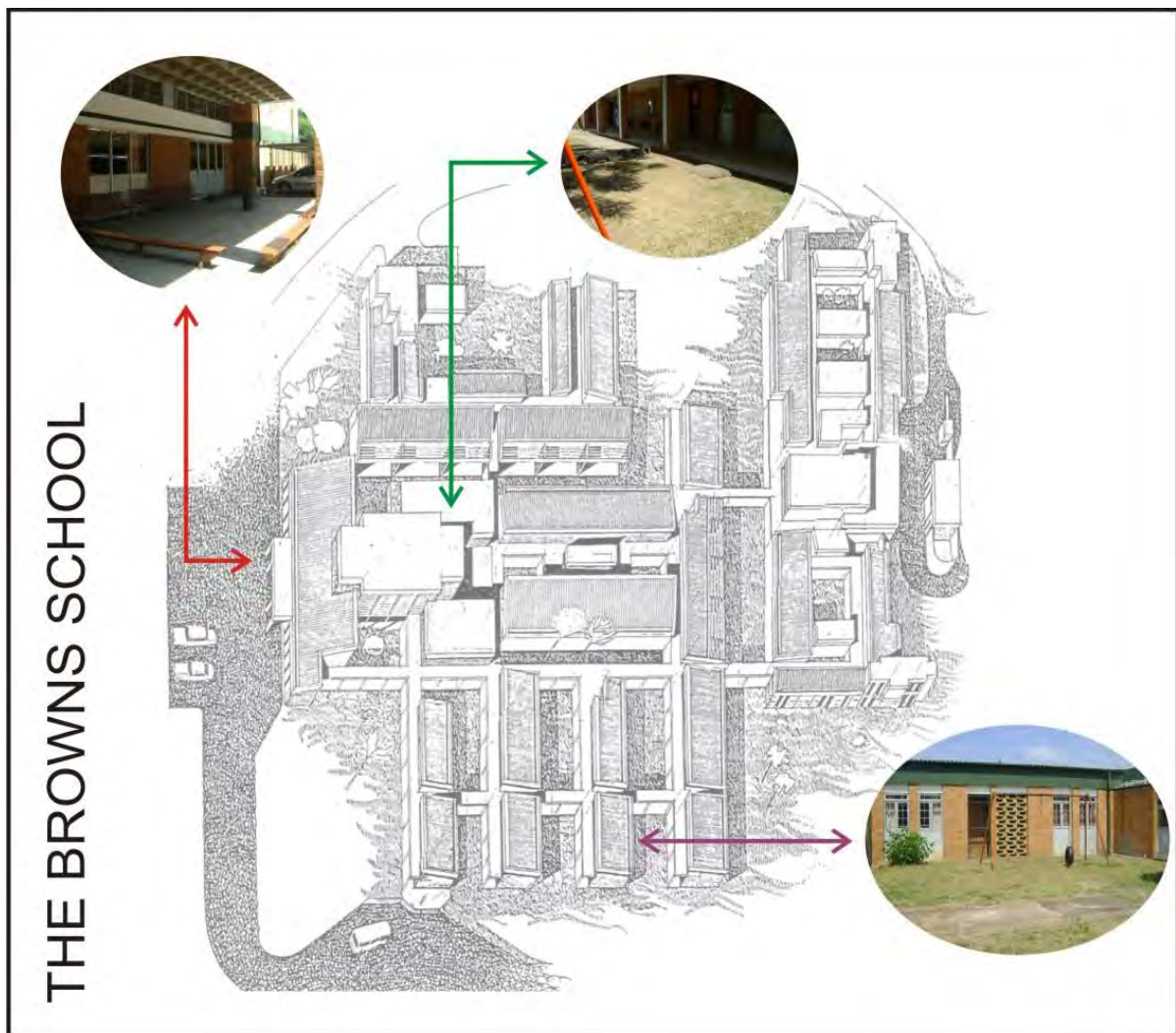


Figure 7.9: Axonometric view of The Browns School, with images of the entrance and courtyards (Millier, 1988: 33, altered by author).

ACCOMMODATION:

The school is quite large and is arranged in a fashion which includes classrooms connected by long corridors resulting in an excessive amount of circulation. With the corridors and

double loaded classrooms leading off them, a newcomer to the school would feel extremely disorientated. However, the corridors are light and airy, being lit by skylights from above and there are large garden courtyards between all of the classrooms. These courtyards are not landscaped and appear dreary in some cases. The therapy department is located in the middle of the school and this placing works extremely well for teachers, therapists and children as it is easily accessible from all points of the school (Fig 7.10). There is also the provision of a hostel towards the lower end of the school which only accommodates about ten children and interviews conducted showed that the hostels provide a really big problem for schools due to the lack of funding, loss of family life and sexualisation of the children. A hydrotherapy pool was included in the initial design but is not in use as it is too costly to run and maintain and it was hardly used. There are playgrounds in the school with some special equipment such as swings for children in wheelchairs (Plate 7.8). An extensive sports field including a cricket field, basketball area and tennis courts are also provided, all of which gets used often and is quite important. In general, the classrooms are spacious and well – lit. They also have verandas attached to them which are used extensively by the teachers, who pointed out that they loved them. An interesting aspect of the school design was that storage areas are provided behind ablution blocks and these are extremely useful for staff. Airbricks are used extensively to air certain parts of the rooms/areas and it was noted that children do not peer through the airbricks and instead are constantly running their hands along it, feeling the textures of the bricks. In general, the school seems to be spacious enough for all of the children; however, there is a large portion of the site not being used due to the separation of sporting facilities from the rest of the school (Fig 7.10).



**Plate 7.8: A specialised swing for wheelchair users
(Source: Author).**

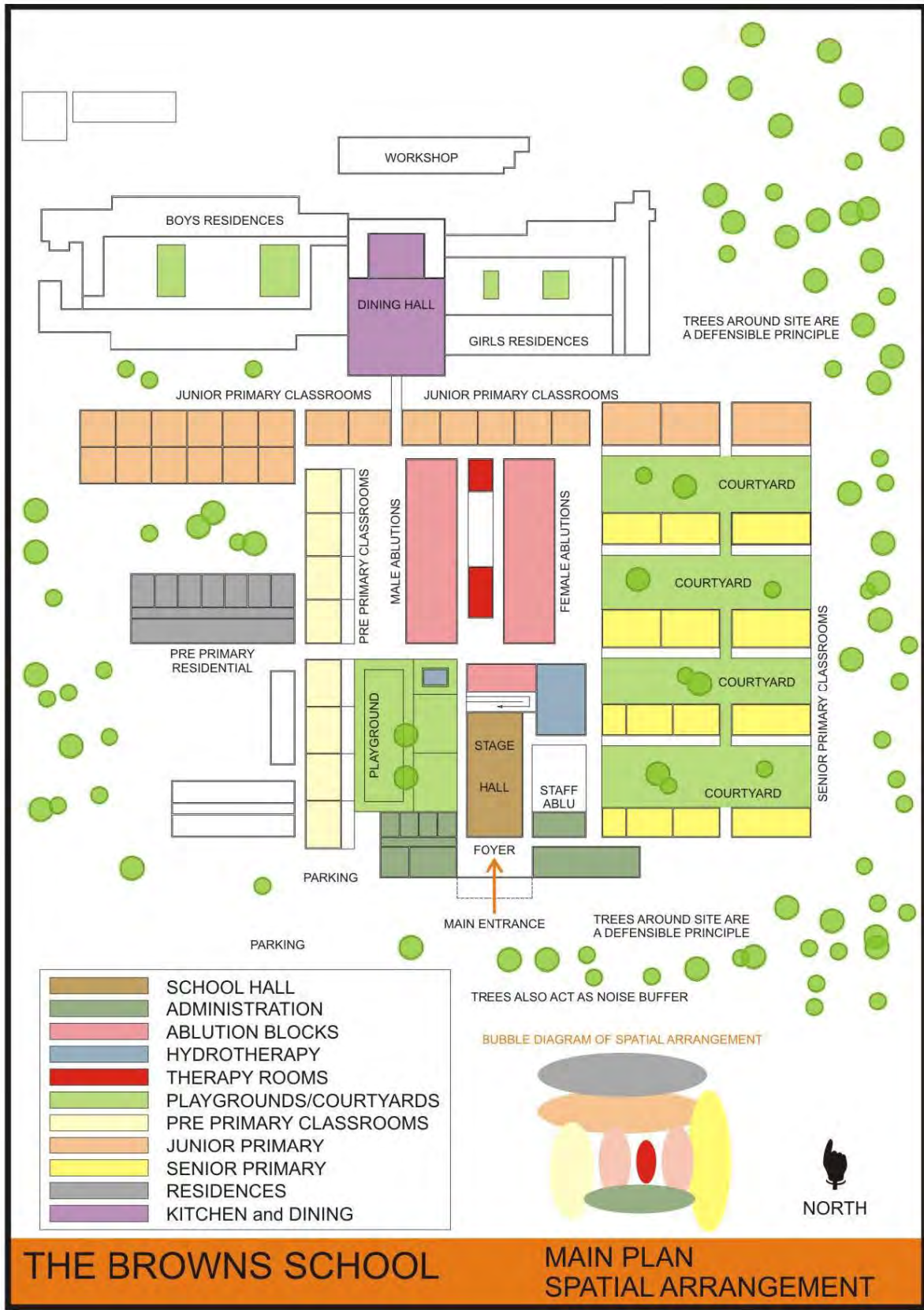


Figure 7.10: A sketch plan of the school showing the relationship between components (Source: Author).

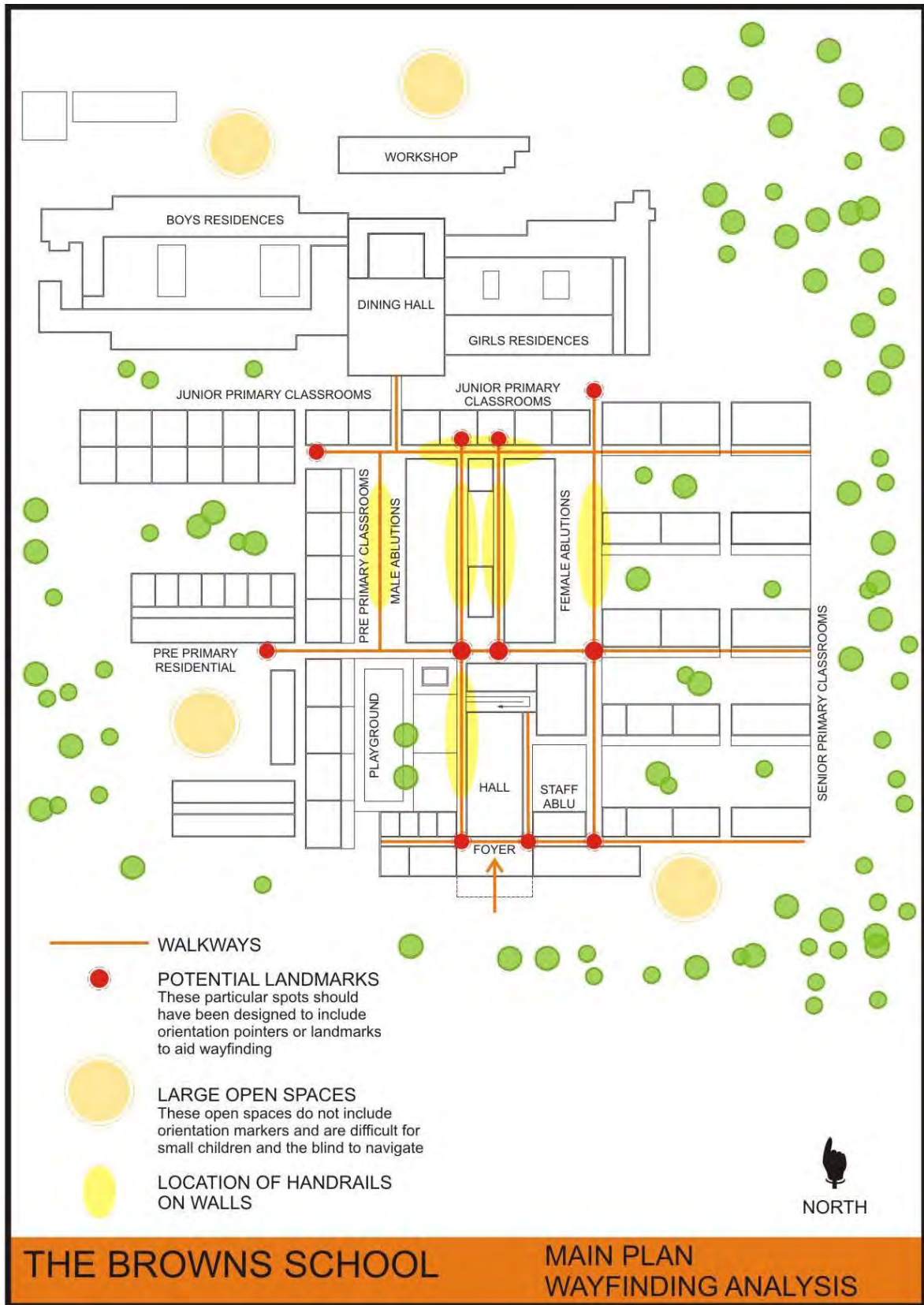


Figure 7.11: A sketch plan indicating the wayfinding/orientation aspects of the design and the lack thereof (Source: Author).

One of the main aspects concerning designing for children and the disabled (especially the blind) is wayfinding and orientation within an environment which is unknown to them. It was recorded during the interviews with the staff at the school, that many of the children and teachers/therapists have difficulty finding their way around. An environment which is legible and easy to understand creates a pleasant atmosphere for children and incorporating interesting wayfinding principles can be easy. However, the school has had to resort to colour coding doors and handrails so that the children and teachers can find their classrooms easily. More importantly than that, the passageways are confusing and the separate phases of teaching (pre – primary, junior primary and senior primary) are not easily defined (Fig 7.11). There are also numerous direction changes at the school where a blind child could easily get lost a few times until he or she has learnt the route. These points where there is a change in direction could have been designed to include landmarks which could indicate a change in direction and what each direction leads to (Fig 7.11).

Another aspect of analysing this school was to gauge an understanding of the spatial accommodation required in a building of this type and the sizes which are appropriate for those spaces. With that in mind, these spaces are to be discussed in terms of their sizes, furniture requirement and other design considerations (Fig 7.12).

ADMINISTRATION and SOCIAL FACILITIES

A large administration component has been provided at the school, with large offices for the principal, reception and records room. Four offices are also provided for other staff members such as the therapists and these are grouped together at the entrance, close to the school hall. The hall acts as a buffer to the noise of the children but is also easy to access so that people do not wander into other parts of the school after hours, when the hall is being used (Fig 7.12 and 7.13).

- Administration – 180sqm in total
- Foyer space with waiting area and seating – 111sqm
- School hall – 260sqm including stage and backstage areas. There is a ramp leading to the backstage areas as this portion is higher due to the stage being higher than the normal floor level. Ramps from within the hall also lead to the stage, making access easier for those in wheelchairs (Fig 7.15).

THERAPY FACILITIES and ABLUTIONS

The school does not have a large therapy allocation and provides two spaces which accommodates occupational therapists, psychologists, physiotherapists and speech therapists. One of these blocks is double storey and even though it is not ideal to have stairs for those in wheelchairs it is a good idea to have steps included in the design of the therapy rooms to teach children how to climb steps, especially the blind. A hydrotherapy unit provided is not used and during the visit, the researcher was not allowed into these rooms as they were being used. An analysis of the plans allows for the determination of room sizes (Fig 7.12).

- Hydrotherapy – 130sqm in total and 72sqm for attached ablution facilities (Fig 7.15).
- Therapy units – 44sqm each with courtyard in between.
- The ablution facilities for the entire school are located near the therapy blocks which are actually in the centre of the plan with every other aspect revolving around them. These large ablution blocks are far from some of the classrooms and do not incorporate specialised facilities. It is better to provide ablution facilities for each phase and set of classrooms.

CLASSROOMS

The school only provides for the pre – primary, junior primary and senior primary phases and these phases are separated yet form a hierarchical sequence in terms of spatial arrangement. All of the classrooms include storage space, row seating and display spaces for art and other work which is prominently displayed even on the doors and walls outside the classrooms. A spacious outdoor, covered space directly outside the classrooms provides for the opportunity to teach outdoors and this also acts as a transition space between the classrooms and courtyards (Fig 7.12 and 7.14).

- Pre – primary classrooms – 55sqm each with an attached outdoor teaching space of 23 sqm.
- Pre – primary playground, including a small pool, play equipment, a scooter track and swings (Plate 7.8) – 596sqm.
- Pre – primary residential – 419sqm in total with seven rooms provided each one being 27sqm.
- Junior primary classrooms – 47sqm and 53sqm.
- Senior primary classrooms – ranging between 70 – 90sqm.

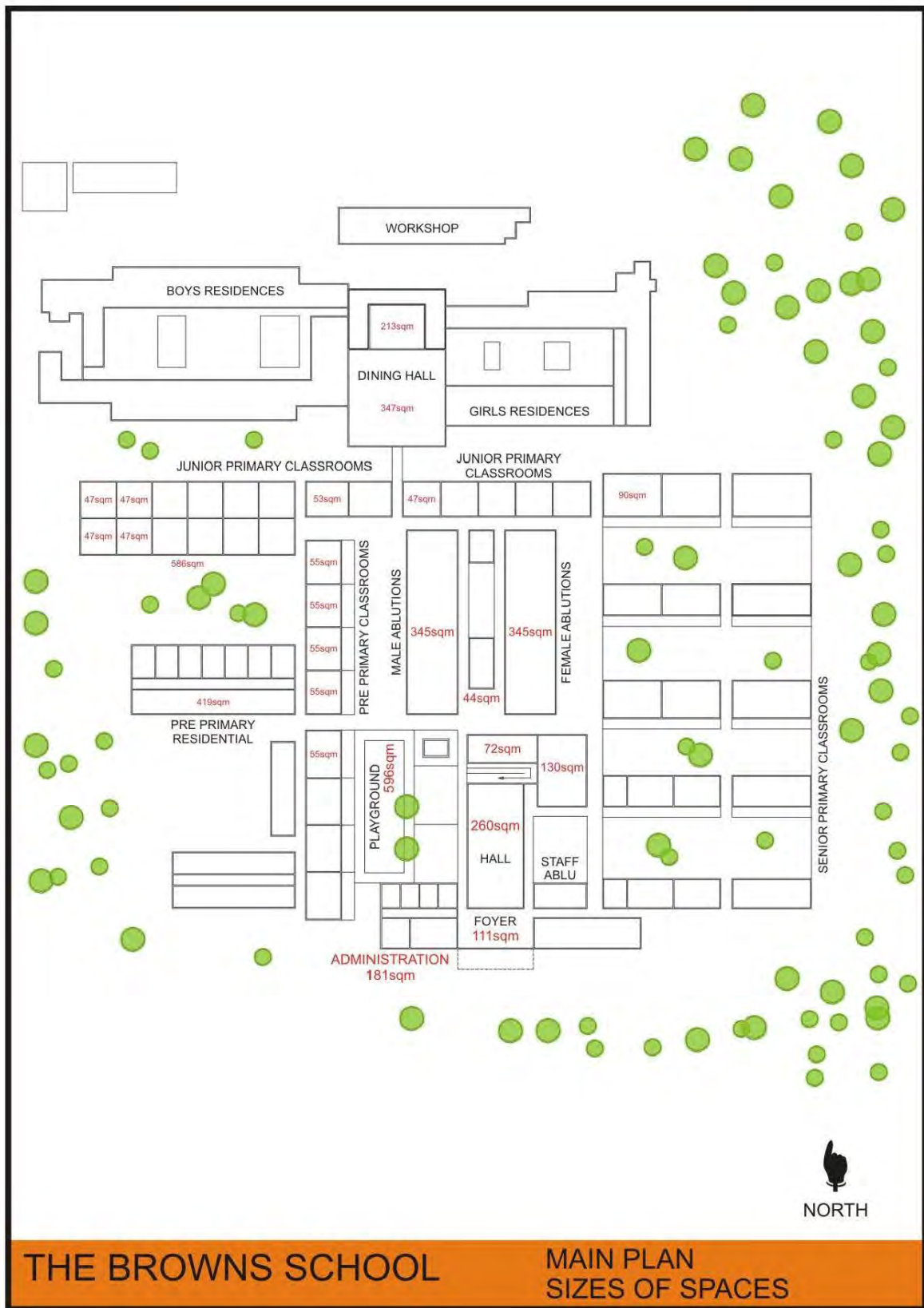


Figure 7.12: A sketch plan indicating the various sizes of the different spaces (Source: Author).

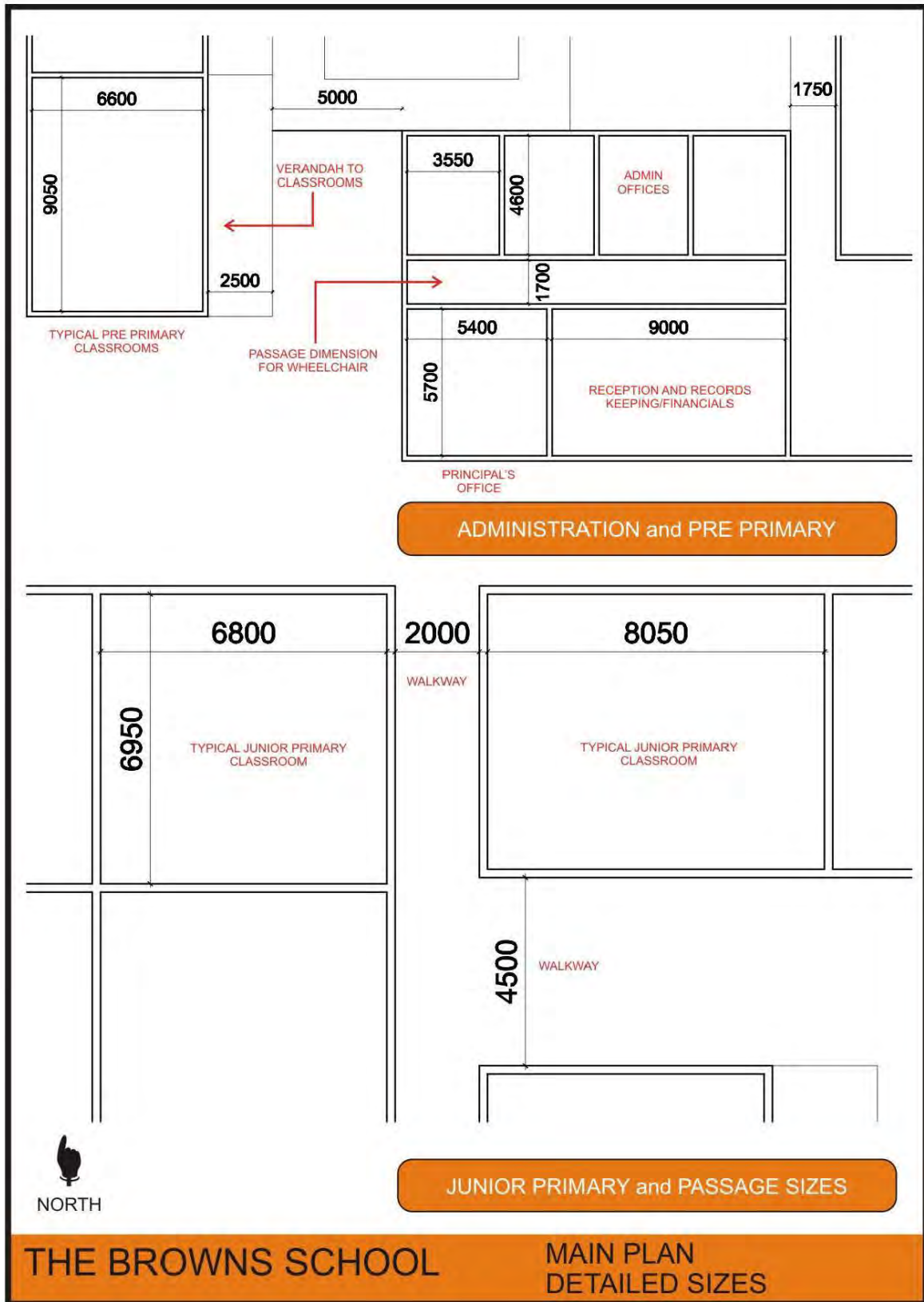


Figure 7.13: The sizes of the administration components, passage sizes for wheelchair access and classroom sizes in the junior primary (Source: Author).

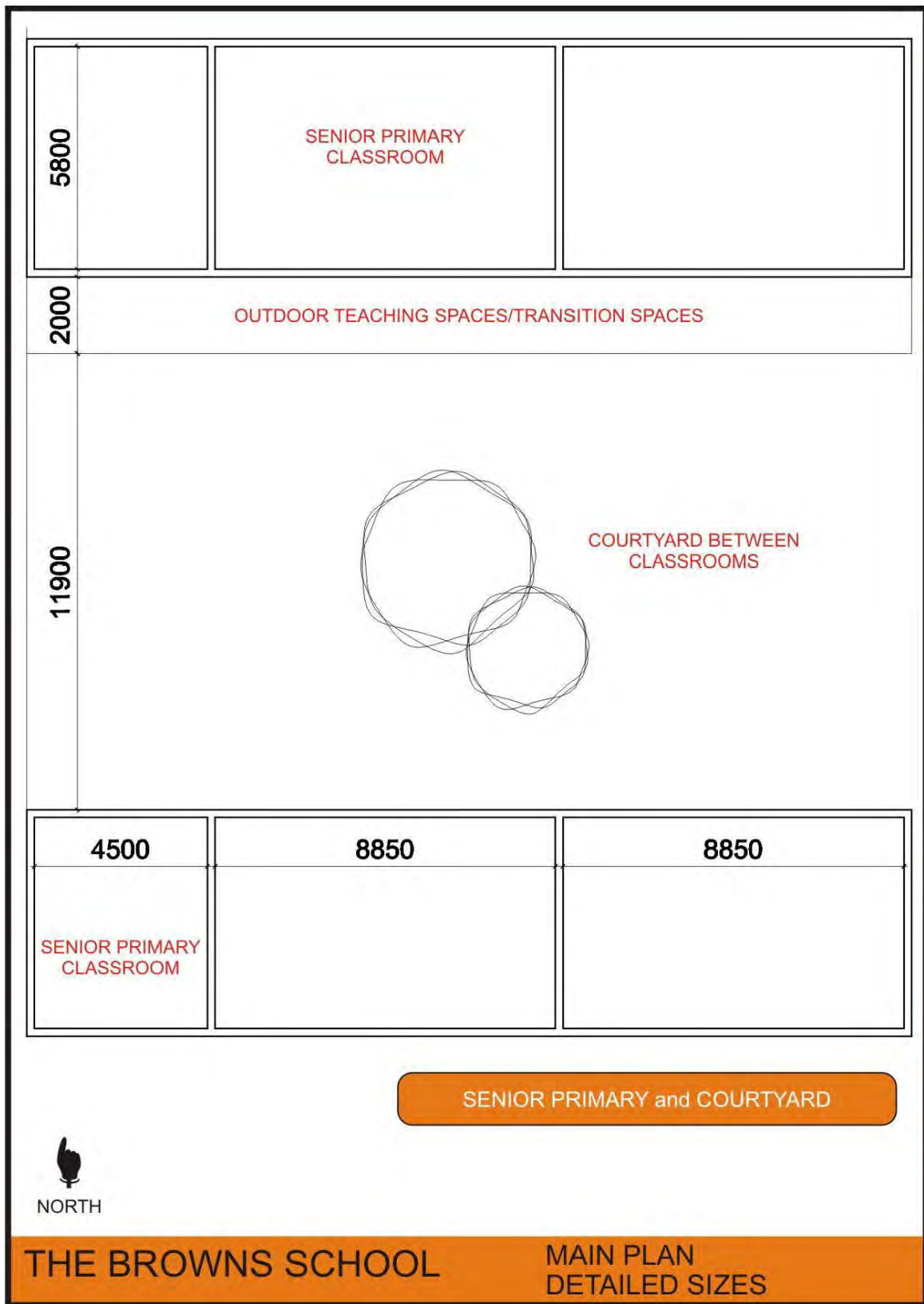


Figure 7.14: The sizes of the senior primary classrooms and adjacent courtyards (Source: Author).

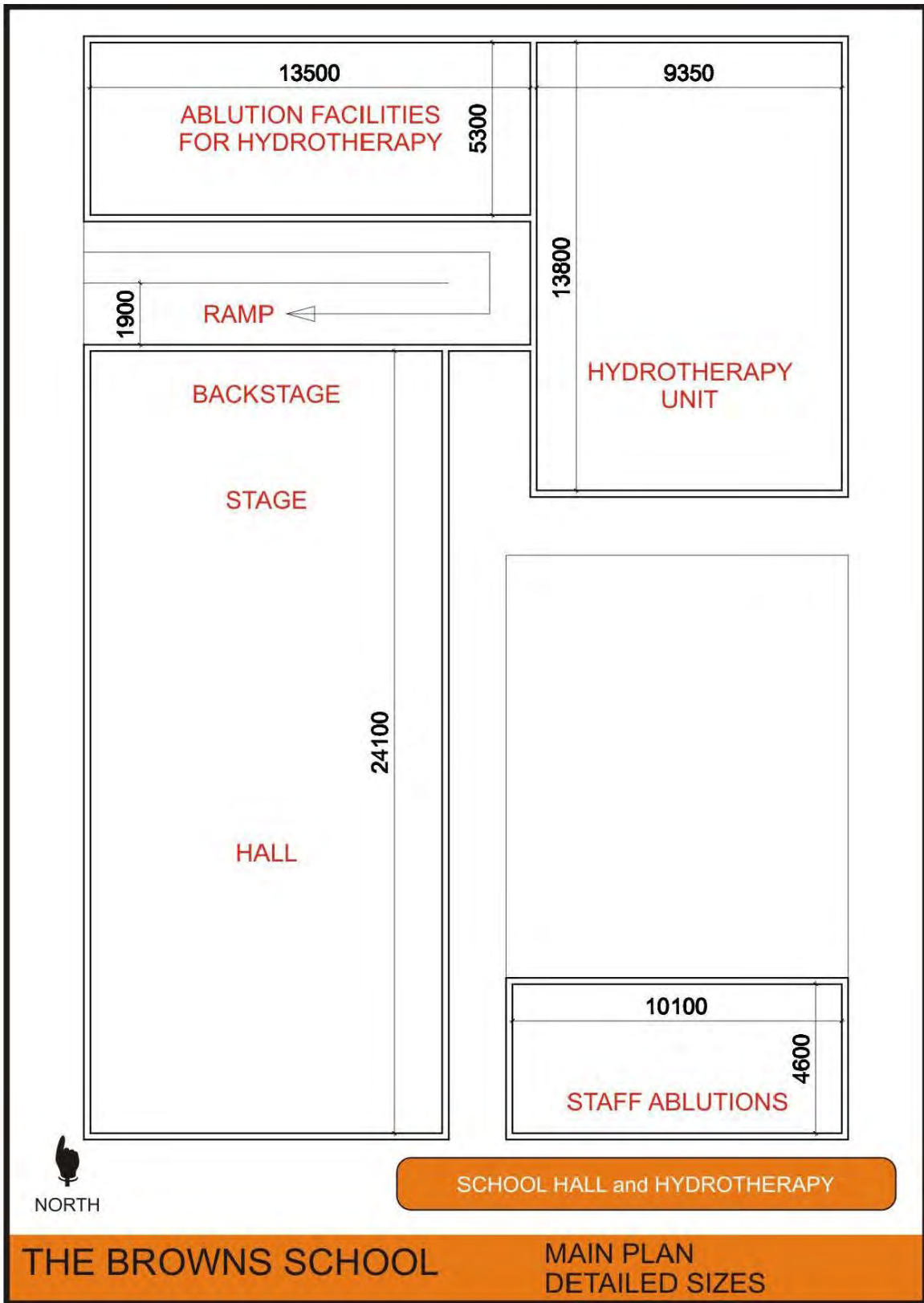


Figure 7.15: The sizes of the hydrotherapy unit and hall with associated facilities (Source: Author).

BARRIER – FREE DESIGN:

In terms of barrier-free design, the Browns School has handrails running along all of the walls. These are painted in different colours and the doors to the classrooms are wider than



Plate 7.9: Coloured handrails used for aiding children
(Source: Author).

normal doors, also painted in different colours. The use of coloured doors and handrails helps the children and teachers to find their classrooms easily because of the maze of corridors and classrooms (Plate 7.9 and Fig 7.11). Some of the toilets are specially fitted with equipment at the school but all of the sinks are conventional and are not lower than normal,

nor do they have handrails attached at the front. The corridors have ramps leading into the courtyards and there are brick upstands at the bottom of all of the walls so that the children in wheelchairs do not damage the walls if they bang into them. Most of the site is quite flat and there is no need for many ramps. There is an extremely long ramp leading to the playing fields and tennis courts and it takes the children a long time to get down there. Since autistic children are very highly strung and thus need incredible special attention, classrooms were specially designed for them at the school and they have their own playground which is not accessible to all of the other children at the school. The use of different types of bricks also aids blind children to find their way easily around the school.

SENSORY STIMULATION:

There is a lot of use of colour and the textures of the bricks are welcoming to the touch (Plate 7.10). The playgrounds incorporate elements of water and growing plants which is interesting for the children. Positive attitudes of teachers and therapists are combined with a caring environment which seems to work well for the children. There appears to be no special design considerations, architecturally, which are meant to excite, stimulate and entice the children, yet the environment is conducive to learning. Classrooms are well – organised,

have plenty of spaces for displaying children’s work and most of them have a lot of natural sunlight. Some of them do get very hot in summer as cross ventilation does not occur due to the double loaded corridors.



Plate 7.10: An elevation showing the use of different textures (Source: Author).

BUILT FORM AND ARCHITECTURAL EXPRESSION:

The general form of the school is one which is not institutional or fortress – like. Instead, the buildings are simple in their form and are not designed with special features which are aimed at enticing the children’s interest.

Some of the courtyards have been designed to be interesting, with layers of elements which provide for interactive spaces (Plate 7.11).

There is a defined entrance area to the school, which provides a transition space for the children and parents alike. The use of airbricks provided an interesting



Plate 7.11: An image of an interesting courtyard at the school which provides layers of opportunities for the children (Source: Author).

element to the facades and they could have been incorporated better to allow for dramatic interplays with light and textures. Exposed brickwork and double pitched green roof sheeting were the main construction materials which formed the basis for the architectural expression. These forms are simple and economical, easy to maintain and mimic the

residential architecture of the surrounding suburbs. The overall built – form of the school is simple and functional, conforming to a gridiron pattern of planning (Fig 7.16).

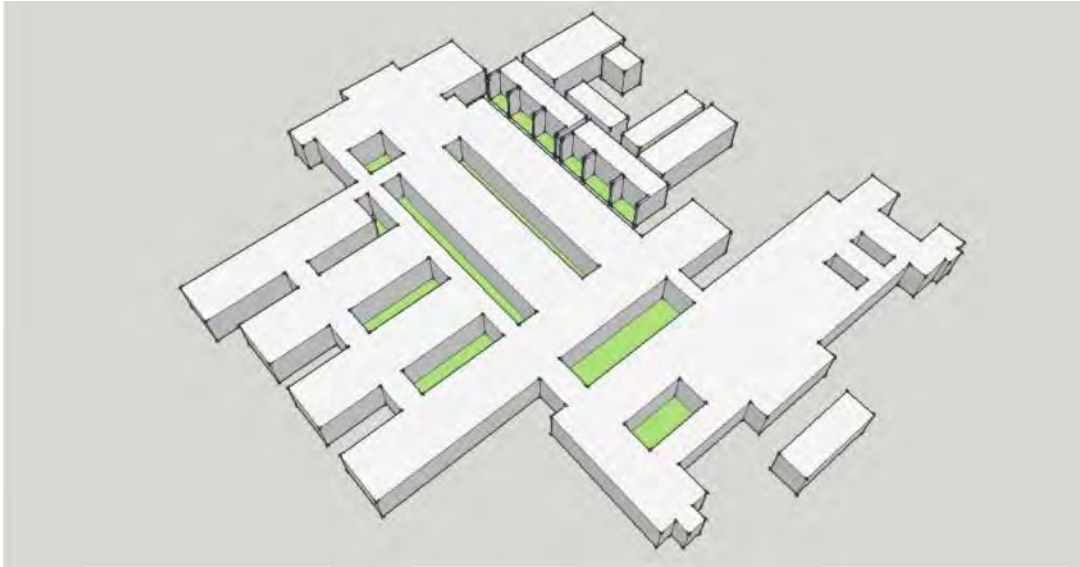


Figure 7.16: A rough overall built form of the school, where one can see the courtyards which puncture the maze of walkways and classrooms (Source: Author).

CRITICAL REGIONALISM:

The site had been excavated deeply and flattened when the school was built and this is in no way responding to the original site. Since the school is in a residential area, it can be said that it does respond to its context. The school buildings are not over – scaled, look similar to the surrounding context (houses) in the sense that they are also constructed of brick and sheeted roofs and the environment is not sterile or daunting. It is uncertain whether the materials used were locally produced, as the school has been in use for a long period of time. The school was built merely out of the need for one and therefore is not sensitively designed to incorporate aspects such as culture and local crafts.

DATA ANALYSIS AND INTERPRETATION:

The observation of this case study was mainly to understand aspects of barrier – free design for the disabled and how well certain architectural elements work as well as to gain an understanding of spatial accommodation and the associated sizes. In order to achieve this, various methods were used. The observation of the school has already been discussed. Focused interviews were carried out on the principal and various educators and measurements of different spaces were also recorded. These will be detailed below.

RESULTS OF FOCUSED INTERVIEWS:

IN TERMS OF URBAN DESIGN:

- The site works well because it is fenced and there is a sense of territoriality due to the trees surrounding the site.
- The site is surrounded by green spaces which act as buffers for the school.
- Close to main transport routes – this is essential.
- Residential context is important for a facility of this nature.
- Flat site is also an essential and so is a large space to accommodate all of the various functions including sports fields.
- Close to amenities very important, especially a hospital or clinic.
- Trees act as noise buffers and create visual barriers in terms of defensible space principles.

GENERAL OBSERVATIONS:

- Three hundred and fifty eight children were enrolled at the school when the case study was conducted (March 2008), with a total of 44 classrooms serving them, with roughly eight – nine students per class.
- The ages of the children ranges from three to thirteen/fourteen.
- The school caters for all types of disabled children but mostly those with cerebral palsy.
- The building is durable and has been maintained well.
- The coloured handrails on the walls are used by about one hundred of the three hundred and fifty eight children and are effective.
- The hydrotherapy pools are not in use because chemicals needed for them are too costly.
- Flat roofs are an issue, causing leakages into classrooms.
- The children are encouraged to play outdoors during their lunch breaks.
- The hostel is expensive to maintain and provides an issue of sexualisation of the children.
- It is easy for the children to find their way around the buildings and spaces once they have gotten used to it and especially after they have had mobility/orientation training.

- There are separate classrooms for the different age groups as this is more conducive to their development.
- Skylights in the dark walkways are useful to bring in light.
- Not enough light coming into the classrooms, relying heavily on artificial lighting.
- The design of the built environment is extremely important to the development of all children (disabled or not).
- The autistic playground is totally enclosed because these children are difficult to manage and within a smaller space, they are much easier to control.
- Displaying the children’s art and work is extremely important and should be well incorporated into the school.
- Verandas provide outdoor classrooms which are used in good weather. These are well used and open directly onto playgrounds/courtyards, acting as transitional zones between the classrooms and the courtyards.

SITE OBSERVATIONS, SKETCHES AND PHOTOGRAPHS:

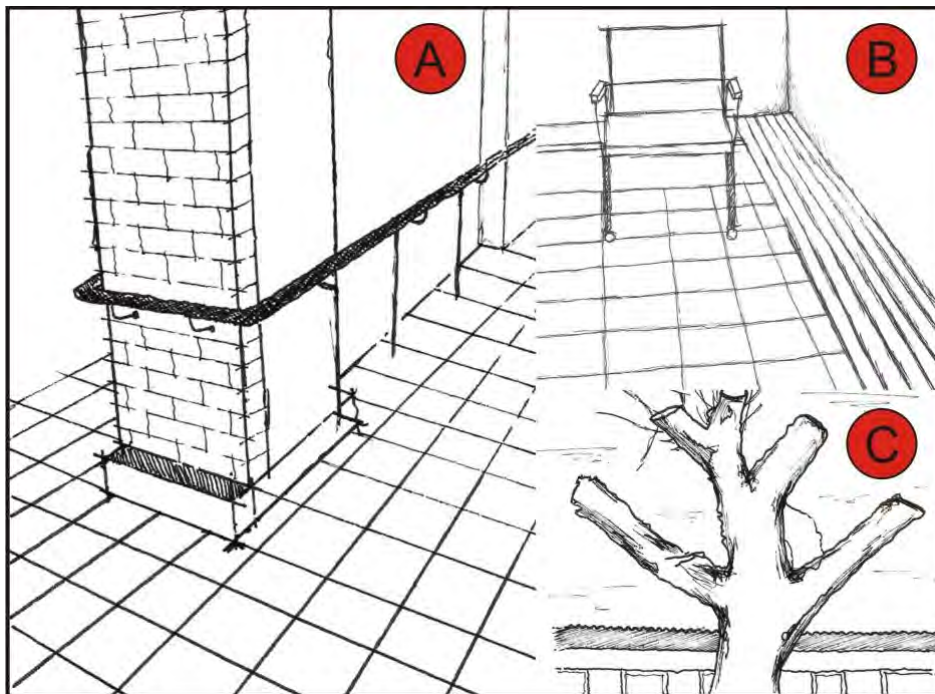


Figure 7.17: Sketches done during the observation of the case study.

A: This is a detail of the railings that are attached to all the walls at the school, providing a support for the blind children as well as for those in wheelchairs.

B: Wooden slatted benches are used in the bathrooms for the children in wheelchairs to change.

C: Interesting tree in courtyard (Source: Author).

Conclusion

The architectural aspects of this school are informative in terms of understanding how to design for disabled children; such as colour being used for orientation, the inclusion of courtyards between the classrooms and the expansive amount of space reserved for sport, of which the children are greatly encouraged to participate in, as it is considered to be therapeutic for disabled children. However, there are a few negative aspects about the design. One of them being the maze of corridors and double loaded classrooms, which cannot be found by the users without the use of coloured doors and handrails. This confusing spatial layout does not aid natural wayfinding techniques. The colouring system is effective, however, in allowing both adults and children to find their way around easily. Also, from the case study, it was observed that long ramps are a waste of space and finances. In general, the school works well in terms of barrier – free design principles, offering many spaces and activities for all types of disabled children to enjoy. The attention to detail allows children access to all parts of the school, making the learning environment hassle free. From this case study, it can be concluded that in schools for the disabled; wayfinding, orientation techniques, stimulating environments and barrier – free design are extremely important, having both educational and psychological effects and implications.

AN ANALYSIS OF THE OPEN AIR SCHOOL IN TERMS OF BARRIER – FREE DESIGN

Introduction

The Open Air School (the actual name of the school) is a special needs school for children with all types of disabilities, including those who are blind, deaf and autistic. It caters for 260 learners from pre – primary to Grade 12 and offers a wide variety of activities for the children.

Justification of Case Study

The school is over 90 years old and was one of the first of its kind of school in South Africa when it was built. Over the years, there have been various alterations to the school but most of the original buildings are still in use. It is also located within a strong community and is close to various amenities. The school currently offers exemplary facilities and activities for the children at the school and would, for these reasons present an interesting case study.

Location

The Open Air School is located in the suburb of Glenwood, Durban and is surrounded by Glenwood High School and Glenwood Junior Primary School (Fig 7.18).



Figure 7.18: A map showing the location of the school in Glenwood (www.googleearth.com, altered by author).

Historical and Social Context

The school was founded in 1921 by Dr Thompson, a medical officer in the Natal Education Department. He had realised the need for such a school in Durban and the original school buildings consisted of two classrooms, a doctor's treatment room, a kitchen, cloakrooms and a bathroom with a special bath. The name of the school was adopted by Mr Thompson who wanted to build a school based on the open air type schools in Britain where it was believed that ill and recuperating children should be exposed to as much open air as possible. As the number of disabled children grew, a hostel was opened in 1952 catering for children who lived out of the Durban area and additions were added in 1973. During the years that followed, the school expanded to accommodate the large influx of students and currently includes a hotel – keeping centre with a restaurant, a braille unit, state of the art media centre and a medical block (www.openairschool.co.za). The school is surrounded by quiet, supportive neighbourhoods and communities, allowing it to thrive in this environment. Close proximity to sensory elements such as a park (Bulwer Park), cultural zones (NSA Art Gallery) and numerous shopping centres provides a social hub and network for the school.

Empirical Data

SITE, ACCESS AND ENTRANCE:

The site for the school is large as it also incorporates sports fields which are shared by two other schools (which are not special needs schools). It can be accessed from Frere Road and is surrounded by Frere Crescent and McDonald Road. There is parking outside the school for parents dropping off children, but not too much of parking, which leads to vehicular congestion. Upon entrance into the school grounds from Frere Road, there is a large and impressive façade which signals the entrance point into the school (Plate 7.12). One has to traverse up a large flight of stairs to get to the main reception



Plate 7.12: The large, imposing entrance façade to the school (Source: Author).

area and this seems inappropriate for children in wheelchairs who have to use a long and

confusing ramped system to get to the reception areas. The site includes many trees and these provide shade and defined boundaries between areas as well as the different schools. Large sports fields in – between the schools provides a separation between them however, they might be noisy to one school if the other school on the property is using it. The close composition of the three schools allows them to provide support for each other and it also allows the disabled children to interact with children who are not disabled (Fig 7.19).



Figure 7.19: The close proximity of the schools allows for them to lend support to one another and create an educational campus environment for the children (www.googleearth.com, altered by author).

ACCOMMODATION:

The design of the spatial layout of the school is similar to the Brown’s School in the sense that it is punctuated with courtyards between classrooms and the different phases of the school (Fig 7.20). The difference here is that the layout is less confusing and the pathways have much more natural light. A linear block set on pilotes is the first part of the school one encounters upon arrival, with a light – filled, yet imposing entrance area. This linear block is

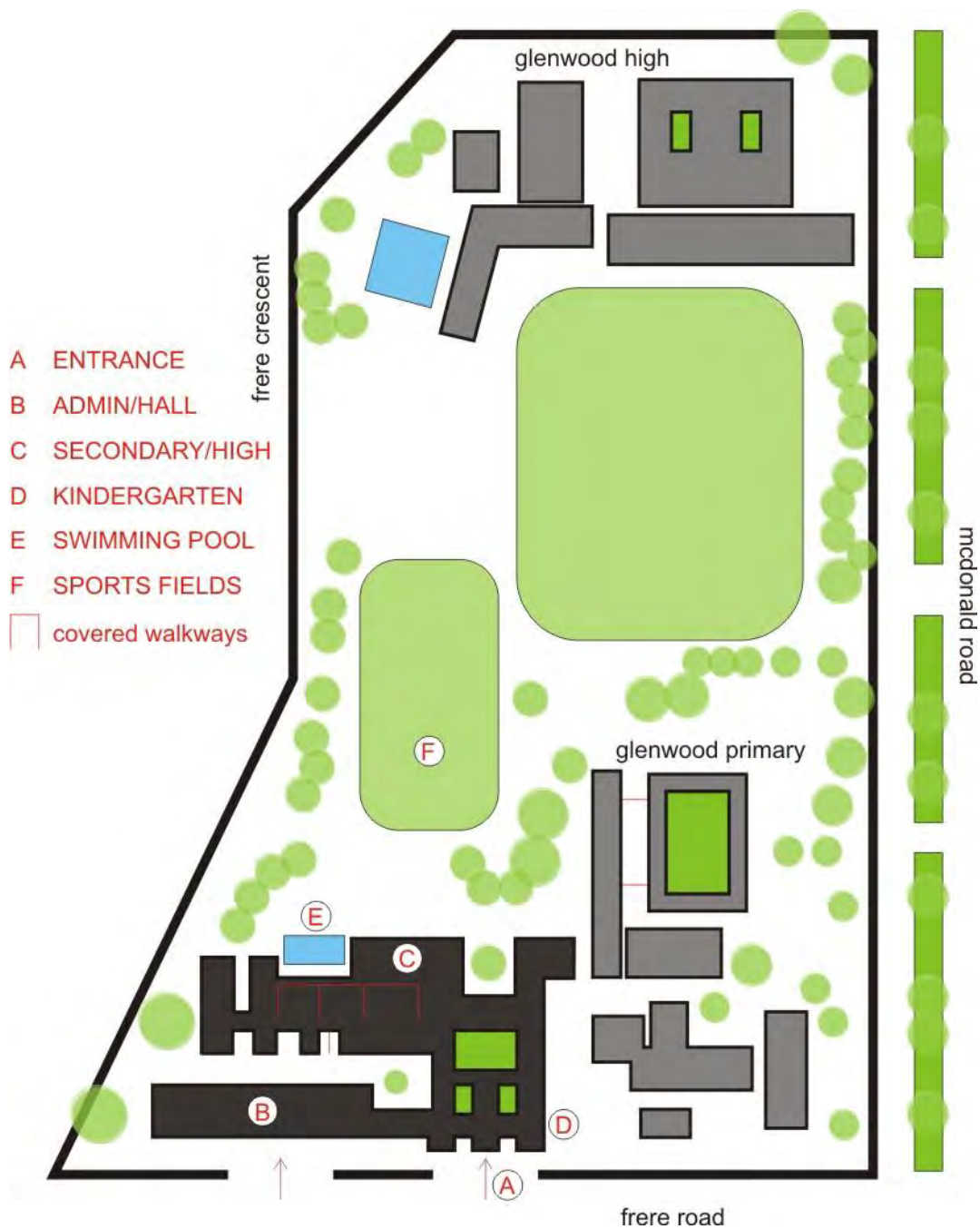


Figure 7.20: A plan of the school showing the various components and their relations (Source: Author).

made up of the reception, administration and the school hall. There is a large open space which separates this area from the classrooms and the rest of the school (Fig 7.21). A covered ramp is the only element which connects these two aspects of the school. The foundation phase for the younger children is to the right of the school and the classrooms for the bigger children are to the left (Fig 7.21).

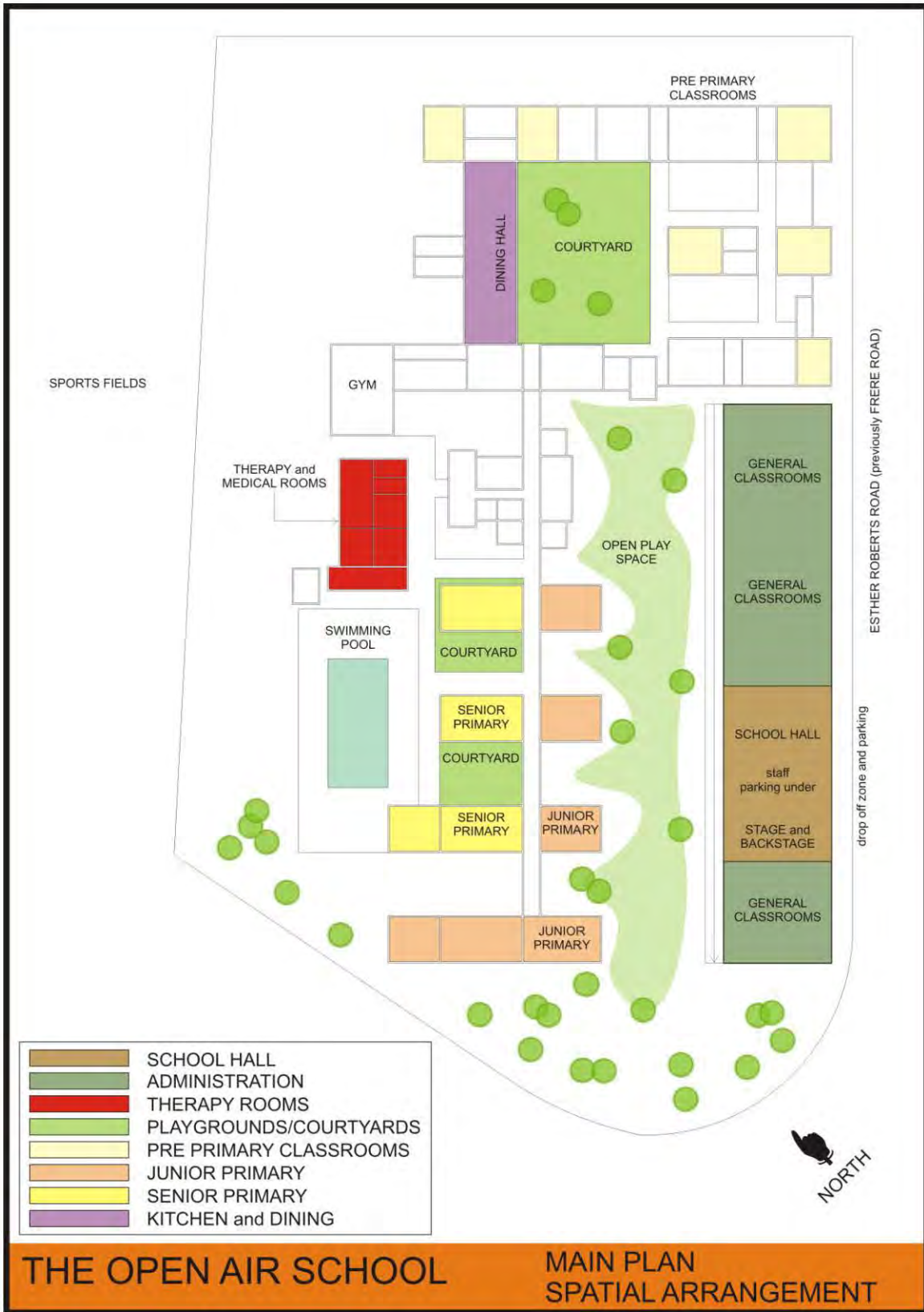


Figure 7.21: A detailed plan of the school showing the various components and their relations (Source: City Council – redrawn by author).

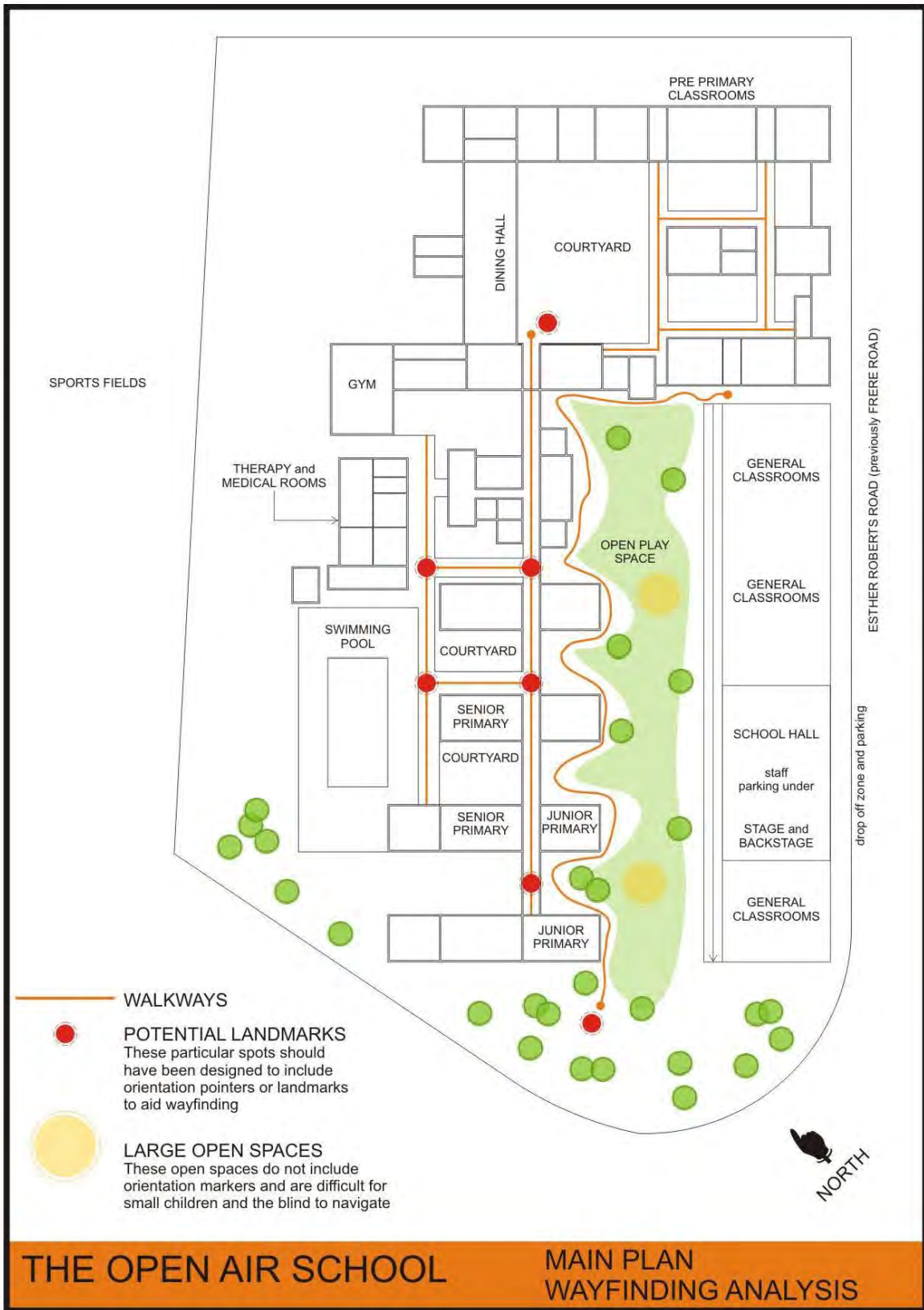


Figure 7.22: A detailed plan of the school showing walkways and related wayfinding analysis.
(Source: City Council – redrawn by author).

A medical block provides medical facilities for the children and this is located closer to the smaller children along with the occupational therapy and physiotherapy rooms. This might be too far for the older children when they are in need of medical services and it might have been better located centrally within the school (as is the case with the Browns School). A pool and sports fields are accommodated to the back of the school and away from the roads. This area is sheltered by trees and a roof covering. The addition of a small spectator stand at the edge of the pool allows for galas and competitions to be held alongside the pool, where people can sit comfortably in the shade.

One of the main aspects concerning designing for children and the disabled (especially the blind) is wayfinding and orientation within an environment which is confusing to them. This school is similar to the previous case study in terms of wayfinding and orientation. None of the buildings/classrooms are easily identifiable and they blend seamlessly into one another. The spatial layout here is much less confusing and easier to navigate but there are also numerous direction changes at the school where a blind child could easily get lost a few times until he or she has learnt the route. These points where there is a change in direction could have been designed to include landmarks which could indicate a change in direction and what each direction leads to (Fig 7.22).

Another aspect of analysing this school was to gauge an understanding of the spatial accommodation required in a building of this type and the sizes which are appropriate for those spaces. With that in mind, these spaces are to be discussed in terms of their sizes, furniture requirement and other design considerations (Fig 7.23).

ADMINISTRATION and SOCIAL FACILITIES

A large administration component has been provided at the school, with large offices for the principal, reception and records room. All of these aspects are close to the entrance as well as to the school hall. The hall acts as a buffer to the noise of the children but is also easy to access so that people do not wander into other parts of the school after hours, when the hall is being used.

THERAPY FACILITIES and ABLUTIONS

The school has a dedicated medical block which is quite clinical in character and not at all stimulating to the children. There is the provision of physiotherapy rooms, speech therapy rooms, an audiology room and psychologist's rooms. There is no hydrotherapy unit, instead the children are taught and encouraged to swim in an outdoor swimming pool (Fig 7.24 and 7.25).

- Speech therapy – 10sqm, general activities room – 46sqm, office – 15 sqm.
- Psychology rooms – 12sqm.
- Remedial therapy rooms – 8sqm (individual therapy) and 12sqm (group therapy).
- Audio visual unit – 35sqm including a projection room.

CLASSROOMS

Similarly to the previous case study, this school's spatial arrangement is composed in a hierarchical fashion. The layout is not very confusing and employs various design considerations which are conducive to creating social atmospheres and learning. The walkways and courtyards are pleasant and inviting, incorporating plants, trees and shady, as well as sunny areas, for different types of play (Fig 7.23 and 7.24).

- Pre – primary classrooms – ranges from 57 to 94sqm.
- Junior and senior primary – ranges from 52 to 72sqm.
- Library – 32sqm.
- Dining hall – 187sqm.
- Swimming pool – 154sqm.

Unfortunately, the researcher was not allowed access into the braille unit; hostel and media centre and no plans were obtainable for these facilities. Whatever plans are shown were obtained from the city council and are out dated as there have been additions and alterations. Nevertheless, they provide valuable information for the collection of data in terms of spatial accommodation and related sizes. The hostel is situated away from the school, in another road and this allows the students to feel as if they are at home and away from school after hours but realistically, this would not be possible for every situation because that would imply the acquiring of a site away from the school and transport would become an issue if it is not provided by the school.



Figure 7.23: A detailed plan of the school showing the sizes of some of the spaces (Source: City Council – redrawn by author).



Figure 7.24: Detailed plans indicating the sizes and arrangements of classrooms and the speech therapy unit (Source: City Council – redrawn by author).

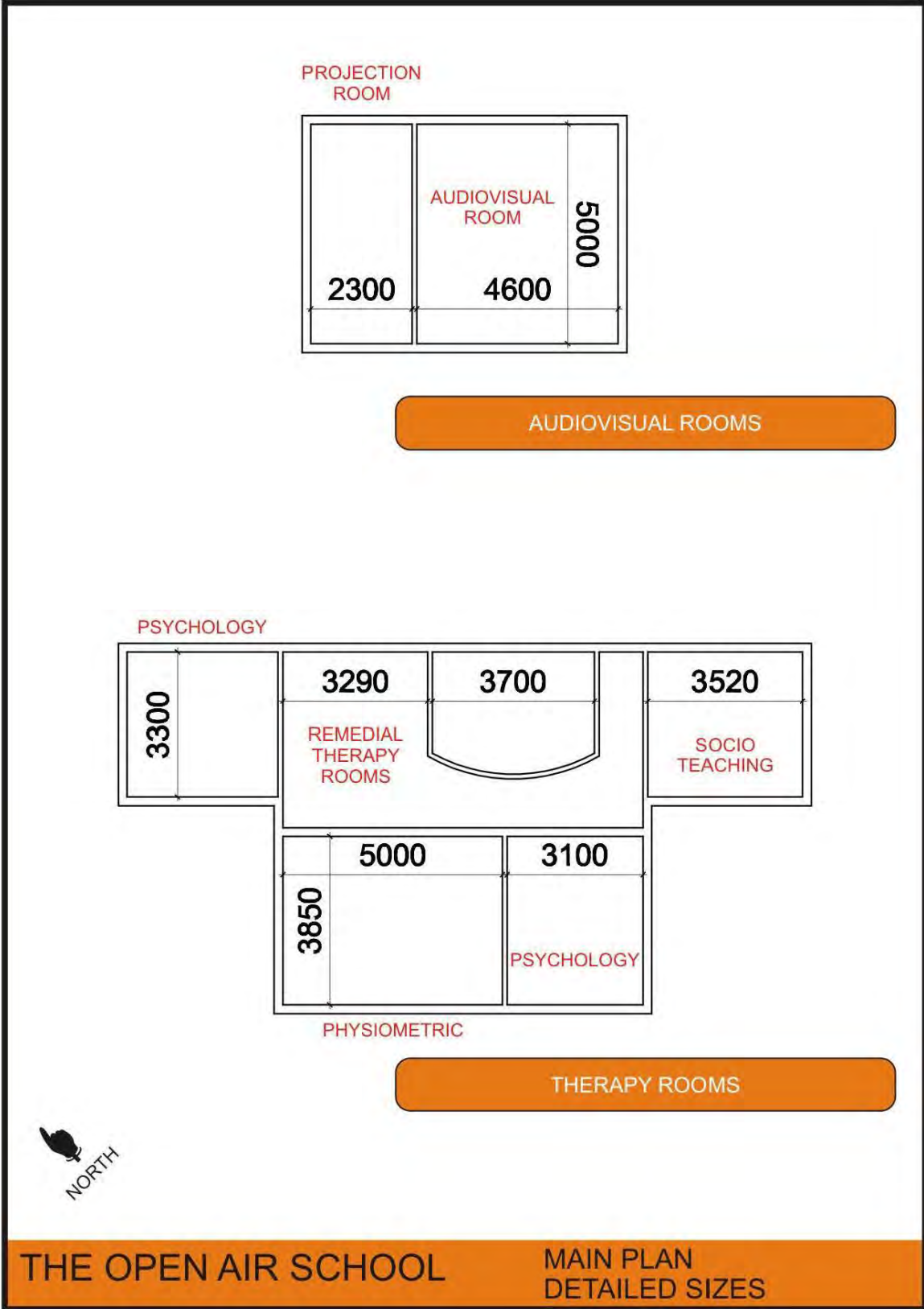


Figure 7.25: Detailed plans indicating the sizes and arrangements of therapy rooms (Source: City Council – redrawn by author).

BARRIER – FREE DESIGN:

In terms of specialist design for disabled children, the school has provision of a high – quality medical facility on site, rooms for therapists, a braille unit which teaches the blind children how to read and there are ramps, where needed. There are no special design



Plate 7.13: A ramp at the school (Source: Author).

features for the children such as handrails on the walls, the use of colour for orientation and there is no specialised playground. The two ramps provided are interesting, one has a fascinating roof covering with exposed trusses and the other is designed to resemble a hill, with continuous up and down elements, which allows the children in wheelchairs to get used to unusual surfaces (Plate 7.13). These ramps are the only elements of the school which incorporate the use of handrails to guide the children. Some of the windows have been placed lower than normal to allow the smaller children and those in wheelchairs easy access to open them. These windows have been made solid and not translucent, so that the children do not get distracted when looking out of them. All of the doors at the school are designed to be larger than normal ones for wheelchair access and they also have metal plates attached at the bottom so that the wheelchairs do not damage the doors or the frames. The bathrooms all have specially designed basins and toilets for the children but are not spacious enough, it seems. Different paving textures and grass allows for blind children to differentiate where they are walking when there is no trail rail to guide them along. The pool itself has also been designed to aid disabled children to get in and out easily and the non – slip floor surfaces around the pool ensure that they do not get hurt.

SENSORY STIMULATION:

The design of the buildings does not incorporate any specific colour scheme to excite the children; rather muted and dull tones of blue and white are used throughout. There is an element of tactility to the buildings, where a contrasting play between brick, white smooth



Plate 7.14: The use of textural variations in terms of materials and colour (Source: Author).

walls, blue rough plastered walls, glass and wood provide interesting facades (Plate 7.14). The use of wood complements the age of the school and the aged look of the buildings reflects its timeless feel. The covered walkways have a subtle amount of natural light, which is not too harsh for the blind/partially blind children and this works well for them. Airbrick walls (Plate 7.14) are stimulating, textured surfaces for the sensory delight of the children. Other than those aspects, there is nothing more to the design of the school in terms of sensory stimulation. Most of the classrooms are simple in their spatial arrangement and offer nothing more than tables, chairs, storage and a blackboard.

BUILT FORM AND ARCHITECTURAL EXPRESSION:

This school is constructed out of brick, concrete, tiled roofs and timber. The entrance areas, administration component and hall of the school are the only parts of the school which have



Plate 7.15: The main façade of the school (Source: Author).

an expressive architectural form, with the use of different materials, arched and circular windows and timber panelled ceilings (Plate 7.15). The rest of the school is a simple construction methodology and most of the buildings resemble the surrounding context, which are mostly houses, flats and offices (which were originally houses).

Lightweight, translucent coverings to the walkways filter light into these spaces, creating ethereal spaces for the children when they are walking from space to space. None of the courtyards have been designed especially for the children; however some of them are delightful, incorporating trees, different smelling plants as well as benches and tables. Since the buildings are so old, they exude an aura of



Plate 7.16: The architectural expression of the school which resembles the surrounding residential architecture of the suburb of Glenwood (Source: Author).

being strong and secure. None of the elements of the building have been child – scaled but the floor to ceiling heights would not make the children feel too diminutive in comparison. Similarly with Browns, one cannot tell what part of the building houses what activity, except for the administration areas and the school hall (Plate 7.16).

DATA ANALYSIS AND INTERPRETATION:

The observation of this case study was mainly to understand aspects of barrier – free design for the disabled and how well certain architectural elements work. In order to achieve this, various methods were used. The observation of the school has already been discussed. Focused interviews were carried out on the principal and various educators and measurements of different spaces were also recorded. These will be detailed below.

RESULTS OF FOCUSED INTERVIEWS:

- There are two hundred children enrolled at the school for 2011.
- The age groups range from three years old to fifteen years old.
- The school caters for all disabilities; cerebral palsy, diabetes, cystic fibrosis, blind, amputees and paraplegics who were in motor car accidents.
- The environment exudes a sense of care and has a very aged look, which appeals to the children.
- Use of brick has ensured a long – lasting and durable set of buildings.
- The children are encouraged to play outdoors everyday by educators and therapists as this is seen to be very beneficial.
- It is easy enough for the children to find their way around the spaces once they have had mobility and orientation training.
- The design of buildings is extremely important to all children, especially the disabled.
- Some of the doors at the school are not wide enough to accommodate wheelchairs, posing many problems.
- There are also a lot of stairs around the school.
- The blind children use walking sticks and canes to find their way around.
- Children using crutches are extremely fast when they walk and any potential dangers (such as steps or level changes) should be easily marked for them to see easily.

SITE OBSERVATIONS AND SKETCHES:

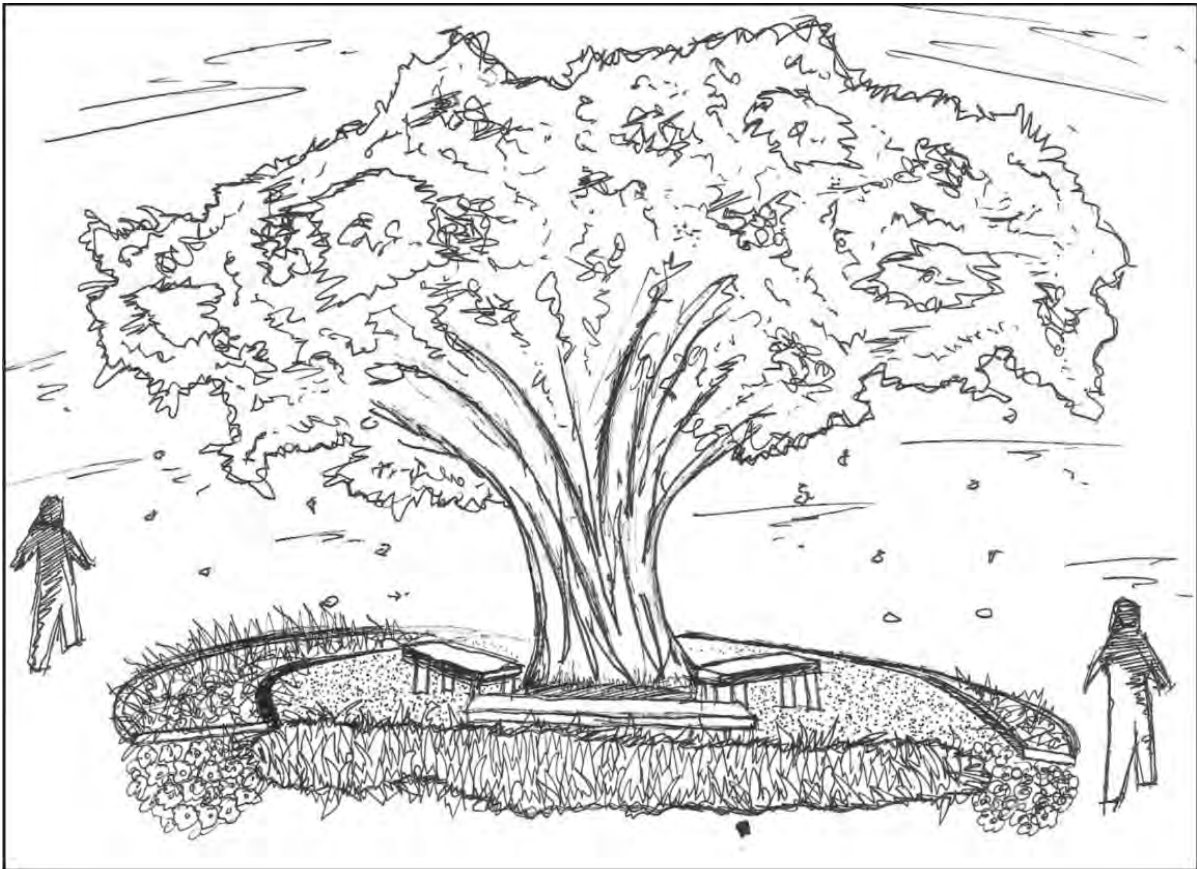


Figure 7.26: One of the courtyards at the school has a storytelling tree, which is surrounded by benches and grass for seating. The use of plants and flowers adds to the sensory experience of the space (Source: Author).

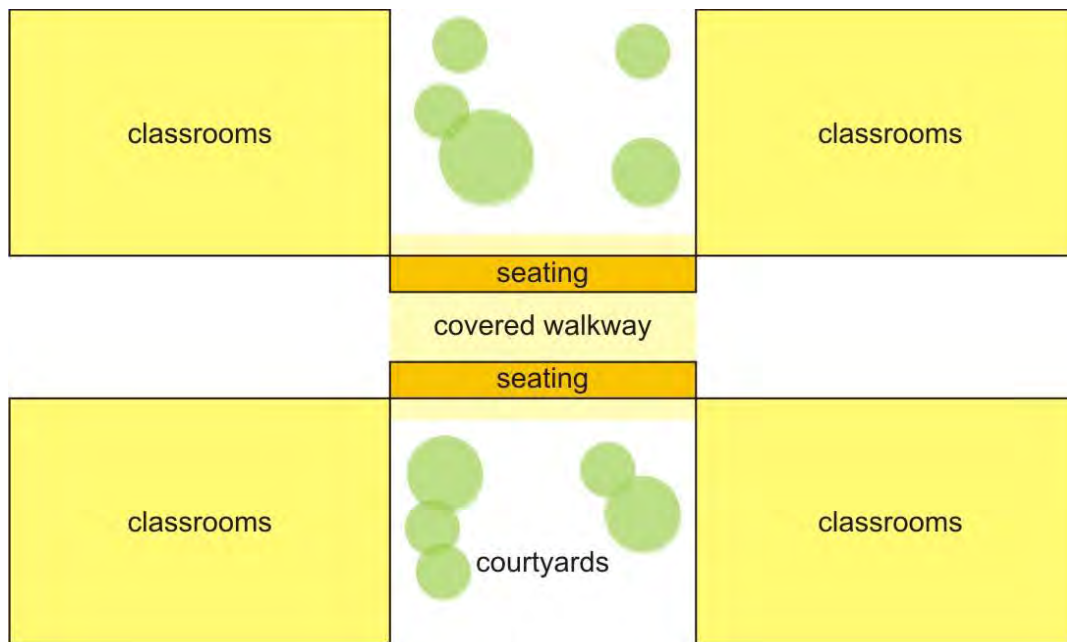


Figure 7.27: Transitional spaces between classrooms provide layers of opportunity for social engagement. Courtyards provide larger spaces for playing, while covered walkways with seating provide for social lingering between classes and on colder days (Source: Author).

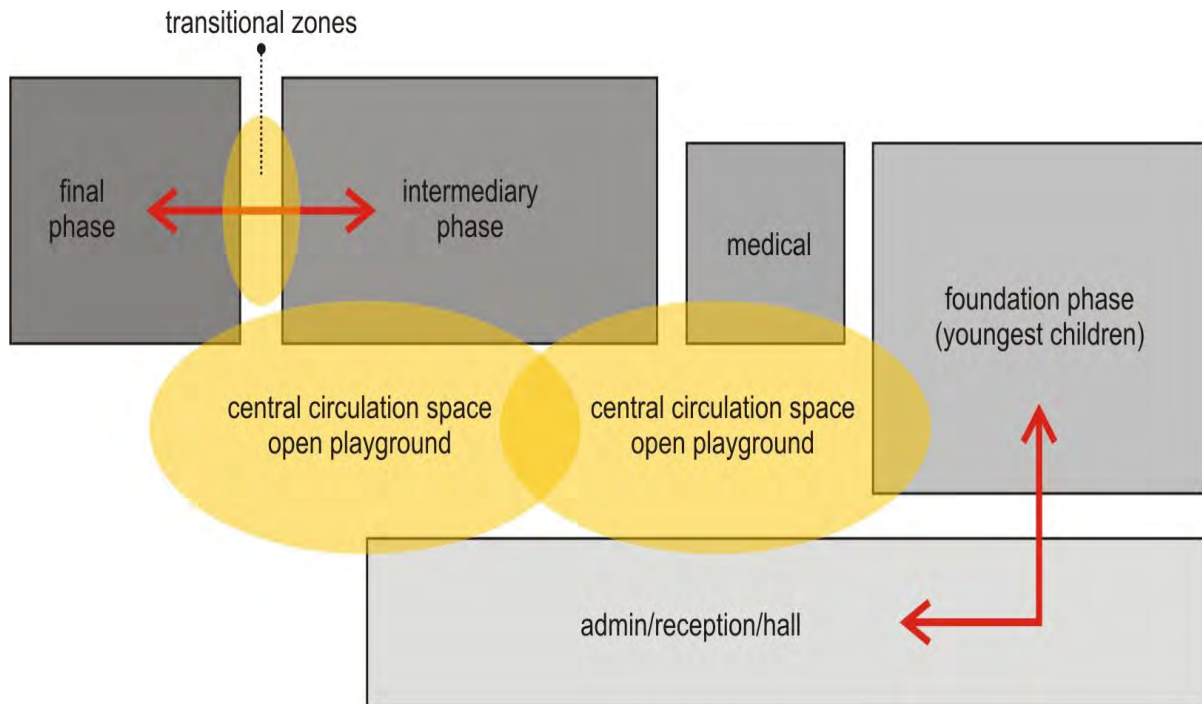


Figure 7.28: Diagrammatic layout of the school, where a hierarchy of the different learning phases is interpreted into the spatial planning and are linked by transitional spaces such as walkways and courtyards. A central circulation space allows access to all of the different classrooms from the entrance/administration area. The double storey reception/administration and hall allows their inner walkways to have views out onto this space and naturally survey the classrooms (Source: Author).

Conclusion

The services offered at this school are at a high level and the buildings themselves are extremely well maintained. However, in terms of providing an exciting physical environment, the buildings don't seem to achieve this very well and certainly not for the smaller children. There has not been any specialist building design for disabled children and the medical facility seems very clinical and cold and not at all inviting. This can be a little scary for small children who are at the school without the support of their parents at hand. Even though the staff has a warm and positive attitude, the architectural environment seems lacking in this respect. Also, the buildings are a reflection of the residential architecture surrounding them and do not have their own sense of identity but perhaps this works well in making the children feel at home and therefore at ease. The long history of the school has allowed it to gain a reputable identity in the city and thus in that way, it has a strong identity, which is sadly, not due to the building design.

CHAPTER EIGHT

ANALYSIS AND DISCUSSION

CHAPTER 8 ANALYSIS AND DISCUSSION

The literature review and case studies analysed and examined the various theories which were connected to understanding the psychological impacts of architecture on child development. This chapter will deal with discussing the findings from those theories and concepts, providing a conclusive argument to the main hypothesis.

Firstly, it was hypothesised that architecture has a direct impact upon the development of children, affecting their physical, social, emotional and intellectual growth, but it was also put forth that disabled children are more in need of sensitively designed environments which do not handicap them. The negative effect of built environments on disabled children can have long lasting effects on their social and emotional identity. Understanding the different types of disabilities is extremely important as this informs a design in a multitude of ways and it is the duty of any architect to consider the disabled in any building design.

Designing for disabled children also requires an understanding of child development, human perception and the role of the sensory systems in these processes. The field of architectural psychology grapples with these issues, contemplating the delicate relationship between buildings and the people who use them. Architectural psychology deals mainly with perception, probing deep into understanding the ways in which people perceive and assimilate their architectural environments. Perception is a complex process which involves all of the human senses (including the indirect ones) and is intricately linked to emotions, experiences and memories. This forms a unified mental image of different situations, for people, but for those whose senses have been impaired; their perceptions are slightly different, affecting every process level, especially during childhood. Architectural psychology is a field which is composed of various elements, all of which are considered in built environments. The effects of colour and light on people's health, well – being and emotional states has been well documented and shows that these have a major psychological role in all people's lives, especially children, who respond naturally to colours. Architects therefore have the duty of ensuring that buildings enhance cultural and societal beliefs, promoting place identity which in turn affects personal identity. Colour, light, patterns, textures, materials and shapes all have implications on our perception and therefore our experiences, forming the crux to the psychological impacts of architecture.

These aspects (colour, light, patterns, textures, materials and shapes) also form part of creating legible environments, which also have an effect on people. If a building is a drab and dreary place, one would feel unhappy to work in it every day of their lives. Therefore, creating buildings which express an identity that is related not only to function but to culture as well, allows for the conception of meanings that people attach to places, which in turn affects their emotions and thus experiences. Legibility is closely related to orienting one's self in environments. Wayfinding or finding one's way through an environment is solely triggered by the built environment. For the disabled, legibility, orientation and wayfinding are the key elements to the successful use of any building. The perception of buildings constructs a mental cognitive map which informs wayfinding and orientation. Thus, all of these concepts are closely related, with architecture playing a pivotal role in shaping child development and identity.

Personal identity is composed of social, emotional, intellectual and physical properties of the human body. In order for identity to form and evolve, place identity and perception play the biggest role. The cultures of people are direct bearers on the creation of place identity and should therefore be integrated as a part of the building design process, because it is argued that understanding cultures means to truly understand people. Place identity forms part and parcel of designing critically for a region and thus, the ideas of critical regionalism and genius loci come into play. The appreciation and consideration of local cultures, people, materials and history connects people to roots and traditions, respecting the sense of place, which informs place identity. Considering nature in the design of built environments is even more important, also creating links to a sense of place.

Nature was a part of the earth before man began building and yet, the world is facing a loss of precious resources due to the destruction of the earth's natural elements. The psychological benefits of nature to human well-being is irrefutable and is considered to have numerous, positive effects on children. Natural environments and animals provide many opportunities for children of all ages to explore creatively through playing and unfortunately, in many cities around the world, children are being exposed to nature less and less. The healing powers of nature can be therapeutic for children who are sick or have become disabled. Most importantly though, teaching children about nature has become a

crucial aspect because it will empower them to have a respect for nature and they can have positive attitudes towards natural resources when they are adults. Playing comes naturally to children and nature provides countless experiential and learning possibilities for them. Considering the incorporation of nature into the design of buildings also indicates taking into deliberation aspects such as sick building syndrome which can have adverse effects on people. Children should not be exposed to too much of artificial lighting, toxic materials and air – conditioning as these can have long term effects on their health. Natural light, ventilation and materials negate the effects of sick building syndrome, creating environments which are life – filled. However, sick building syndrome can also be attributed to the adverse psychological effects that buildings can have on people. Large, cavernous spaces can induce emotions of fear in children and they can feel unprotected.

Making children feel safe and secure is one of the first steps in ensuring the success of any building, as was observed from the case studies. When children feel protected, they are free from worry and can focus their attention on playing, learning and developing. Safety fears promote negative meanings that can be attached to buildings and preventing incidences of crime is extremely important. The South African context is rife with issues of crime and children’s environments need to be defensible so that these situations do not arise. Careful design of buildings and the surrounding spaces through defensible space principles can hinder criminals from considering that building as a target, although building design cannot totally prevent this. The security of a tight and supportive community can also help to protect children’s safety. Therefore, architects have a major role to play, in ensuring that buildings not only cater for the disabled, but also incorporate aspects such as culture, history, nature, sustainability and safety.

The concepts discussed above were the determinants to the choice of case studies, all of which are located in KwaZulu Natal. The first case study, Seven Fountains Primary School encompassed all of the aspects related to architectural psychology, except for wayfinding design and barrier – free design. An analysis of this case study exemplifies that building design can have an impact on the development, identity and morale of children. Set in a rural community, the school design has gone a long way, ensuring the comfort and stimulation of the children as well as helping to improve their performance and attitudes. Sensory design, if incorporated cleverly, has many implications on the learning

environments of children, having the greatest psychological impact. Passive and sustainable design is also just as important, all of which can be drawn from the conclusive evidence presented in analysing the Seven Fountains School.

The second case study; the Browns School, was chosen mainly because it is a school for the disabled and incorporates aspects of barrier – free design. This case study mainly highlighted aspects of designing for disabled children, but most importantly showed that wayfinding design (especially for the blind) is extremely crucial and should be integrated with sensory design to create environments which are legible and easy to navigate. Not only does this create a pleasing and stimulating environment, but also one which is easy to understand and promotes safety and protection, for children. Details of barrier – free design are just as important to ensure the ease of access for all types of disabilities and these need to also be integrated seamlessly into any building design, thus reducing any negative psychological impacts.

The last case study; the Open Air School, was also analysed for its barrier – free design components. This case study highlighted that the identity of buildings should be carefully considered, so that they do not mimic their context. Respecting and integrating the context should be a factor which contributes to the creation of a building identity which is unique yet regionalist. This also forms part of creating legible environments, so that in a complex of buildings, one can easily identify the library from the office block, without having to refer to signs displayed on the main facades. For children, especially, this becomes critical because they can get confused easily and buildings which look exactly like the next one appears unstimulating to them. Both the Browns School and the Open Air School provided detailed understandings of the various components involved in the design of special needs schools, such as the provision of medical and therapeutic facilities, specialised classrooms and ablutions. The next chapter deals with concluding the main argument and listing recommendations which can be drawn into the next phase of the project.

CHAPTER NINE

CONCLUSION AND RECOMMENDATIONS

CHAPTER 9 CONCLUSION AND RECOMMENDATIONS

The comprehensive research carried out in the fields of architectural psychology, child development, barrier – free design and universal access has provided a solid foundation for understanding the important role that architecture has to play in child development. In the perspective of child development, early childhood is a period of fantasy, imagination and wonder and children learn through sensorial and motoric activities. This learning is activated (and influenced) by the various functions of the features in the environment that surrounds them. In middle childhood, children are naturally disposed to discovering and bonding with nature. This teaches them the evocative workings of the world and logical reasoning through their handling of objects. With all phases of childhood, playing is the stimulant of the cognitive faculties in the human body; the senses, because „active experience with the environment affords (sic) children to form logical thought“ (Said, 2006: 2).

Simple aspects of everyday life such as light, colour, shapes, scale, forms and textures are the building blocks to creating a successful architectural environment which also plays a role in child development, as shown in the analysis of these theories. Colour and anthropometrics (scale) seem to be the most dominant aspects in architecture for children, providing conceptual frameworks for the overall aspects of design. Legibility of architecture and wayfinding techniques is important for disabled children as well as for the spatial planning process. Therefore the design of spaces for children must conform to their physical functioning and cognitive development, which helps to form reasoning, memory and language. All of these aspects are closely tied to the social development of children and it is during childhood that basic social skills are formed, which determines many aspects of people’s lives, most important of all is their identity.

Analysis of the various theories has shown that the field of architectural psychology and sensory design is becoming an important element in all built environments and architects must always remember that buildings are designed for people to use them and not for buildings to simply be visually appealing. The relation between architecture and child development requires a much more concerted effort to ensure that buildings have a positive psychological impact so that children all over the world can lead fulfilled lives, having strong connections to other people, communities, cultures and nature, aspects which are

becoming increasingly imperative in the twenty first century. Architects also have the task of integrating the disabled seamlessly into all environments so that they too can lead satisfactory lives, without being impeded by any barrier. The psychological effects of buildings on people are undisputable and are imperative to be considered when designing any building.

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APPENDICES

APPENDIX ONE – FOCUSED INTERVIEWS

The following appendix is a sample of the interviews that were conducted on various people during the analysis of the case studies. These interviews were structured in a way that allowed the respondents to provide answers which helped to further understand the impact of architecture on child development. The results of the interviews carried out are listed in the case studies under data analysis and interpretation.

**INTERVIEW CARRIED OUT AND COMPILED BY MITHASHA MISTREY
MASTERS OF ARCHITECTURE STUDENT AT THE UNIVERSITY OF KWAZULU NATAL
STUDENT NUMBER – 204504703**

PART A

Name:
Age:
Date:

THE ABOVE ARE OPTIONAL

Name of the school:.....

PART B

1. What is your job/role at the school?
.....
2. How many children are currently enrolled at the school?
.....
3. What are the ages of the children?
.....
4. What is the main ethos of the school with regards to the teaching and development of disabled children?
.....
.....
5. How would you rate the design and appearance of the school?
.....
.....

6. In your opinion, do you think that the children enjoy being here?

.....

7. What measures have been implemented to ensure that the children are safe and secure?

.....

.....

8. What methods are employed to stimulate the children?

.....

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9. Are the children encouraged to play outdoors, in a natural environment, or with animals and if the answer is yes, how often?

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.....

10. How easy is it for the children to find their way around the buildings and spaces? Are there any unusual or awkward spaces that could make the children feel uncomfortable?

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.....

11. Are there separate spaces/classrooms for the different age groups?

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12. Has provision been made for a therapeutic component to the school?

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13. In your opinion, how important is the design of buildings to the development of children?

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14. Are there any aspects of the building that you think are interesting to the children?

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15. Have the rooms and spaces been designed to allow the children individual expression so that they feel as if they have a space of their own?

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16. If you had to, what changes would you make to the building to make it more suitable for the children and why?

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THE END

APPENDIX TWO – OBSERVED BEHAVIOUR SHEET

The following appendix is a sample of the observed behaviour sheets that were used to analyse and observe the spaces and the people using them, during the case studies. These observed behaviour sheets were compiled by the author and were structured in such a way as to allow the observation of the spaces and people so that the answers obtained would support or negate the answers obtained from the interviews. The results obtained from these observations are listed below the sample.

OBSERVER:

DATE:

TIME:

ENVIRONMENTAL SETTING:

LOCATION OF THE OBSERVED BEHAVIOUR

INDIVIDUALS INVOLVED

NUMBER AND CHARACTERISTIC OF THE CHILDREN OBSERVED

GROUP SIZE

TWO – THREE YEARS OLD

FOUR – FIVE YEARS OLD

SIX – EIGHT YEARS OLD

OLDER

OBSERVED BEHAVIOURS RELATED TO THE ENVIRONMENT

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DESIGN OF THE PHYSICAL ENVIRONMENT

General impression of the physical environment

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Is it child – scaled and safe?

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Is it well – lit and stimulating?

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Are there any special design features implemented to stimulate and excite the children? If yes, describe these features.

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Does the space include ample storage, which is easily accessible by both adults and children?

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.....

Are there aspects of the design which appear to restrict or obstruct learning?

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.....
.....

RESULTS

Different environmental settings were analysed and observed, including classrooms, playgrounds, therapy rooms, libraries and school halls, at the various case studies analysed.

The observed behaviours relating to the spaces that the children were in are as follows:

- In brightly coloured classrooms, the children are more stimulated.
- Well – lit classrooms are better to work in than the artificially lit ones.
- The children use any type of playground equipment, but especially like the one’s which incorporate water, sand, dress – up and slides.
- The playgrounds are large, with many of the classrooms opening onto them.
- Large verandas are well – used as outdoor classrooms.
- Cold and unstimulating therapy rooms appear too clinical and not at all child – friendly.
- The use of round tables in the classrooms encourages social learning but also makes it hard for the children to see the blackboard.
- The children particularly enjoy the lessons during which they do art.

- Except for the Seven Fountains School, there were no special design features meant to stimulate and excite the children at the other two case studies.
- The water fountains at the Seven Fountains School were scaled to the height of a five or six year old.
- All of the environments gave the impression of being safe and secure.
- There was ample storage in all of the spaces.
- The use of folding, stacking doors in between classrooms allowed for the classrooms to be extended into bigger spaces which is useful if classes are to be combined or if these spaces are used for a different purpose.
- Incorporation of a smaller scaled road, with fake traffic lights and road signs allows the children to imagine that they are actually using a real road and can provide hours of stimulation, especially for the disabled in wheelchairs.
- The integration of trees on playgrounds and sports fields is important for children to have shade as well as to cut down the amount of sunlight that the blind children are exposed to, because the light affects them.
- Large, open spaces disorientate blind children as they have no landmark system to navigate themselves through the space.

APPENDIX THREE
SEVEN FOUNTAINS BUILDING STUDY

442: 7 Fountains Primary School Post-occupancy Evaluation

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Abstract

7 Fountains Primary School is situated in an impoverished community with extreme climates in the Kokstad region of KwaZulu Natal, South Africa. The new school was built with passive design principals to provide a healthy, comfortable learning environment. This project sought to quantify the performance of these passive interventions. In a collaborative effort with the school's educators and staff, a number of data sensors, consumption meters and a weather station were installed at the school. Overall the classrooms are 10°C warmer in winter than outdoor temperatures, the light levels are significantly high such that electrical lighting is seldom used and innovative water systems have provided 45% of the toilet block water from non-potable sources. Insulated cavity walls provide improved thermal performance and traditional mud-brick construction provides moderate indoor surface temperatures despite extreme outdoor surface temperatures. Donated facilities such as computers that low-income schools do not usually have access to, demand an additional 39% electricity. Teachers have noticed a drop in winter absenteeism from 50% in the old school to almost 0% in the new school. The data is being used to inform design decisions about other rural school projects.

Keywords: passive design, monitoring, schools

1. Introduction

7 Fountains Primary School opened in 2007 in Shayamoya, a poverty stricken settlement outside of Kokstad, Kwa-Zulu Natal, South Africa. Kokstad experiences extreme weather conditions relative to the rest of South Africa; including snow in winter and high temperatures in summer. Figure 1 shows the maximum, minimum and mean dry bulb temperatures throughout the year.

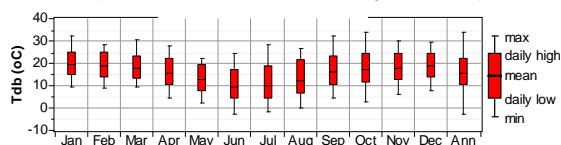


Fig 1. Dry bulb temperatures for Kokstad

The school buildings were built with external donor funding but within a conventional Department of Education budget. This enabled the design to stray beyond the standard educational design drawings while still making the various interventions obtainable to other projects. Effort went into using passive-design principals to optimise comfort and extensive workshops with the local community ensured public input. Passive design strategies included daylight analysis, natural ventilation, thermal performance of the building envelope, and thermal comfort in the classrooms. Conservative energy and water systems were also installed to minimise reliance on municipal supply while still providing a healthy teaching environment.

This paper explores the post-occupancy performance of the school and in particular the performance of certain passive design strategies. In a collaborative project with the educators at the

school, a number of data logging devices were installed to monitor different aspects of the design and function of the buildings.

Qualitative investigation provided feedback on the perceived comfort of the learners. The results from this investigation are valuable for future design decisions at other schools with the results being freely disseminated.

2. Daylight

The 1990s saw a resurgence in designing schools with good daylighting. Not only does this reduce energy consumption from artificial lights, but a number of studies have shown the strong correlation between improved student performance and daylighted schools. Niklas and Bailey [2], in a study on three daylighted schools in North Carolina, showed that students at these schools outperformed their contemporaries in non-daylighted schools by 5-14%. Hescong et al support this finding with a further study in the United States involving 3 districts of 6000 – 8000 students each in which they “established a statistically compelling connection between the presence of daylight and student performance” [1].

While the exact reason for this connection is unsure, studies [1, 3, 4] suggest that increased daylight provides better visibility, enhanced mood and improved health.

2.1 Design strategies

The 7 Fountains design resulted in 70% of teaching spaces having optimal orientation (North facing) for classrooms with walkways on the South side to avoid over shading in winter. Light shelves made of galvanised metal assist in solar

shading and reflect light onto the light coloured ceiling and deeper into the space. Blackboards are positioned on the South side of the classroom to avoid glare from the large North windows. In an attempt to reduce electricity consumption by breaking habit of turning all the lights on at once, the electric lights switch on separately: the lights on the darker side of the room are connected to a switch at the door and the lights on the lighter side of the classroom are connected to a switch near the windows (opposite the door as in figure 4).

2.2 Measurements

Light sensors were installed at occupant level in the following classrooms:

- Optimal North facing orientation at 7 Fountains
- Sub-optimal West orientation at 7 Fountains
- Optimal North orientation at conventional local primary school

In the North facing classroom at 7 Fountains, state loggers were installed at the light switches to determine when lights are turned on and off.

2.3 Results

Light levels at 7 Fountains are consistently high even in classrooms with sub-optimal orientation (figure 2). In the week shown, electric lights were only used on the 21st April. The conventional local school, with no access to electric lights, has significantly lower natural light levels, despite its Northern orientation. The solar radiation, indicative of outdoor light levels, is given in the figure to show the relationship between internal and external light.

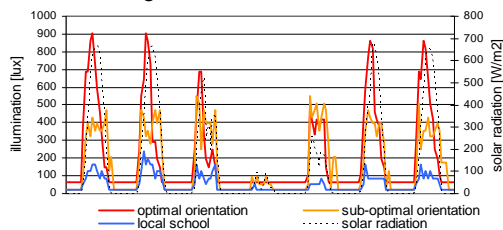


Fig 2. Comparison of light levels in classrooms with optimal/sub-optimal orientation, and a conventional local school; solar radiation included: 17 – 23 April 2008

Figure 3 shows the results from the state loggers at the light switches during the summer rainy season. The electrical lights are seldom used and only at times when the average light intensity is low. This is confirmed by the survey data in which educators explained that they only use electric lights during overcast or cloudy conditions [6].

The bar chart shows the duration of electric light use on the dark and light side of the classroom indicating that the lights on the dark side of the classroom are used more frequently than the lights on the lighter side. This trend is more pronounced in the latter part of the time period. This could be attributed to the instructive posters (figure 4) that were installed in the classroom in February 2008 explaining the measurement

devices and how lights should be used confirming the importance of occupant education.

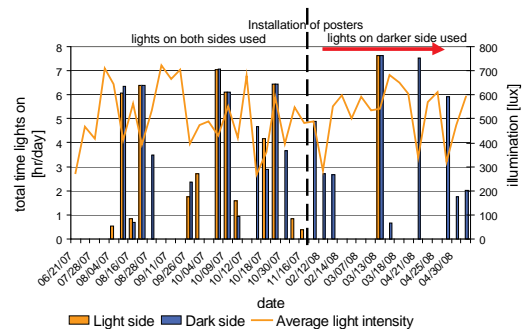


Fig 3. Duration of electric light use on light and dark side of classroom; with average light intensity

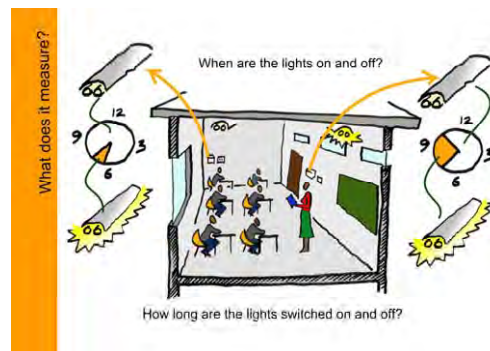


Fig 4. Poster installed in classroom explaining measuring equipment and separate switches

3. Temperature

Thermally comfortable classrooms with adequate ventilation play an important role in effective learning. In a survey with the educators at 7 Fountains Primary School, it was noted that in comparison to the poorly insulated previous school building, absenteeism during winter has dropped from 50% to almost 0%. They suggest the reason for this is that the classrooms are more comfortable than the children's homes [6]. Improved thermal performance, increased natural ventilation and fewer learners per room has provided a healthier environment where the risk of illness is reduced.

3.1 Design strategies

Given the extreme climatic conditions experienced in the Kokstad region, particular attention was paid to thermal comfort within the classrooms. The old school buildings (converted migrant worker cottages of concrete blocks with no ceilings) had very poor thermal performance [6]. Optimising orientation for most classrooms and putting the walkways on the south side of the buildings provides opportunity for passive solar heating.

The architects and designers of 7 Fountains Primary School substituted Department of Education specified bricks for locally manufactured bricks. Not only did this provide much needed capital injection into the local community and reduce the negative environmental impacts of additional transport, but

it also freed up funding for installing insulation in the cavity walls.

The ceilings are insulated (u-value of 0.4W/m²K) which improves thermal performance through reducing heat loss in winter and heat gain in summer. It also improves comfort levels by reducing the fluctuation in mean radiant temperatures of an important surface exposed to the occupants.

3.2 Measurements

Temperature and humidity loggers are installed in optimal and sub-optimally orientated classrooms at 7 Fountains and in an optimal orientated classroom at a local primary school. Ceiling temperatures are also measured for a classroom at 7 Fountains and at the local school.

3.3 Results

The humidity data confirms the very dry climate in the Kokstad region; it shows no significant fluctuations or potential sources of discomfort in summer. The dry winter may require some sort of humidification however this has not been investigated further.

The indoor air temperature of an optimally orientated classroom at 7 Fountains during a week in April, is maintained at a comfortable 20°C which is approximately 10-15°C warmer than the outdoor temperature (figure 5). A non-North facing classroom is about 5-10°C warmer than the outside temperature whereas a North facing classroom in a building that has not been built with passive design principals (the classrooms are over-shaded by deep walk ways on the North) is only 3-5°C warmer than the outdoor temperature. All the classrooms function to reduce the extreme variance in outdoor temperature, with the optimal orientated classroom performing best. The warming effect of children in the class can be seen in the mornings when the indoor air temperature increases faster than the outdoor temperature.

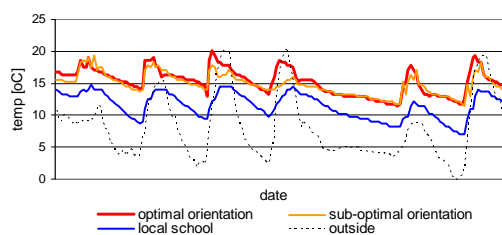


Fig 5. Comparison of temperatures in classrooms with optimal/sub-optimal orientation and a local school: Wed 4 – Tues 10 June 2008

The effect of insulating the ceiling results in ceiling temperatures closely matching the ambient indoor air temperatures and removes a potential source of discomfort of having a surface radiating heat or cold to the occupants. Figure 6 shows a classroom that is well insulated – the ceiling temperature follows the air temperature closely; whereas Figure 7 shows a classroom with no ceiling insulation – the ceiling temperatures are more extreme than the air temperatures. The outside air temperature is also

shown on the graphs as an overall indication of the thermal performance.

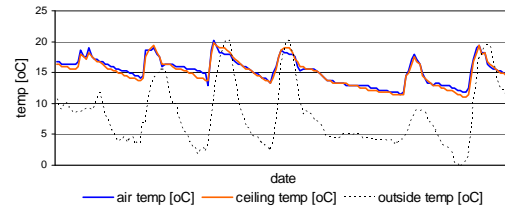


Fig 6. Air, ceiling and outside temperature for a classroom at 7 Fountains: Wed 4 – Tues 10 June 2008

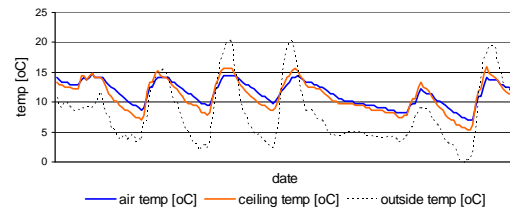


Fig 7. Air, ceiling and outside temperature for a classroom at local school: Wed 4 – Tues 10 June 2008

4. Thermal performance of classroom walls

Insulating walls is common practice in many cooler countries however in most parts of South Africa this is seen as unnecessary. Given the extreme temperature variation in Kokstad, the addition of wall insulation can significantly improve the thermal performance of a brick cavity wall.

In rural South Africa, traditional building methods use mud-bricks in a circular 'rondavel' floor-plan. One of the classrooms at the school is built in this format with help from members of the community. While mud-brick construction may be seen as a less modern way of building, the thermal performance of straw reinforced mud-bricks has superior insulating capabilities to concrete brick construction [5].

4.1 Design strategies

The thermal performance of the conventional brick wall envelope is greatly increased by the addition of insulation in the cavity (0.6W/m²K). A multi-cultural teaching room was constructed using traditional hand-made mud bricks containing straw to improve the strength and insulating capacity of the material. The intention was to demonstrate that traditional construction methods are appropriate to the climate and can have similar performance to modern methods.

4.2 Measurements

This experiment set out to compare the thermal performance of the insulated cavity wall and the mud brick wall. Temperature sensors were placed in the wall at four different intervals (on the inside wall surface, inside of the insulation, external to the insulation and on the outside wall surface as in figure 8). A set of data was collected for both the brick cavity with insulation wall and the traditional mud-brick wall.

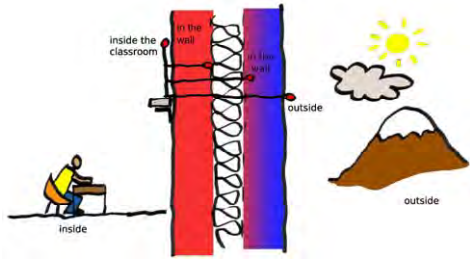


Fig 8. Graphic showing position of temperature sensors through the cavity wall

4.3 Results

During cold months (figure 9) the insulated cavity brick wall performs very well with indoor surface temperatures 5-10°C warmer than the outside surface temperatures. The mud-brick (figure 10) wall performs well with indoor wall temperatures that remain consistently 5°C warmer than the cold outdoor wall temperatures (figure 10). The average indoor surface temperature of the mud-brick wall is approximately 5°C cooler than the insulated cavity brick wall, however this may also be a result of the larger volume and less frequent use (lower internal gains) of the mud-brick room.

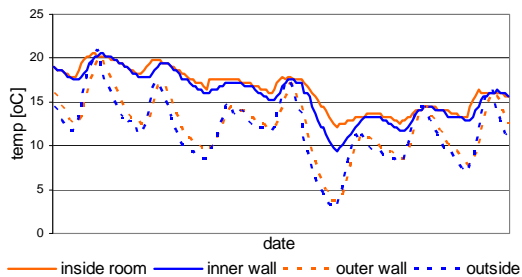


Fig 9. Temperature profile through wall of brick with insulated cavity: Tues 24 - Mon 30 July 2007

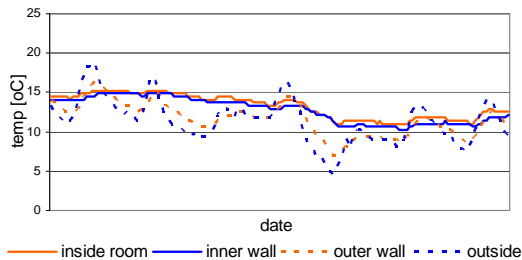


Fig 10. Temperature profile through wall of mud-brick: Tues 24 - Mon 30 July 2007

In the warmer summer months, the insulated cavity brick classroom never overheats remaining between 20-25°C (figure 11) despite high outdoor temperatures. The mud-brick classroom (figure 12) performs similarly on warm days and maintains a very even temperature between 20-23°C.

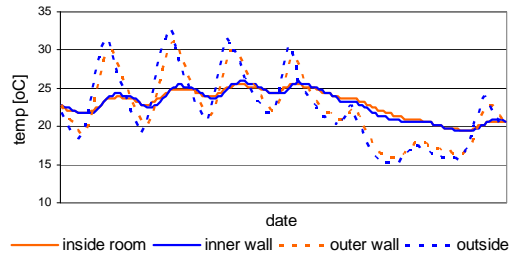


Fig 11. Temperature profile through wall of brick with insulated cavity: Sun 30 Dec-Sat 5 Jan 2008

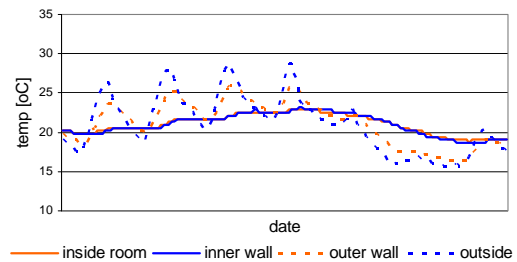


Fig 12. Temperature profile through wall of mud-brick: Sun 30 Dec-Sat 5 Jan 2008

5. Electrical energy consumption

Many rural schools in South Africa have no access to electricity and rely purely on daylight for illumination and chalk boards and books for educational tools. With the new construction, 7 Fountains Primary School were not only provided with electricity for electrical lights but computers, a television and other teaching aids were donated demanding additional energy and placing a cost burden on the school.

5.1 Measurements

The aim is to monitor electricity consumption and to quantify the additional electricity consumption burden that providing computers, a library and borehole pump will place on a low-income school such as 7 Fountains. While the donated teaching aids are very welcome at the school [6], it is important to identify the additional running cost. A system of three electricity meters were installed to measure the following consumption:

- the total incoming electricity
- block C which contains the computer room, library etc
- the borehole pump

5.2 Results

The electricity consumption follows the school calendar fairly closely with weekends and holidays shown as low consumption periods. There is little difference between winter and summer consumption due to the lack of electrical heating and cooling systems. Figure 13 shows an example summer week.

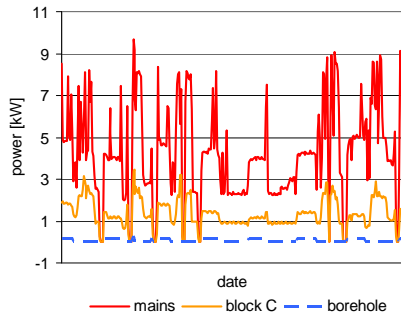


Fig 13. Power drawn: example week Wed 16-Tues 22 January 2008

Table 1 shows monthly electrical consumption for four given months. The difference in consumption during the holidays compared with term time is evident as is the percentage additional electricity consumption due to facilities in block C and the borehole pump. On average these extra electrical devices demand an additional 39% electricity above the standard school buildings. It is interesting to note that during the December holidays, the borehole pump was used as much as during term time. This could either be from tanks continually topped up with borehole water that overflows to the reservoir or it could indicate that members of the community are using the school's water system during the holidays.

Table 1. Selected months' electrical consumption for the three meters and percentage additional consumption due to block C and the borehole pump

month	school activity	mains [kwh]	block C [kwh]	borehole [kwh]	% additional consumption
Nov 2007	term	3866.7	1517.7	62.4	40.86
Dec 2007	holidays	1460.2	573.4	56.3	43.12
Jan 2008	half holidays	2664.1	836.1	46.7	33.14
May 2008	term	3095.7	1118.2	52.9	37.83

6. Water consumption

The township of Shayamoya is connected to the Kokstad municipal water system however supply is limited to two hours in the morning and two hours in the evening with little water pressure and flow available.

6.1 Design strategies

The toilets are connected to a non-potable water system (utilising the pipe distribution to the fire hose reels) that is fed by surface runoff collected in a large reservoir for seasonal storage and pumped to header tanks (daily storage) using a wind pump. The wash hand basins, drinking fountains and solar water heaters are fed from header tanks connected to mains water and the borehole. Overflow from the 40m³ header tanks flows back to the reservoir. Roof runoff is collected in separate storage tanks (with overflow to surface drainage to the reservoir) and used for garden irrigation.

6.2 Measurements

Loggers are installed at three water meters to measure the water consumption of the following:

- toilets of a junior ablution block

- wash hand basins of a junior ablution block
- solar water heater system

6.3 Results

The usage pattern of ablution water shows clear spikes during school time particularly during the 10am and noon break times. Almost no water is used over the weekends (figure 14).

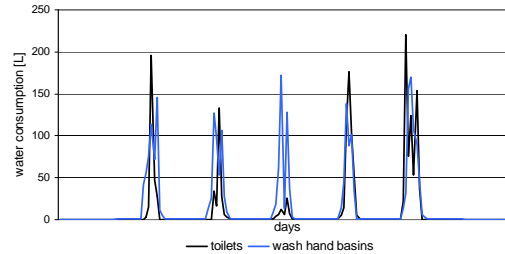


Fig 14. Water consumption for an ablution facility: example week Sun 7 – Sat 13 October 2007

The pattern of hot water consumption is more even throughout the day with some water use over the weekends. This suggests that cleaning staff or members of the community use hot water over the weekend (figure 15).

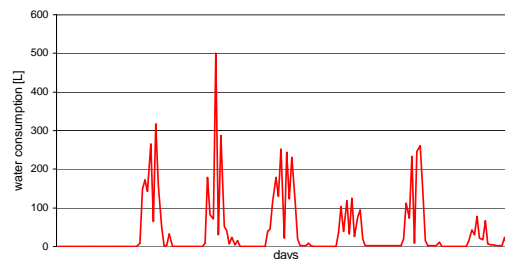


Fig 15. Hot water consumption at solar water heaters: example week Sun 7- Sat 13 October 2007

The actual monthly water consumption shown in figure 16 illustrates general trends of water use including the distinct difference between term time (October) and holidays (December). Malfunctions in the system can also be picked up from the data - in November there is evidence of a problem with the wash hand basins as the consumption is significantly higher than on an average month. One surprising result evident from the data is that aside from possible mechanical malfunctions, on an average day, the wash hand basins in this ablution facility use 10% more water than the toilets. This suggests user error such as leaving taps running or failing to flush the toilets after each use. It is likely that most of the learners do not have flush toilets or indoor running water at home and therefore may not understand correct usage practices.

While the graph shows hot water consumption higher than for toilets and wash hand basins, the solar water heaters supply hot water to the entire school whereas the bathroom that is monitored is only one out of four facilities for learners. There are also additional teachers' facilities. If this data is extrapolated to estimate total consumption, we can estimate that toilets, wash hand basins and the solar water heaters use almost 6m³ per day during the school term. Of that, 5 m³ is for bathrooms.

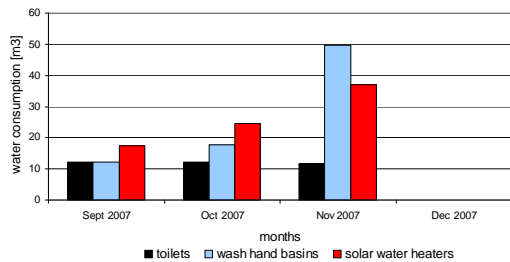


Fig 16. Metered monthly water consumption

On an average month 45% of the water used in the bathrooms is for toilet flushing and comes from a non-potable source. This represents a significant saving of potable water.

It would be interesting to perform these measurements in another toilet facility to determine whether the trends are similar with the older learners.

7. Conclusions

The monitoring of the performance of passive and sustainable strategies at 7 Fountains Primary School has shown that simple cost-effective strategies can have a marked outcome on the comfort and resulting performance of learners and educators. In summer, classrooms do not over-heat and winter temperatures are on average 10°C warmer than outdoor temperature. Daylight levels are significantly higher with minimal use of electric lights. When they are used, the lights on the darker side of the class are turned on first. This was aided by the installation of informative posters suggesting that such tools should be installed in all classrooms at occupation which could further influence the performance related to opening and closing of windows at different times related to season.

Insulated cavity walls in winter provide an indoor surface temperature of 10°C higher than outdoor surface temperature. In summer, indoor wall temperatures remain between 20-25°C despite high external temperatures. Results indicate that a regularly occupied mud-brick construction classroom could perform similarly, supporting the applicability of traditional construction methods to the local climate.

The addition of electricity-demanding facilities such as computer rooms, libraries and borehole pumps require an additional 39% electricity that the school administration has to pay for. An innovative water system provides continuous supply for toilets, wash basins, drinking fountains, and warm water for cleaning and cooking. 45% of the water used in toilet blocks is non-potable which represents a significant saving in potable water from municipal mains and the borehole. However further user education could reduce the wash hand basin use as it appears to be excessive. An impact similar to that on the electrical lights usage may be seen through user education.

Throughout the project, a strong emphasis was placed on the involvement of the staff at the school. While there have been some obstacles in

this process such as missing data, malfunction of logging systems and files not able to be sent, the benefits have been invaluable. There is a feeling of ownership towards the performance of the school as well as the data that demonstrates this.

7.1. Future steps

The project is ongoing monitoring and the aim is for the educators of 7 Fountains to take over the entire process of downloading and manipulating data. This is valuable for academic purposes, educational tools in the classroom and to identify operation and maintenance issues (overuse of wash basin water and water leaks).

An additional monitor has been placed in a classroom at an exclusive private school in the area. Future data assessments will provide a comparison between an up-market school building and the 7 Fountains classrooms.

The data gathered in this exercise is already being used to influence design decisions in other rural schools. It is our hope that Department of Education will begin to incorporate passive design strategies in their school building guidelines.

8. Acknowledgements

The South African National Energy Research Institute (SANERI) and the international donor for funding the monitoring equipment. The staff at 7 Fountains Primary School provided invaluable help in installing the loggers and downloading the individual data sets. East Coast Architects for leading the design team and creating opportunities and a positive design environment to include these strategies. Builder and design team for being open to new ideas.

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APPENDIX FOUR – PLAYGROUND FOR THE DISABLED

The following appendix is a set of photographs taken of the playground equipment which is found at a playground for disabled children in Mitchell Park, Durban. Unfortunately, it was observed that the playground is locked up and rarely used. However, the equipment provided for play at the playground has been specially designed for disabled children and is to be documented here in order to be implemented into the design process. All photographs were taken by author, unless otherwise specified.

PHOTOGRAPHS





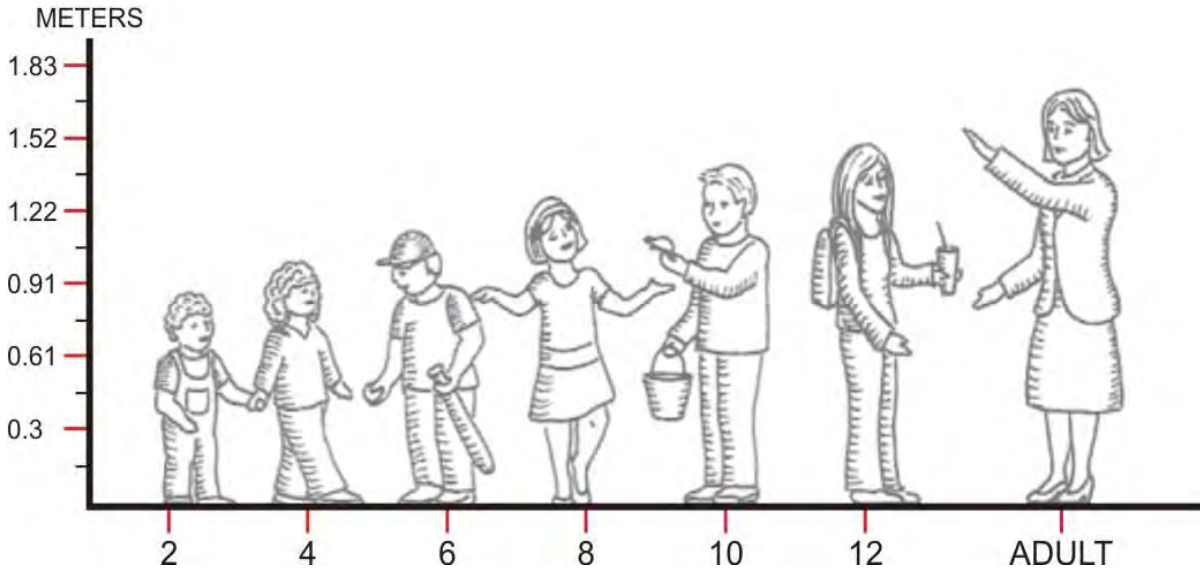
ROUNDABOUT SWINGS



ROCKER

APPENDIX FIVE – ANTHROPOMETRIC DATA – CHILDREN

This appendix outlines anthropometric data for children, detailing the average heights and sizes of children of different ages.



The average heights of children as shown in the image above were determined by:

“averaging the boys stature for age and girls stature for age in the 50th percentile of the (sic) paediatric growth charts developed by the National Centre for Health Statistics in collaboration with the National Centre for Chronic Disease Prevention and Health Promotion” (Tai, Haque, McLellan and Knight, 2006: 26).

AGES	WORKTOP	TABLE	SEAT
15	915mm	550mm	370mm
12	795mm	590mm	340mm
9	695mm	525mm	300mm
7	635mm	480mm	275mm
5	570mm	445mm	250mm
AGES	SEAT TO BACKREST	MIN BACKREST	ARMREST SPACING
15	150mm	175mm	445mm
12	145mm	160mm	420mm
9	135mm	140mm	355mm
7	130mm	130mm	330mm
5	120mm	125mm	305mm

AGES	HIGH REACH	LOW REACH	REACH DISTANCE	REACH RADIUS	EYE LEVEL
15	2085mm	815mm	735mm	660mm	1215mm
	1915mm	730mm	685mm	610mm	1160mm
	1765mm	665mm	635mm	570mm	1100mm
12	1880mm	705mm	665mm	600mm	1100mm
	1705mm	630mm	620mm	555mm	1040mm
	1545mm	560mm	565mm	510mm	990mm
9	1645mm	605mm	600mm	535mm	975mm
	1510mm	555mm	550mm	495mm	925mm
	1345mm	510mm	485mm	435mm	880mm
7	1505mm	545mm	550mm	500mm	890mm
	1370mm	510mm	495mm	445mm	850mm
	1245mm	485mm	445mm	395mm	815mm
5	1330mm	500mm	480mm	430mm	815mm
	1210mm	465mm	435mm	385mm	770mm
	1085mm	425mm	390mm	345mm	720mm

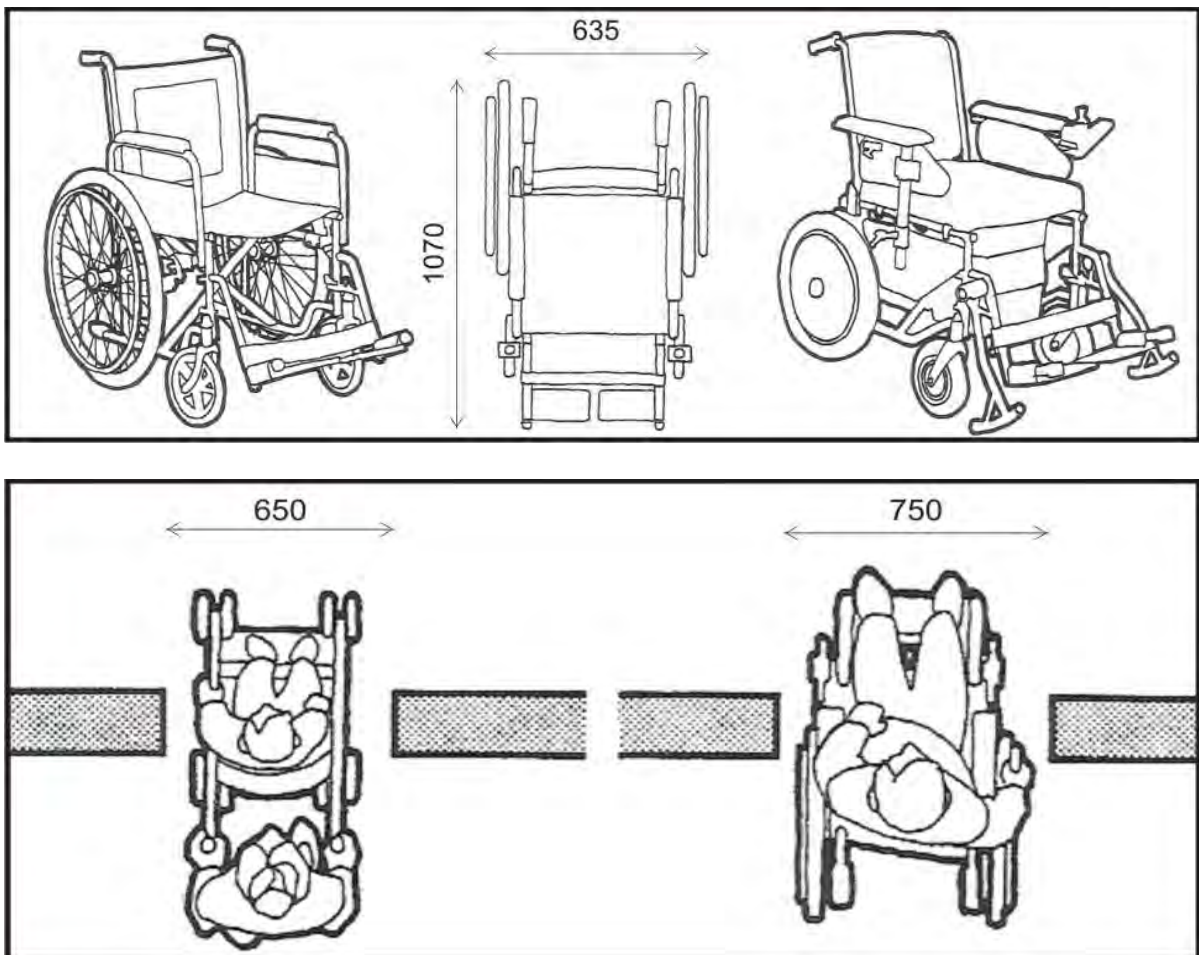
The two tables above indicate the different sizes of children of different ages. The sizes include reach distances, eye level heights and seating dimensions. All of the above data was obtained from Neufert, 1980: 131.

APPENDIX SIX – ANTHROPOMETRIC DATA – DISABLED

Anthropometric data for disabled access is an important part of the design research and is to be set out in this appendix. The following information has been extracted from Goldsmith (1997). Selwyn Goldsmith outlines various architectural parameters to consider in different types of buildings, when designing for the disabled. Only certain types will be discussed as these were found to be most relevant to the project.

MOBILITY EQUIPMENT:

The image below displays the appearance of a standard adult wheelchair and its size. This was obtained from Goldsmith, 1997: 332 and 333.



For adequate space on through – routes, a clear space 650mm wide accommodates ambulant people. 750mm accommodates wheelchair users.

	CLEAR OPENING WIDTH OF DOOR	CLEAR APPROACH SPACE IN FRONT OF DOOR	CLEAR APPROACH SPACE TO EITHER SIDE OF DOOR
STANDARD WHEELCHAIR – SELF PROPELLED	770mm 820mm	1300mm 1200mm 1800mm	650mm 700mm 150mm
STANDARD WHEELCHAIR – PUSHED/PULLED	770mm 820mm	1500mm 1800mm	800mm 150mm
LARGE WHEELCHAIR – PUSHED/PULLED	820mm	1500mm 1800mm	900mm 300mm

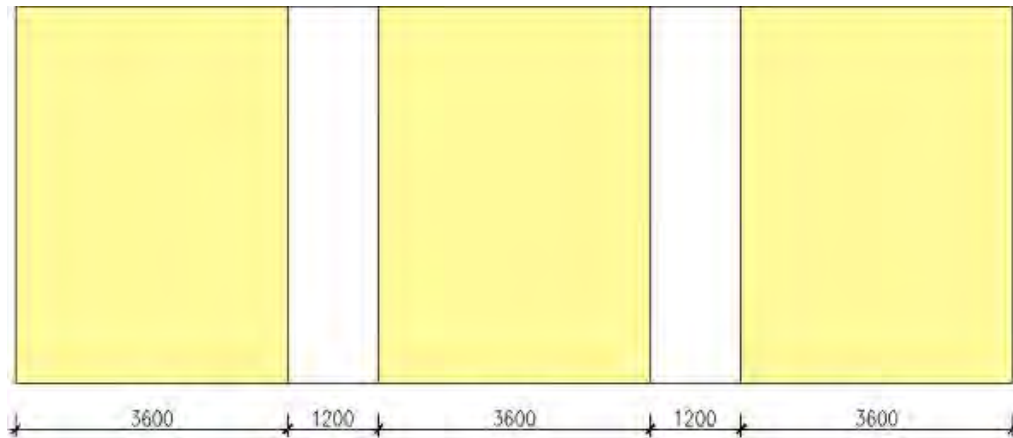
This table was obtained from: Goldsmith, 1997: 335.

DESIGNING FOR A COMMUNITY CENTRE (Goldsmith, 1997: 307):

Approaches to entrances	All pedestrian routes between public road, parking areas and building entrances to be level or ramped. Maximum ramp gradient to be 1:15.
Entrances	Main entrance: double door, each leaf having minimum 700mm. Side entrance: single door, minimum 820mm
Circulation features	All areas to have level access from main entrance. Doors to all zones to be minimum 800mm.

PARKING PROVISION:

For a large amount of disabled people in wheelchairs anticipated to be using the building, parking bays would be designed with an aisle to the side of each bay; 1.2, wide for wheelchair approach.



APPROACHES TO BUILDINGS:

Some wheelchair users can propel themselves independently only on level ground, not where there is an incline. For new buildings, there has to be a ramp which is not steeper than 1:15.

The reasons for setting this gradient are:

- For downward travel, 1:15 is not so steep as to be uncomfortable for a capable, unassisted wheelchair user or an ambulant disabled person to negotiate, whereas a steeper ramp may be.
- For upward travel, 1:15 is not so steep as to be uncomfortable for a capable, unassisted wheelchair user, a person pushing someone in a wheelchair, an ambulant disabled person or a person pushing a child/children in a pushchair to manage.
- A 1:15 gradient is not so steep as to warrant a handrail as an aid for an ambulant disabled person – a steeper ramp should have a handrail.
- Thresholds at all entrance doors to be flush.

OTHER:

- Corridor minimum width where there are two people in wheelchairs passing with handrails on either side – 2400mm.
- Corridor minimum width where there are lockers – 2700mm.
- Corridor where a toilet door opens out – 1800mm.
- Handrails should be at two heights – one for smaller children and one for larger.
- Balustrades at 1200mm.
- Double – doors on internal circulation routes to have hold – open catches.

Accessibility data for disabled people/children has been extensively researched and documented and what has been presented in this appendix is a brief understanding of some of the constraints which will be considered.

PART TWO
DESIGN REPORT

CHAPTER 1 INTRODUCTION

1.1 INTRODUCTION

The literature review and case studies as set out in the preceding chapters laid the foundation and background information to understanding the pertinent questions which were posed in the hypothesis. It was discovered that built environments for children are psychological stimulants in all faculties of their growth and development processes, even more so if they are physically disabled. There is currently a large amount of disabled children in South Africa who do not have adequate access to educational, therapeutic and recreational facilities. Parents who have disabled children face numerous challenges every day as many of these children are discriminated against by their societies. Addressing the needs of disabled children from a young age is particularly important and early childhood development should be a phase within which a sound foundation is laid. To allow for a child's special needs to be addressed from a young age, early identification is of paramount importance and if children do not receive the necessary therapy, medical intervention and specialised support, their progress is hampered and they do not receive the training or tools required for them to integrate successfully into society.

The design of a proposed *Educational Facility for Physically Disabled Children* sets out to provide an environment where a disabled child's educational, social, psychological, therapeutic and recreational needs can be met, within a context (Durban) which is lacking such resources. This will be achieved by providing a facility which is stimulating, flexible, comfortable and informal, yet provides various opportunities for disabled children to further enhance their development. The special architectural considerations for the disabled will be a large facet of the design component and therefore, this chapter's purpose is to explore the description behind the project and how the framework set out in the literature review will be assimilated into the design. A subsequent potential client, brief and schedule of accommodation will be drawn up. The main objective of this chapter is to ascertain guidelines from which the design of an educational facility can be appropriately generated.

1.2 PROJECT DESCRIPTION

The proposed design project of an Educational Facility is aimed at providing facilities for the development of physically disabled children. It is surmised that there is an incredible need for services aimed at the rehabilitation of disabled children in South Africa and particularly Durban. There are three main issues which have risen as being crucial, from the research document. Firstly, attention has not been paid to the active stimulation and development of children in the design of schools and learning environments. Secondly, the amount of disabled children outweighs the current provision of special educational facilities and lastly, this is further compounded by the scattering of resources such as medical and therapeutic facilities. This issue is further alleviated by the large distances parents have to travel in order for their disabled child to receive adequate education and medical attention.

These facts were ascertained from various interviews conducted at numerous existing schools for the disabled in KwaZulu Natal. One of the main facts noted was that all of these schools get hundreds of applications every year but have to turn many down as there is not enough space to accommodate these children. Interviews with the KwaZulu Natal Society for the Blind staff members showed that there is a vast number of blind and partially sighted children who do not go to school and currently do not have access to one. Many of these young children can be included in normal schools but this can only be achieved if they obtain sufficient training in their younger years in order to cope at a normal school. Therefore it is imperative to understand the current statistics and figures of the disabled population in South Africa and KwaZulu Natal. This would further strengthen the argument and need for an educational facility which addresses the needs of the disabled population.

In 1986, twenty five years ago, it was recorded that 12.8 % of the South African Population was classified as disabled (Clark, 1988: 7). Conversion of these percentages showed the following statistics:

TOTAL POPULATION:	27 425 620
NUMBER OF DISABLED PERSONS	3 516 877

A population census conducted in 2001, the most recent, showed the following statistics regarding the total population and disability figures, including those in KwaZulu Natal:

AGE IN YEARS	TOTAL SOUTH AFRICAN POPULATION	DISABLED PERSONS
0 – 9	9 303 370	190 659
10 – 19	10 043 638	305 736
LEVEL OF EDUCATION	TOTAL SOUTH AFRICAN POPULATION	DISABLED PERSONS
NOT APPLICABLE	4 449 816	71 321
NO SCHOOLING	6 389 654	672 288
SOME PRIMARY	12 084 349	628 690
COMPLETE PRIMARY	2 809 832	151 457

Table 1.1: The statistics of the total South African population in terms of children and disabled children, as recorded in the 2001 census (statssa, 2001 census: 41).

AGE IN YEARS	TOTAL KWAZULU NATAL POPULATION	DISABLED PERSONS IN KZN
0 – 9	2 129 661	49 068
10 – 19	2 267 817	71 735
LEVEL OF EDUCATION	TOTAL KWAZULU NATAL POPULATION	DISABLED PERSONS IN KZN
NOT APPLICABLE	1 012 650	18 983
NO SCHOOLING	1 539 275	154 742
SOME PRIMARY	2 625 777	131 804
COMPLETE PRIMARY	555 072	27 552

Table 1.2: The statistics of the total KwaZulu Natal population in terms of children and disabled children as well as schooling, as recorded in the 2001 census (statssa, 2001 census: 45).

These statistics show that out of the total population of 44 819 778, counted in 2001, 19 347 008 of that population were composed of new born babies to nineteen year olds. This means that 43 % of the total population consisted of children (people between the ages of 0 – 18 are considered to be children), which is less than half of the entire population. From 1986 to 2001 (fifteen years), the population rose by 17 394 158 people. The number of disabled people in 1986 was recorded at being 3 516 877, which was twelve % of the total population, however by 2001, the total number of disabled children was recorded as being 496 395. Therefore 2 % of the total child population was recorded as being disabled in 2001. So it is safe to assume that if the total population increased in fifteen years, then the child population grew as well. Furthermore, in 2001, a total of 4 397 478 children (0 – 18 years of age) were recorded in KwaZulu Natal, which is 22 % of the total South African population recorded for that particular age range. Out of those numbers, 120 803 children in KwaZulu Natal were recorded as having some form of disability, which is 3 %. 154 742 disabled children had no schooling in KwaZulu Natal, in 2001 which means that out of a total of 120 803 disabled children, only 33 939 had some form of schooling which is only a quarter of that population. Therefore it can be deduced that the majority of disabled children in KwaZulu Natal do not have access to adequate schooling facilities.

In 2007, it was estimated that the total South African population stood at 47 706 907 individuals. Between 2001 and 2007, there was an average growth of 481 188 people per year. If we add those figures, there are currently 49 631 659 people in South Africa (Provide Project, 2009: 6). Since the next census is being carried out at the end of 2011, it is difficult to estimate the current number of disabled persons in South Africa and KwaZulu Natal; therefore, the current estimates will be calculated using the statistics from 2001.

STATISTICS	2001	2011
SA POPULATION	44 819 778	49 631 659
SA CHILD POPULATION	19 347 008	24 815 830
KZN CHILD POPULATION	4 397 478	5 459 482
KZN DISABLED CHILD POPULATION	120 803	163 784

Therefore, it can be estimated that there are currently 163 784 disabled children in KwaZulu Natal and since Durban is the largest city in KwaZulu Natal, it is assumed that the largest number of disabled children reside within and around the city. In terms of specific disability statistics, the following were deduced, within KwaZulu Natal (www.kznhealth.gov.za):

- Physical Disabilities 26.3 %
- Blindness 23.6 %
- Deafness 14.2 %
- Emotional 11.9 %
- Multiple 10.5 %
- Intellectual 9.71 %
- Communication 3.81 %

Therefore, general physical disabilities and blindness were the most prevalent disabilities recorded in KwaZulu Natal in 2001 and these will be the disabilities targeted in the design of the educational facility. The main users of the building/s would therefore include: disabled children (from new born babies to the age of 10/12), their caretakers/educators, various therapists and medical practitioners as well as administrative and support staff to ensure the smooth running of the entire facility. Taking into account the users of the building, it will thus provide the following amenities:

- An educational component also comprising a cultural, arts and crafts component.
- A comprehensive medical and therapeutic facility providing for the holistic assessment, treatment and healing of disabled children.
- A public component facilitating the promotion of disabled rights, highlighting their plight as well as educating the public about the disabled.
- A community and social component, ensuring the integration of the children into society as well as creating a strong cultural identity for the complex.
- And lastly, the provision of stimulating outdoor spaces.

All of the abovementioned aspects and the brief were derived from precedent and case studies, interviews with various professionals and the literature research. These aspects will be further explained and enhanced in the description of the brief and accompanying schedule of accommodation. The notional client/organisation will be discussed henceforth.

1.3 THE NOTIONAL CLIENT

The clients for the proposed child development complex is the KwaZulu Natal Department of Education (KZNDEC) and The Disabled Children's Action Group (DICAG), which is a cross – disability national organisation whose purpose is addressing the needs of disabled children in South Africa. It has a close affiliation and collaboration with Disabled People South Africa (DPSA).

1.3.1 The Client's Organisation

DICAG was established in 1993 by parents of disabled children who realised that there wasn't a concerted effort being made by Government to meet the demanding needs of disabled children in South Africa. They have a specific focus on children who are in difficult situations, as a result of racial oppression, environmental location and/or severity of disability. The organisation has over 3900 members with branches all over South Africa, with the head office located in Cape Town. DICAG's vision, mission and goals are as follows:

- Their vision is to advocate for the rights of children with disabilities to ensure their full integration into society with equal opportunities for all.
- Their mission is to be a non – racial, national organisation which promotes and protects the rights of children with all forms of disabilities.
- Their goals are to safeguard the survival, protection and holistic development of disabled children, promote the full integration and independence of disabled children, raise the awareness on rights of these children and participate in networking with similar organisations on disability issues.
- DICAG is represented on the UN Advisory Panel in Geneva which addresses global issues on children.

- They are the chairing organisation of the Advocacy Network in Africa.
- DICAG are also affiliated to the National Children’s Rights Committee, which is an umbrella organisation of CGO’s and NGO’s who work with children in South Africa.
- They are also members of – Disabled People International, South African Disability Alliance (SADA), Enabling Education Network Children’s Institute and the African Network for Developmental Disabilities (ANDD).

The release of the White Paper on an Integrated National Disability Strategy and Equality Legislation increased international networking and the advocacy efforts by DICAG to highlight the plight of disabled children in South Africa (www.dicag.co.za).

1.3.2 Funding and Revenue Generators

The proposed funding and revenue generators for the design project will therefore be facilitated by various outlets – firstly from KZNDEC as well as from DPSA. Other proposals for funding generators are:

- Funding from the government, ensuring that the facility remains open to all and fees payable for students will ensure the running of the school.
- The Centre for Early Childhood Development (CECD) who work to assist and train communities on childhood development. They also initiate the building of ECD centres in various communities.
- The FirstRand Foundation – particularly the FNB Fund which supports Community Care Programmes and Early Childhood Development Programmes.

Fundraising and donations will also be relied upon, as well as fees which will be payable towards the educational component of the complex. An exhibition/showroom/crafts store, rental of the hall and community use of the sports fields after hours will also contribute to the on – going financial needs of the complex.

1.3.3 The Client’s Requirements

The clients are proposed to have the following requirements:

- Firstly, the psychological effects of the scheme in its totality and individual parts must be designed to have a positive impact on the users.
- All facets of the scheme should have the core concept of child development in mind as well as focusing on preventing architectural barriers for the disabled.
- The scale of children, especially those who are disabled must be taken into consideration for the scheme.
- The entire scheme must be designed to accommodate the needs of all types of disabled children, providing a stimulating, enjoyable, holistic, caring and positive environment which targets ALL aspects of childhood development.
- The project must be placed within an area which addresses a population of disabled children who are currently lacking such services.
- The site and context must inform the legibility and identity of the building.
- The scheme must also benefit the surrounding community and be designed to be usable after hours.

1.3.4 Detailed Client Brief

In terms of a detailed brief and the intended architectural aim of the project; An Educational Facility for Physically Disabled Children, issues surrounding childhood development and disability form the pivotal role of shaping the entire scheme. Appropriate facilities need to be provided for the running of the administrative centre. This includes the following facilities: administration, offices for regional staff members, seminar and meeting rooms, luncheon areas as well as fund – raising and donation offices.

Since the funding for the complex is proposed to be generated by government and private organisations, it is also important that the scheme combines income generating activities such as lecture, seminar and meeting rooms which can be rented out to the public. The core activities of the complex is the provision of therapeutic, medical, educational, social and recreational facilities for the development and growth of disabled children, facilitating a greater awareness of their plight. Providing a therapeutic and medical component addresses the issue that there is a lack of combined resources in one place, for the disabled, to ensure a

holistic treatment and therefore, this aspect of the scheme incorporates healing design principles. The educational component will provide opportunities for disabled children who cannot get access to a school for various reasons. As it stands, there are a large number of children in the context of Durban who are turned away from the existing special needs schools due to a lack of space and resources (Mr Smythe, Unpublished Interview, February 2011, Mr Naidoo, Unpublished Interview, February 2011 and Linda, Unpublished Interview, February 2011). Also ascertained from the interviews, was that a number of between 100 – 200 children should be accommodated at the school as this is the number that most of the existing schools currently accommodate and can cope with. Social and recreational facilities that are to be included will incorporate a school hall, outdoor theatre, gardens, playgrounds and a children’s library. Sporting facilities for the disabled are also to be provided, enhancing avenues for disabled children to be agents in their own development. All aspects of the scheme, therefore aim to address the lack of appropriate child facilities and those for the disabled. Sensory design principles, colour, light, natural ventilation, sustainability, legibility, wayfinding and safety are elements which need to be employed in creating a child – friendly environment which can have a positive psychological impact on the users. The complex should also be designed so that it is adaptable and flexible for future additions and/or changes.

The facility also needs to address the current, global issues which surround children, especially those who are disabled, such as stigmatisation, social exclusion, lack of healthcare facilities, nature – deficit disorder and many more.

1.3.5 Schedule of Accommodation

The schedule of accommodation was determined by a variety of factors, namely; the analysis of relevant precedent and case studies, through the conducting of interviews and referring to various books as well as building bulletins (refer to Appendix One). This schedule listed on the following pages sets out in detail the spaces that are to be provided, the type of activity or function of the space, the size of the spaces and the general requirements of each space. The activities of the complex can be divided into five main areas:

- Administration

- Therapy and assessment Centre
- Educational and social facilities
- Sport and recreation
- Residential accommodation

All of these areas are to be related to one another and in order to make the design process easier, the schedule of accommodation will be laid out in the following ways; a description of the various spaces/rooms within each of these five areas will first be explained, detailing any specific considerations that is required. A table will thereafter be set out giving the quantity of spaces/rooms and the area required.

ACCOMMODATION DESCRIPTIONS:

1. APPROACH and ENTRANCE

The approach and entrance to the complex is one of the most important aspects and can have positive psychological implications if well designed to be easily identified. This aspect can convey the first impression of the building and needs to be extremely legible, especially for the multiply disabled. The main parking lot should be located adjacent to the entrance and the bays need to be carefully designed to comply with requirements for people in wheelchairs. Within the immediate entrance space, there should be sufficient circulation and waiting space for people gathering and children in wheelchairs.

2. RECEPTION and ORIENTATION AREAS

One of the most essential aspects of the entrance area is that it should be easily found by blind and partially sighted people and for this purpose, sensory and wayfinding principles become important. The reception space must be attractive, child – friendly and welcoming, incorporating elements which draw children’s attention as this is where their first impression is created, something which can have a lasting psychological impression. The reception area also serves as a point of reference for people to navigate to their desired destination within the complex. From here, routes, paths, landmarks and destinations need to be clearly visible and for the blind/partially

sighted; tactile and audible clues, as well as colour contrasts can be particularly helpful.

3. EXHIBITION

An exhibition space for the facility is going to be provided for various reasons. Firstly, the showcasing of the children's arts and crafts will give them a sense of pride and enhance their self – esteem as well as allowing the public to become aware of the issues which are faced by the disabled population within South Africa. Any crafts made by the children can be sold to the public to generate revenue for the building but these need to be properly displayed. Located near the entrance and reception areas is ideal for exposure.

4. ADMINISTRATION OFFICES

Offices need to be provided for all of the standard spaces that are required by administration of the entire facility. The functions include processing of information, records, accounting and financial control. Therefore, this area will include aspects such as meeting rooms, staff rooms and seminar rooms as well as outdoor spaces. It is also proposed that the seminar and meeting rooms be designed in such a way that they can be rented out to the public when not in use by the centre. For these spaces, natural light and ventilation is important. All areas are to be accessible to wheelchairs.

5. ORIENTATION and GUIDE DOG CENTRE

This aspect of the accommodation is crucial, specifically to the blind and partially sighted children. Due to the fact that they cannot see where they are going and cannot read letters or signs, the orientation and mobility centre will be designed to introduce the children to understand how to navigate their way through any surrounding. Mobility instructors will train the children on how to find their way around the complex as well as aiding them to understand how to find their way around any environment that they are placed in. Outdoor areas with different textures, sensory atmospheres and colours will aid in this training, as well. A guide dog training facility will also be provided for training in the use of guide dogs. The

dogs will also be located close to the residential facility for the companionship and play of the children. This guide dog training facility can also be used by the public after hours.

6. THERAPY and ASSESSMENT CENTRE

The therapy and assessment centre is intended to provide therapy facilities for disabled children in one place, so that they are assessed and treated in a holistic manner. Ensuring disabled children's health and therapeutic needs is of paramount importance and for many of these children, there is a need for specialist facilities to help stimulate and develop positive social, physical and emotional growth. Consultations with relevant medical and therapeutic professionals will as part of a multi – disciplinary team, form the basis for the spatial requirements. The general medical rooms to be provided are:

- Medical care/inspection room
- First aid room and sick bays
- Consultants offices

Sensory, interactive play areas and hydrotherapy facilities are also to be provided as these will form part of the overall therapy process. Many consultants are involved in the therapy and assessment of disabled children, to assess their individual situation and organise relevant therapists to aid them. Doctors, child psychologists and physiotherapists are involved in the initial assessment stages and also form part of the therapeutic process. Occupational therapists, speech and language therapists, an educational psychologist and movement therapists are to be accommodated for. In order to fully understand the spatial requirement for each of these therapists, their job and role in the therapeutic process will be briefly outline.

7. PHYSIOTHERAPY

The role of physiotherapists is to encourage and develop motor skills. They assess the children and devise therapeutic programmes to maintain and develop the

children's motor skills. These treatment plans are constantly reviewed and evaluated, according to the individual's changing needs. Treatment normally includes good positioning of the body and exercise. Full height mirrors, parallel bars, climbing lattice, resonance boards, floor mats, mobiles and other stimuli are normally used and therapy rooms need to be large enough to accommodate these. Physiotherapists also use (if available) an adjustable – height, electrically operated therapy couch with a ceiling – mounted hoist to transfer a child from a wheelchair to the couch.

8. OCCUPATIONAL THERAPY

Occupational therapy involves the use of purposeful physical activity and play which is aimed at helping children to attain functional performance as well as developing self – confidence, self – esteem and independence. The occupational therapists role is to assess abilities such as motor, sensory, perceptual, social and emotional, in many areas. They achieve this by incorporating aspects such as woodworking, pottery, handcrafts, sewing, cooking and painting into their therapy sessions, providing important vocational training for disabled children.

9. SPEECH and LANGUAGE THERAPY

Occupational therapy and speech and language therapy are the most essential provisions in facilities for the disabled. The aim of the speech and language therapist is to enable children with speech, language and communication difficulties to overcome these complications, reaching their maximum communication capacities. Similarly to the other therapists, speech and language therapists also make assessments, plan and prepare programmes. Facilities used include an induction loop and hearing aids and a soft play/sensory room should be incorporated. Sufficient electrical points should be provided, for CD players, televisions, computers, portable ICT touch screens or wall mounted whiteboards. The rooms that speech therapists use should be designed with acoustic principles.

10. MOVEMENT THERAPY

Movement/dance therapy is a fairly new and fast growing therapy which is rooted in the creative arts. These therapists work with individuals and help them to improve

self – esteem and develop coping strategies for various problems. Movement therapy is thus used as a psychotherapeutic tool and generally, dance movement therapists have introductory warm – up times and this is followed by a period of faster movement based on the programmes and themes set by the therapists. Lastly, there is a cool – down stage which prepares the individual to relax and prepare for re – entry into their normal day routines. Symbolism, imagery and fantasy are some of the themes explored, especially for children. Movement therapists also work closely with occupational therapists and sensory integration forms a large part of the therapy process. Sensory integration is aimed at the proximal senses, including tactile, vestibular and proprioceptive.

11. SOFT PLAY and SENSORY ROOMS

These rooms are normally provided for the younger children with sensory and physical difficulties. Robust and lively play is encouraged in the soft play rooms and the walls and floor should be lined with soft – padded cushions or mattresses. The playing area may also contain the following: foam shapes or toys, punch bags, ball – pool area and an overhead hoist.

Sensory/interactive rooms are normally designed to be soothing, relaxing spaces through the use of gentle, recuperative stimulations. These rooms are usually entirely white and incorporate a broad range of equipment to create differing light, sound and colour stimulations. Mirror balls, mirrors, beanbags, wedges and rolls are some of the furniture/equipment used.

Dark rooms, on the other hand are designed so that daylight can be excluded. This type of room is particularly useful for children with very poor vision, who are encouraged to use whatever residual vision they have to develop skills in light awareness. The requirements are similar to white rooms, except that dark colours, black walls and heavy curtaining are incorporated, to create the effect of a dark room. Equipment such as a television and computer may be used and must be considered during the design process.

12. HYDROTHERAPY

Hydrotherapy is principally for medical treatment and exercise for those with physical disabilities, because such movement can be achieved with less physical effort. A physiotherapist or trained adult can aid in the treatment of this water therapy and warm water is normally used as it is more beneficial and therapeutic. Sensory equipment, lighting and sound can also be used with underwater lighting features.

13. SENSORY and HEALING GARDENS

Sensory and healing gardens are also to be integrated into the design as part of the therapy facilities. These gardens will incorporate elements such as plant/smellscapes, textured walls, water play areas, fountains and gardening as part of the therapeutic process because nature is beneficial to health and well – being. Different types of gardens such as themed gardens and music gardens are aspects which will be considered during the design process.

14. EDUCATIONAL and SOCIAL FACILITIES

The educational component of the complex will be designed to include a day care centre/nursery for babies and young children, whose parents are working and have nowhere to leave their disabled children during the day. Classrooms and teaching spaces will also be provided for the older children in the primary and secondary phases, teaching general subjects as well as different types of skills. It is important to note that for disabled children, there are fewer individuals placed within classes due to the fact that they need more attention. Also, classes will need to be designed to suit the needs required by different disabilities.

15. DAYCARE/NURSERY CENTRE

During the early years, children are grouped together in larger class bases for full – time or part – time activities which include playing, painting and other activities. A nursery area for small babies is also required with appropriate changing facilities. Learning through play is extremely important at this age and spaces will target the sensory systems, including vestibular and proprioceptive. Environments need to be

large enough for a variety of equipment, toys and activities. Outdoor play areas are essential for this phase of learning.

16. LEARNING and SOCIAL SPACES – PRIMARY PHASE

Transition from the early years to the primary phase is one of considerable change and typical class bases should support 6 – 8 children with a broad range of needs. Flexible arrangements with loose furniture are effective to allow for a range of settings and activities. Special design considerations can include: a sensory corner, a quiet corner, computer workstations with screening, storage for equipment and mobility devices and interactive whiteboards. Tables should also be height adjustable. In the primary phase, children are taught subjects such as art, science, maths, english and music. Access to well – designed outdoor spaces enables children to work with nature through sensory planting and gardening.

17. LIBRARY

A well – designed and efficient library is essential for the functioning of any educational facility. The advancement of technology has brought about equipment such as computers, braille readers, touch screens, audio visual, video display, toys and reference objects. Shelving should be at an appropriate height for children and those in wheelchairs. Acoustic, fire and security issues need to be considered as well as lighting and ventilation. ICT equipment should also be considered, for use by disabled children. This includes interactive whiteboards, plasma screens, adaptive keyboards and switching equipment.

18. MULTI – PURPOSE COMMUNITY HALL

A multi – purpose space for assembly, PE (physical exercises) and performances will be included. This hall is envisioned to be used and rented out to the community after hours to ensure that revenue can be generated from it.

19. OUTDOOR SPACES

Experiencing outdoor spaces can be extremely beneficial to disabled children and these places will be designed to integrate various sensory elements which appeal to

all of the senses. Outdoor spaces should enrich teaching, learning and recreation simultaneously. Transition spaces between classes will prevent noise and visual distraction to other students. Playgrounds with specialised equipment and sensorially designed play structures will also be integrated to enhance a disabled child's experience. Adventure playgrounds are usually employed for the playing of disabled children as they are seen to be most effective.

Sporting facilities will also form a part of the provision for outdoor spaces as sport is also therapeutic and beneficial for the development of many skills, including motor and cognitive.

20. RESIDENTIAL FACILITIES

Providing residential accommodation for children who live far away is essential due to the lack of educational facilities. These facilities will be separated for girls and boys and will be kept to a minimum to ensure that there are not a large number of children to care for as this becomes problematic and expensive. Bedrooms, ablutions, dining and social facilities will be accommodated for as well as outdoor gardens.

21. PARKING

The provision of parking is to comply with the regulations concerning accessibility for the disabled and separate parking lots will be provided for both the therapy and assessment centre and the educational facility. In terms of the amount of parking bays provided, this will be determined by the expected staff and proposed visitor numbers.

The detailed schedule of accommodation will be set out in the following pages. This will be done as so: each of the five main parts discussed above has been allocated a title of each space/room, a minimum space requirement and their general requirements.

SCHEDULE OF ACCOMMODATION

	SPACE DESCRIPTION	NO. OF PEOPLE	QUANTITY	AREA (m ²)	GENERAL REQUIREMENTS
ADMINISTRATION	RECEPTION AREA	2	1	6m ²	General office equipment.
	WAITING AREA		1	65m ²	General seating.
	HALL MANAGER	1	1	15m ²	General office equipment.
	PRINCIPAL'S OFFICE	1	1	35m ²	General office equipment.
	VICE PRINCIPAL'S OFFICE	1	1	25m ²	General office equipment.
	MANAGER – THERAPY CENTRE	1	1	25m ²	General office equipment.
	FINANCIAL MANAGER	1	1	15m ²	General office equipment.
	CLEANER'S STORE	2	1	20m ²	For storage of cleaning equipment.
	PRIVATE OFFICE	1	1	20m ²	General office equipment.

	SPACE DESCRIPTION	NO. OF PEOPLE	QUANTITY	AREA (m ²)	GENERAL REQUIREMENTS
ADMINISTRATION	MEETING ROOM		1	70m ²	Flexible, divisible space with audio visual equipment and computers.
	STAFF ROOM		1	135m ²	Flexible and comfortable with notice boards and bookshelves.
	OUTDOOR SPACE			180m ²	Flexible seating, plants – attractive and quiet space – with surveillance.
	KITCHEN and STORAGE	3 at a time	1	20m ²	Usual kitchen requirements – sink, fridge, microwave, stove and bin area.
	MALE ABLUTIONS		1	40m ²	Ablution facilities to comply with all accessibility regulations.
	FEMALE ABLUTIONS		1	40m ²	Ablution facilities to comply with all accessibility regulations.
				TOTAL AREA FOR ADMINISTRATION: 711m²	

	SPACE DESCRIPTION	NO. OF PEOPLE	QUANTITY	AREA (m ²)	GENERAL REQUIREMENTS
GUIDE DOG TRAINING	MANAGER'S OFFICE	1	1	15m ²	General office requirements – tables, computers, chairs, filing cabinets.
	WAITING AREA	10	1	25m ²	Flexible spaces with audio visual equipment and computers.
	TRAINING OFFICE	10	1	25m ²	Flexible spaces with audio visual equipment and computers.
	CARETAKERS RESIDENCE	2 per room	3	25m ² each 75m ² total	For the teaching of braille. Tables, chairs and shelves. Reduced lighting.
	DOG KENNELS		1	10m ²	For the storage of braille equipment. To have shelves.
	SIMULATED TRAINING GROUNDS	2 per room	3	25m ² each 75m ² total	For the teaching of mobility and orientation techniques.

	SPACE DESCRIPTION	NO. OF PEOPLE	QUANTITY	AREA (m ²)	GENERAL REQUIREMENTS
THERAPY and ASSESSMENT CENTRE	THERAPY and ASSESSMENT COMPONENT				
	RECEPTION	1	1	6m ²	Reception desk, computer and filing cabinets as well as a photocopier.
	SICK ROOM	2 patients at a time	1	20m ²	Beds, wash hand basin, curtains to separate patients.
	PSYCHOLOGY AND ASSESSMENT ROOM	4	1	45m ²	Desk, chair, filing cabinets, shelves and a bed.
	COMMUNAL PHYSIOTHERAPY	2 Physiotherapists	1	45m ²	Floor mats, inflatables and other large equipment + desk, chair, computer, shelving and filing.
	OCCUPATIONAL THERAPISTS (OT) COMMUNAL OFFICES	3 Therapists	1	60m ²	General office requirements – tables, computers, chairs, filing cabinets.
	OT – LIFE SKILLS		1	70m ²	Small kitchen, bathroom and lounge areas. For the teaching of basic life skills.
	SPEECH AND LANGUAGE THERAPISTS OFFICES	1	1	45m ²	Office equipment, storage, acoustically insulated, mirror, wash hand basin and hearing aid facilities (induction loop).
	THERAPY ROOM EXERCISE	Large groups + individual.	1	95m ²	Exercise area for large groups but to also include partitioning for individual exercise sessions. Ablutions and storage.

	SPACE DESCRIPTION	NO. OF PEOPLE	QUANTITY	AREA (m ²)	GENERAL REQUIREMENTS	
THERAPY and ASSESSMENT CENTRE	SOFT PLAY ROOM	Large groups + individual.	1	95m²	Soft play toys + padded walls and floors. Ablutions and storage.	
	SENSORY WHITE ROOM	Large groups + individual.	1	40m²	Gentle, recuperative stimulations integrating light, sound and colour.	
	SENSORY DARK ROOM	Large groups + individual.	1	20m²	Daylight to be excluded. Dark colours, heavy curtaining, television or computer.	
	MOVEMENT AND DANCE THERAPY ROOM	Large groups + individual.	1	20m²	Large, airy room for dance and movement therapy purposes. Ablutions and storage.	
	HYDROTHERAPY POOL AREA					
	HYDROTHERAPY POOL			1	85m²	One pool with a surround of 2m ² wide. Ramp with handrails into pool.
	CHANGING AREAS			2 (M + F)	20m² each 40m² total	To have lockers as well as non – slip materials. Fully accessible.
	INDIVIDUAL CHANGE ROOMS	2		2 (M + F)	40m² each 80m² total	Changing area for individuals.
	POOL PLANT and CHEMICAL STORAGE			1	15m²	Plant room and storage of chemicals used in the pool.

	SPACE DESCRIPTION	NO. OF PEOPLE	QUANTITY	AREA (m ²)	GENERAL REQUIREMENTS
THERAPY and ASSESSMENT	WATER PLAY FUN ROOM		1	20m²	Water spray room with nozzles on walls. To have non – slip tiles and seating.
	FIRST AID ROOM		1	5m²	First aid equipment.
	OPEN PLAN WORKSHOP		1	140m²	Workshop for the repair of mobility equipment.
	OUTDOOR SENSORY AND THERAPY GARDEN		1	175m²	Therapy exercise and play equipment. Balance beams and stepping stones.
	MUSIC GARDEN		1	40m²	Specialised musical play equipment to be used in therapy.
	STORYTELLING TREE		1	50m²	Low walled enclosure with seating and grass for reading therapy.
	THERAPY PLAYGROUND		1	100m²	Playground with specialised disabled play equipment.
				TOTAL AREA FOR TAC: 1536m²	

	SPACE DESCRIPTION	NO. OF PEOPLE	QUANTITY	AREA (m ²)	GENERAL REQUIREMENTS
EDUCATIONAL	NURSERY	20 babies in total 10 caretakers	4 ZONES	190m²	Divided into various teaching and play spaces as well as sleep and changing areas.
	NURSERY PLAYROOM	20 babies	3 ZONES	80m²	Fun and colourful playroom.
	OUTDOOR PLAY SPACE		1	75m²	Private, outdoor, communal play space with sand play area.
	CLASSROOM – TWO YEAR OLDS	16 children total 4 caretakers	1	100m²	Flexibly arranged with loose furniture. A sensory corner and quiet corner.
	CLASSROOM – TWO YEAR OLDS	16 children total 4 caretakers	1	95m²	Flexibly arranged with loose furniture. A sensory corner and quiet corner.
	OUTDOOR PLAY SPACE		1	150m²	Private, outdoor, communal play space with block play area.
	SMELLSCAPE GARDEN	FOR BABIES – 2 YEAR OLDS	1	50m²	Sensory design principles addressing olfactory senses.
	LOOSE PARTS AND PAINTING GARDEN	FOR BABIES – 2 YEAR OLDS	1	190m²	Sensory design principles for loose parts play.
	GENERAL PLAYGROUND	FOR BABIES – 2 YEAR OLDS	1	450m²	Sensory design principles with various types of play equipment.
	CHILDREN'S ABLUTIONS	FOR BABIES – 5 YEAR OLDS	2 (M + F)	20m² each 40m² total	Accessibility important.

	SPACE DESCRIPTION	NO. OF PEOPLE	QUANTITY	AREA (m ²)	GENERAL REQUIREMENTS
EDUCATIONAL	CLASSROOM – THREE YEAR OLDS	16 children total 4 caretakers	1	70m²	Flexibly arranged with loose furniture. A sensory corner and quiet corner.
	OUTDOOR PLAY SPACE		1	35m²	Private, outdoor, communal play space.
	CLASSROOM – THREE YEAR OLDS	16 children total 4 caretakers	1	90m²	Flexibly arranged with loose furniture. A sensory corner and quiet corner.
	OUTDOOR PLAY SPACE		1	65m²	Private, outdoor, communal play space.
	CLASSROOM – FOUR YEAR OLDS	16 children total 4 caretakers	1	70m²	Flexibly arranged with loose furniture. A sensory corner and quiet corner.
	OUTDOOR PLAY SPACE		1	100m²	Private, outdoor, communal play space.
	CLASSROOM – FOUR YEAR OLDS	16 children total 4 caretakers	1	90m²	Flexibly arranged with loose furniture. A sensory corner and quiet corner.
	OUTDOOR PLAY SPACE		1	100m²	Private, outdoor, communal play space.
	CHILDREN'S ABLUTIONS	FOR 3 – 4 YEAR OLDS	2 (M + F)	20m² each 40m² total	Accessibility important.

	SPACE DESCRIPTION	NO. OF PEOPLE	QUANTITY	AREA (m ²)	GENERAL REQUIREMENTS
EDUCATIONAL	GENERAL PLAYGROUND	FOR 3 – 4 YEAR OLDS	1	340m²	Sensory design principles with various types of play equipment.
	CENTRAL PLAY POINT WITH WIND CHIME LANDMARK		1	100m²	Small central social play point with colourful learning walls and wind chime wall landmarks for guidance.
	CLASSROOM – FIVE YEAR OLDS	16 children total 4 caretakers	1	70m²	Flexibly arranged with loose furniture. A sensory corner and quiet corner.
	OUTDOOR PLAY SPACE		1	100m²	Private, outdoor, communal play space.
	CLASSROOM – FIVE YEAR OLDS	16 children total 4 caretakers	1	90m²	Flexibly arranged with loose furniture. A sensory corner and quiet corner.
	OUTDOOR PLAY SPACE		1	100m²	Private, outdoor, communal play space.
	CLASSROOM – SIX YEAR OLDS	16 children total 4 caretakers	1	70m²	Flexibly arranged with loose furniture. A sensory corner and quiet corner.
	OUTDOOR PLAY SPACE		1	100m²	Private, outdoor, communal play space.

	SPACE DESCRIPTION	NO. OF PEOPLE	QUANTITY	AREA (m ²)	GENERAL REQUIREMENTS
EDUCATIONAL	CLASSROOM – SIX YEAR OLDS	16 children total 4 caretakers	1	90m²	Flexibly arranged with loose furniture. A sensory corner and quiet corner.
	OUTDOOR PLAY SPACE		1	100m²	Private, outdoor, communal play space.
	CHILDREN’S ABLUTIONS	FOR 5 – 6 YEAR OLDS	2 (M + F)	20m² each 40m² total	Accessibility important.
	GENERAL PLAYGROUND	FOR 5 – 6 YEAR OLDS	1	90m²	Sensory design principles with various types of disabled play equipment.
	SENSORY PLAYGROUND	FOR 5 – 6 YEAR OLDS	1	50m²	Sensory design principles.
	LOOSE PARTS AND STORYTELLING TREE	FOR 5 – 6 YEAR OLDS	1	280m²	For loose parts play and storytelling under tree with grass and seating.
	TUCKSHOP	FOR ALL	1	20m²	For the selling of food to the children.
	TUCKSHOP KITCHEN	4	1	20m²	For the preparation of food for the children.
	LIBRARY	FOR ALL	1	220m²	Book shelves and seating with books braille readers.
	LIBRARY OFFICE	2	1	20m²	General office equipment.

	SPACE DESCRIPTION	NO. OF PEOPLE	QUANTITY	AREA (m ²)	GENERAL REQUIREMENTS
EDUCATIONAL	BRAILLE TEACHING ROOM		1	40m²	Low walled enclosure with tactile braille walls which are used for teaching.
	AUDIOVISUAL ROOM		1	50m²	Television room with mats and cushions.
	COMPUTER CORNER		1	50m²	Computer facilities.
	CHILDREN'S ABLUTIONS		2	10m² each 20m² total	Accessibility important.
	PRIVATE READING COURTYARD		1	180m²	Quiet, shady reading area with access to ablution facilities.
	READING COURTYARD ATTACHED TO PLAYGROUND		1	180m²	Reading area with storytelling tree.
	MULTI – PURPOSE HALL		1	600m²	Multi – purpose hall with a basketball court and backstage and storage areas.
	ABLUTIONS		2 (M + F)	30m² each 60m² total	Accessibility important.
				TOTAL AREA FOR EDUCATIONAL: 5160m²	

		SPACE DESCRIPTION	NO. OF PEOPLE	QUANTITY	AREA (m ²)	GENERAL REQUIREMENTS
RESIDENTIAL and PARKING		ENTRANCE		1	10m ²	Seating and waiting area.
		OFFICE		1	10m ²	Residential facility manager.
		TELEVISION ROOM		1	25m ²	Recreational room.
		DINING HALL		1	70m ²	Dining facilities.
		KITCHEN and LAUNDRY		1	40m ²	Kitchen and laundry facilities.
		GIRLS QUARTERS		1	100m ²	Sleeping and storage facilities. Individual rooms and ablutions.
		BOYS QUARTERS		1	100m ²	Sleeping and storage facilities. Individual rooms and ablutions.
		OUTDOOR PLAY AREA		1	200m ²	Trees, planting and seating areas with sensory design principles.
		PARKING BAYS		120 BAYS	3550m ²	Parking for staff and parents with an ambulance bay and disabled drop off bays.
					TOTAL AREA FOR RES + PARKING: 4105m²	
					TOTAL AREA: 11512m²	

1.4 CONCLUSION

In conclusion, the schedule of accommodation comes to 11512m² in total. This figure caters for approximately 180 students and over 60 staff members. This figure is in line with the size of many existing educational facilities of this nature and this calculation is thorough, meeting the needs of staff and students alike. The schedule of accommodation sets out guidance for the choosing of an appropriate site, along with other site determining factors, and this is the next phase of the document. Three appropriate sites have been chosen, and they are rated against each other to determine the best suited site for a project of this nature. Thereafter, a comprehensive site mapping and analysis is set out to best understand the site in order to proceed with the design of the project.

CHAPTER 2 SITE SELECTION, SURVEY AND ANALYSIS

2.1 INTRODUCTION

The selection of a site for the proposed EDUCATIONAL FACILITY has to respond to the intense needs of the potential users: children who are disabled and their caretakers. All of the selection criteria as set out below, for a suitable site, were established from conducting interviews with various organisations for the disabled, the preceding theoretical discourse as well as mapping out where there are existing schools and thus determining which areas are in need of such an educational facility. Due to the fact that most schools work best in a residential/community environment, rather than a hard – edged urban one, this was also taken greatly into consideration. The criteria set out below are used to examine how the site options respond to the specific requirements of the proposed project.

2.2 SITE OPTIONS AND DISCUSSION

2.2.1 Site Selection Criteria

1. Need

One of the main criterions for site selection is that the educational facility must serve an area which is in need of it and that site should also be easily accessible to surrounding areas which are also in need of it. This is important because it is senseless to cater to an area which already has such a school, when there are plenty of areas within Durban that do not have any facilities. Many areas do not even have adequate medical and therapeutic facilities, let alone educational facilities.

2. Location – residential context

The selected site needs to be in an area which is conducive to learning and as the case studies had shown, this means a residential/community context. A residential area provides an ideal surrounding character, due to the fact that it is quieter and safer, allowing for the passive surveillance of children. A residential context also allows for support from the surrounding communities, which is an important factor of any educational facility. Hard – edged urban environments are in no ways conducive to the learning environments, but peri – urban and residential contexts, close to urban amenities provide good opportunities.

3. Site slope

The proposed project is aimed at providing facilities for disabled and blind children, some of whom are in wheelchairs or who find it difficult to walk. Therefore, the site terrain needs to be naturally flat in order to negate the use of ramps and stairs in the building/s.

4. Close to hospital/clinic

Many of the precedents and case studies analysed showed that special educational needs facilities require close access to appropriate medical facilities such as a hospital or clinic, in case a situation arises whereby any of the children needs immediate medical supervision and care. Also, visiting medical specialists and therapists working at the educational facility will need to be located close by if they are not there all the time.

5. Privacy and noise

For any educational facility, privacy and noise are one of the major factors to consider, as excessive noise can be damaging to young children physically as well have serious educational implications. Choosing a site which is located in a quieter area and one which is private allows for the design of buildings which encourage learning, play and inviting atmospheres, all of which are important for children.

6. Accessibility (transport)

The site needs to be easily accessed from major transport routes so that it can serve the immediate context well, as well as surrounding areas which it would also serve. It also needs to have ample parking. Micro – accessibility (pedestrians) and macro – accessibility (vehicular) both need to be considered and if there is no provision for pedestrian access, then one needs to be created.

7. Accommodation size

The site needs to be large enough to accommodate all aspects of the schedule of accommodation, including sports and play grounds as well as future expansion. This means catering for over 100 students and 100 staff, providing ample parking space within the site and temporary parking outside within a drop – off zone.

8. Defensible site

The site needs to be naturally defensible, in the sense that aspects of the site should not be exposed to any potential criminals. A defensible site also allows for the children to feel safer and not exposed to the outside world. Aspects such as defined edges and houses are factors which naturally make a site defensible.

9. Frontages and edges

The existing context needs to be analysed for appropriateness in terms of allowing the scheme to identify important elements which can be integrated into the design to create a successful set of buildings which have their own identity yet belong to the place that they are situated in. This means taking cognisance of the existing site conditions (*genius loci*) as well as considering the cultural and social opportunities that are afforded by the site and its surroundings.

10. Greenfield versus brownfields site

If the site is a natural setting and hasn't been built on, this would also be preferred. Trees and plants on site can also be utilised for the benefit of the children. The site also should be near a park or nature reserve (sensory element).

2.2.2 Potential Sites

One of the main criteria for choosing a site is that it must be in an area which is in need of an education facility for the blind and disabled. The Education White Paper 6 (Department of Education, 2001: 13) documented the following facts in 2001, in KwaZulu Natal there were:

- 58 special need schools.
- 7 631 learners were enrolled in those schools.
- The expenditure per student amounted to R21 254.

It was estimated that there are currently 163 784 disabled children in KwaZulu Natal (Chapter 1.2) and if only 7 631 students are enrolled in special schools – this leaves a large percentage of disabled children not getting proper education and access to facilities.

AREA	CEREBRAL P	DEAFNESS	BLINDNESS	DOWN SYN	AUTISM	PHYSICAL	MENTAL	
empangeni						●		
phoenix	●	●	●			●	●	
maritzburg	●	●	●	●	●	●	●	
pinetown	●				●	●	●	
clare estate	●				●	●	●	
chatsworth							●	
gillitts		●						
toti		●						
inchanga		●	●			●		
harding	●	●	●			●		
kwamashu	●	●		●		●	●	
estcourt	●					●	●	
morningside							●	
madadeni						●	●	
midlands		●					●	
umlazi	●	●				●	●	
bluff							●	
isipingo	●							
glenwood	●	●	●			●	●	
umzinto			●	●			●	
durban north						●	●	
verulam	●			●			●	
vryheid		●	●			●	●	
merebank							●	
scottsville						●	●	
stanger						●	●	
tongaat							●	

Table 2.1: This table shows the distribution of special needs schools across KwaZulu Natal – there are over 70 schools recorded, with schools for the mentally disabled making up the largest portion (Source: Author).

In order to assess which areas would be appropriate for the choosing of a site, existing special needs schools were mapped across KwaZulu Natal in order to determine the areas which are in need of a school for disabled children. At the same time, disabilities catered for were also mapped out to ascertain what types of disabilities are not well catered for. In doing so, it was determined that the areas of Chatsworth, Umlazi, Bluff, Stanger and Tongaat are in need of such an educational facility (Table 1.3). The table also shows that mentally and physically disabled children and those who are deaf and have cerebral palsy are provided with a multitude of special schools. Blind, partially sighted and blind children who have other physical disabilities are limited to schools which are in the Durban CBD,

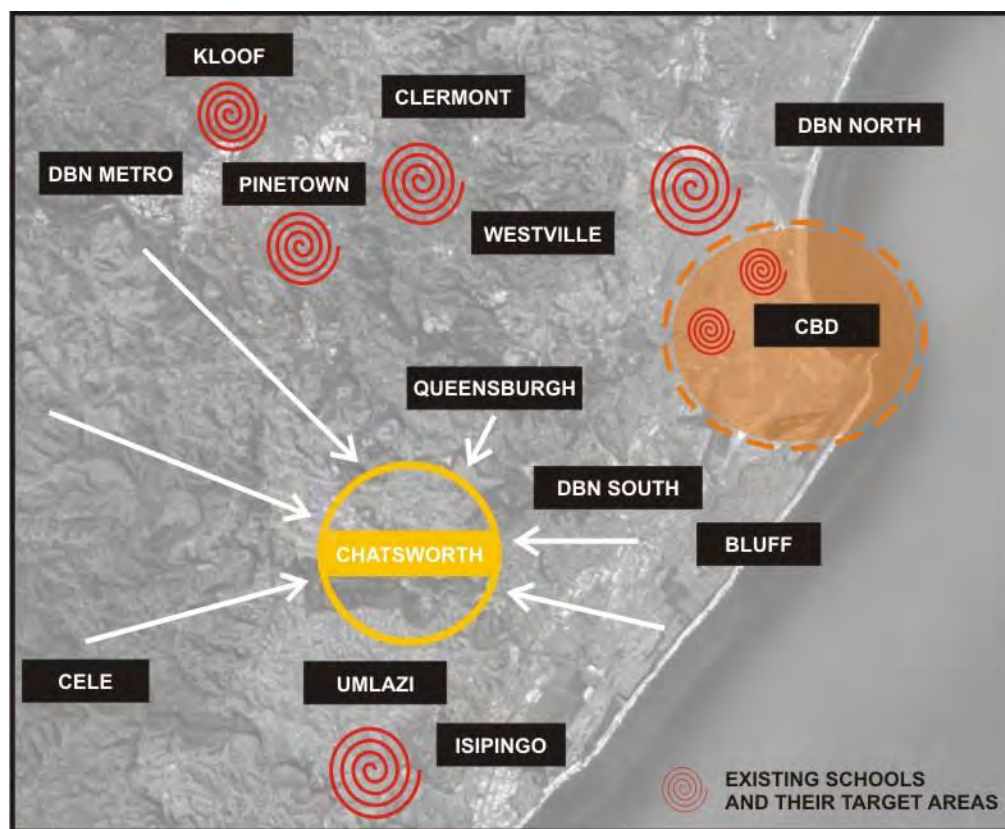


Figure 2.1: Map of the greater Durban area showing the reason for choosing Chatsworth and the surrounding areas as the main site options (www.googleearth.com).

Pietermaritzburg, Berea, Phoenix and Umzinto. The majority of the Durban areas are without the provision of a special needs educational facility and due to the large number of blind children in Durban and the surrounding areas, it is appropriate to provide a school for the visually impaired and physically disabled. The area of Chatsworth and the surrounding areas were seen as being the ones which were the most in need of such a school (Fig 2.1).

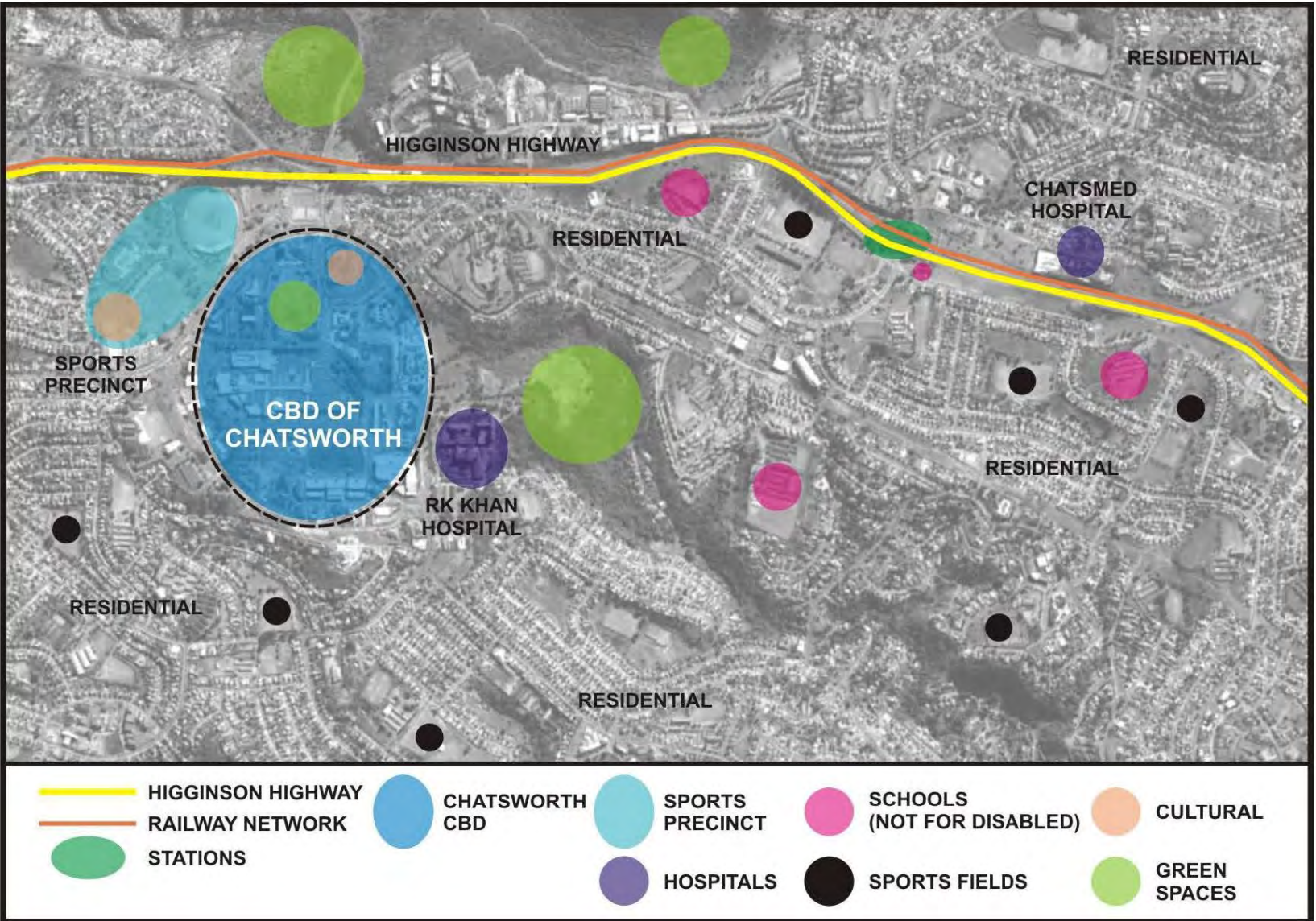


Figure 2.2: Map of Chatsworth detailing the urban analysis in terms of existing facilities (www.googleearth.com).

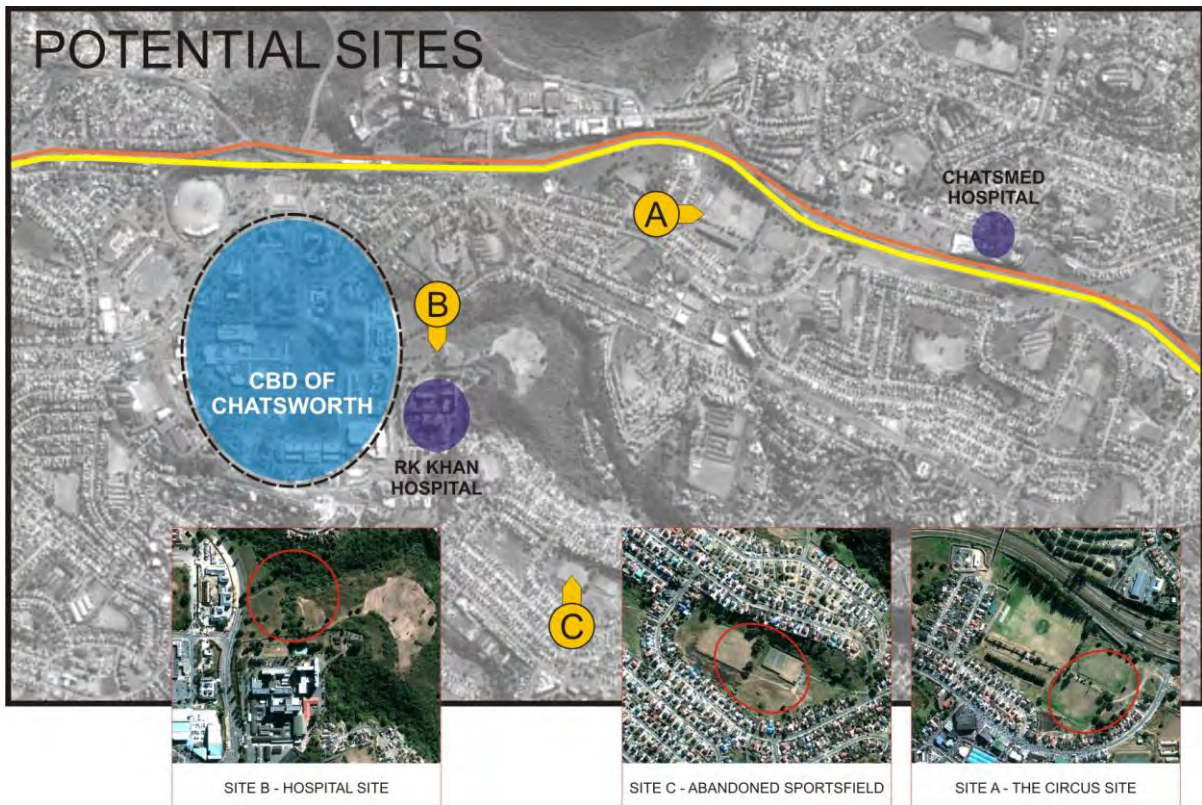


Figure 2.3: The three site options in Chatsworth (www.googleearth.com).

Three site options within Chatsworth (Fig 2.2 and 2.3) were chosen according to the various site selection criteria as set out above and these three will be analysed in detail, in order to find the most appropriate from the three chosen sites. To furthermore strengthen the argument of choosing Chatsworth as the main area within which the site is to be located, disability statistics for the area were gathered, to determine the need for such an educational facility. Within the areas surrounding the three site options, there are estimated to be over 4 774 disabled people (including children) (www.capmon.co.za). There are only two schools catering for the disabled within the Chatsworth area, one for mentally disabled children and one for deaf.

SITE A

The first site (Fig 2.4) is located close to Chatsmed Hospital and the main transport arterial route (Higginson Highway) leading to and from the highway. The site is also located approximately five minutes driving distance from the Chatsworth CBD as well as RK Khan

Hospital. In addition to being a prominent site, it also offers the potential of being close to a small train station/stop. Noise and lack of privacy from the highway could pose a problem, as could the potential of crime. The site is also partially surrounded by houses, with a soccer field to one side of it. Close proximity to the highway, hospitals, sensory elements (parks/green spaces) means that the site meets with most of the criteria. It is also relatively flat and a Greenfield site, being used for sports and festivals, but is not used for most of the

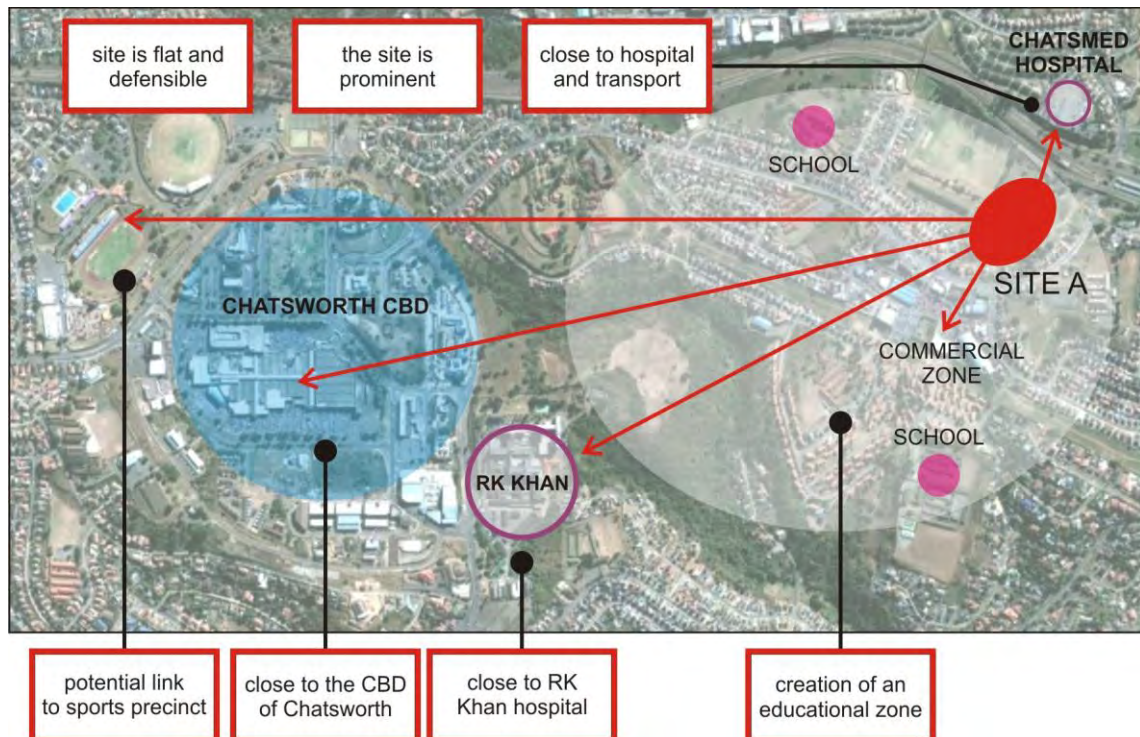


Figure 2.4: SITE A - PROS (www.googleearth.com).

year. The site is zoned as public open space by the city council, but there are currently no plans for any restructuring of the site and it is commonly referred to as ‘the circus site’ by the residents of the area. Westcliff is the name of the council ward that the site is located within and is estimated to hold the largest concentration of disabled people from any other area in Chatsworth – 718 people (www.capmon.co.za). The site also boasts favourable north/south orientation, which is needed for classroom orientation as well as outdoor play spaces.

SITE B

One of the main reasons for choosing the second site (Fig 2.5) is that it is located directly next to RK Khan Hospital. For obvious reasons, this proves to be a major positive about the

site; however it is noisy due to the police station being located opposite as well as a fire station, market place, shops and a noisy road. The site is also not extremely flat and would pose the potential of having more ramps than is actually necessary. It is close to amenities and social and cultural facilities as well as major sporting venues.

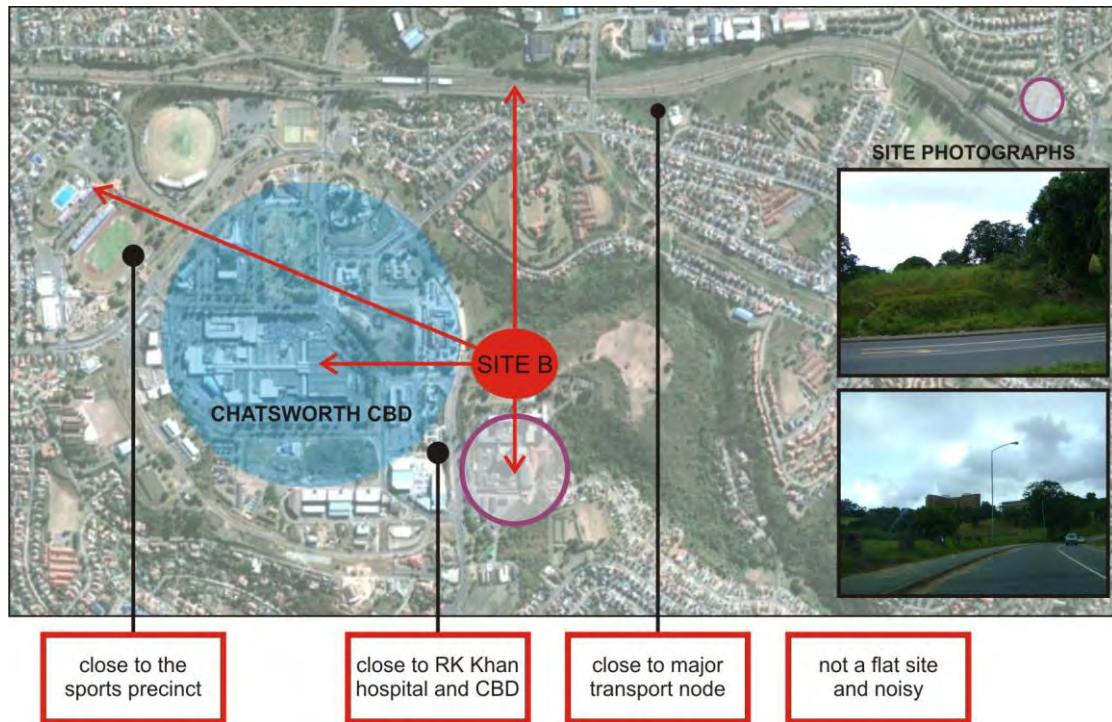


Figure 2.5: SITE B - PROS (www.googleearth.com).

SITE C

The last site option (Fig 2.6) is located furthest away from the main transport route (Higginson Highway), the CBD and is relatively close to one of the hospitals. It is tightly packed on all sides by residential context and is quiet as well as private. There is only one entrance onto the site and there is already a small road built leading to the site, which is too small for the large anticipated traffic in the mornings and afternoons to the site. One of the more positive aspects of the site is that it is an abandoned sports field and playground and is currently quite neglected. The neglected playground equipment on site could be integrated into the scheme and refurbished. This site favours the west/east orientation, however and is dominated by a slight rise in land to one side, at the top of which are houses looking down onto the site. The roads leading to the site are extremely narrow and it is hard to find. There are also pockets of dangerous spots around the site, posing the problems of crime.



Figure 2.6: SITE C - PROS (www.googleearth.com).

A close analysis of the three site options shows the following results based on the nine different site selection criteria. The three sites have been weighed against each other and SITE A appears to be the most appropriate choice for the proposed scheme.

1 – POOR 2 – ADEQUATE 3 – GOOD 4 – EXCELLENT

CRITERIA	SITE A	SITE B	SITE C
NEED	4	4	4
LOCATION	4	3	2
SITE SLOPE	4	2	3
CLOSE TO HOSPITAL	3	4	2
PRIVACY/NOISE	3	2	3
ACCESSIBILITY	4	4	2
SIZE	4	3	4
DEFENSIBLE SITE	2	2	2
FRONTAGES/EDGES	3	4	1
GREENFIELD SITE	3	2	4
TOTAL	34	30	27

2.2.3 Conclusions and Recommendations

In conclusion, it can be said that an appropriate analysis was carried out to understand the statistics involving education for the disabled in the Durban context and for the purpose of this project, the site chosen is appropriate in the sense that it addresses an area which is seen to be in need of such a facility.

2.3 HISTORICAL BACKGROUND OF SELECTED SITE

2.3.1 Location

The site is located in Chatsworth, which is a suburban and residential area and it was created in the late 1960's. Chatsworth comprises an overall area with sixty four minor suburbs. The chosen site, which is known as the circus site, is located near the major road network leading into Chatsworth, known as Higginson Highway. It is also located close to both of the main hospitals within the area.

2.3.1 History

The circus site has been an open piece of land which has been used for festivals and fairs which occur annually within the area. The pieces of land surrounding the site are largely unused and underutilised, one of which being a sports field.

2.4 DESCRIPTION OF EXISTING SITE CONDITIONS

The site and the surrounding sites are green field sites which are largely underdeveloped and hardly in use. The site is relatively flat with a gentle, ramping bank to the back of the site (Fig 2.7). There is also a dirt road leading to the site. The houses surrounding one side of the site are higher than it and thus provide excellent surveillance (Fig 2.8). In turn, the site is higher than the site below it, thus making it quite defensible. There are very few trees on site and none around the perimeter and neither is there any fencing. Orientation of the site is quite ideal as it mostly faces the north – south axis, which can be utilised to enhance the lighting into the building and especially the classrooms. Currently, the site has a good linkage to the surrounding open fields and this will be enhanced in the urban design proposal.



Figure 2.7: The chosen site and the ramping bank to the back of the site (Source: Author).



Figure 2.8: The surrounding houses on a higher level (Source: Author).

2.5 SITE ANALYSIS

For the first part of the site analysis, a comprehensive figure ground study was done to understand the relationship between the site and its context. This shows a tightly compacted suburban layout with easy access to commercial and health facilities, as well as a large abundance of sporting amenities (Fig 2.9).

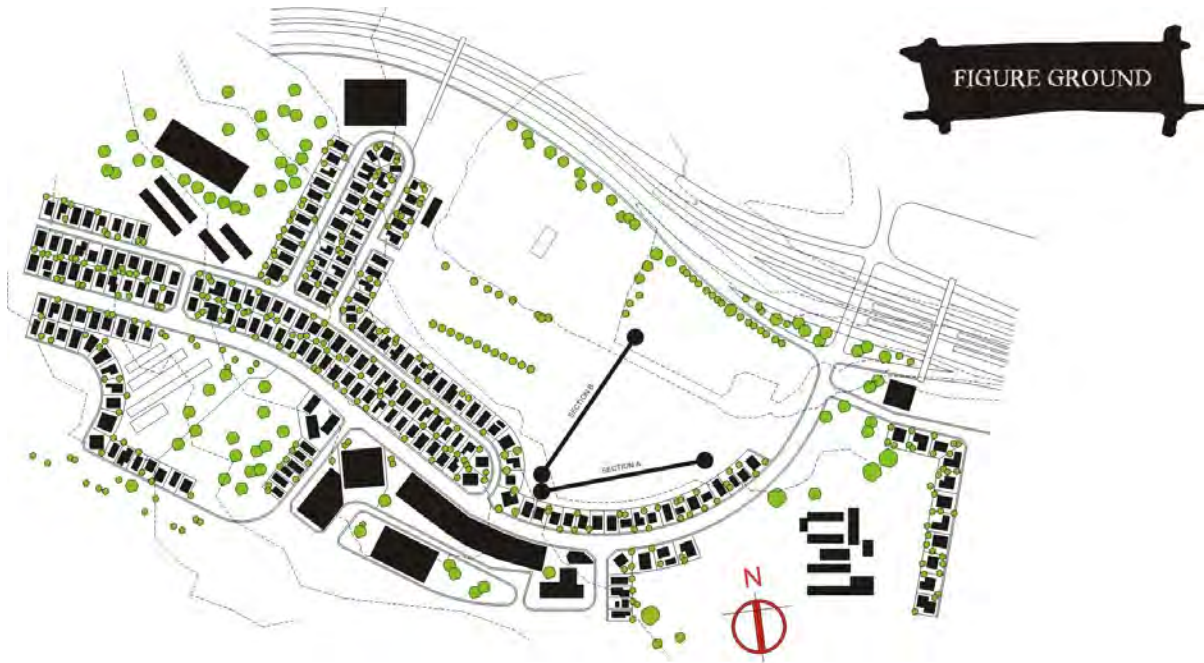


Figure 2.9: Figure ground study (Source: Author).

In terms of existing uses, the site is surrounded by houses and three schools as well as a commercial node (Fig 2.10). The three existing schools in the area allows for this project to tie into an educational node or zone which can reinforce and support each other.

The actual analysis of the site consisted of the following aspects: Noise, prevailing winds, orientation, potential nodes, security concerns, substantial banking, existing roads and views from the site. The site is visible from the road, thus making it legible and clearly accessible. There is minimal noise as the site above the chosen site acts as a buffer to the noise from the roads. This can be enhanced further through the use of planting and fencing. The prevailing winds and orientation would allow for cross ventilation through the site as well as optimal sunlight. There is no road leading directly onto the site, however, there is an existing dirt road which has the potential to be turned into a tarred road, thus enhancing the figure ground aspect of the site (Fig 2.11).



Figure 2.10: Existing uses around site and the immediate context – refer to colour coding (Source: Author).



Figure 2.11: Detailed site analysis – refer to symbol legend (Source: Author).

2.6 CONCLUSION

In conclusion, it is obvious that the site has the idea of being a protected and defensible site, as the form of the site suggests but also to does the way in which the area is layered so that the site is surveyed and can be surveyed from. This is important for the protection and safety of young, vulnerable children who constantly seek reassurance and security. This idea of protecting and embracing can be carried through into the design of the building and can be enhanced through the use of sensory detailing.

CHAPTER 3 DESIGN DEVELOPMENT AND RESOLUTION

3.1 CONCEPTUAL AND THEORETICAL ISSUES

3.1.1 Introduction

The design of an Educational Facility for Physically Disabled Children involves a number of complex issues which need to be resolved in order to facilitate the appropriate care and education of children who are physically or sensorially impaired in some way or another. Designing for children includes taking into consideration various aspects such as colour, light, textures and imagination. Children live in fantasy filled worlds and for a disabled child, a sensory rich environment can aid in their overall development. One of the most important aspects to consider is the issue of scale because children perceive spaces in a unique and individual way, each one different, in comparison to adults. Monotony should be avoided and variety is vital to adequate stimulation for children's growth and development. Designing for the disabled includes understanding accessibility regulations including that for the blind. Wayfinding becomes an important and crucial element to the design process because all people (and not only the blind) need to be able to find their way around easily otherwise they will feel lost and intimidated by their environment.

Critical regionalism and phenomenology of architecture are also important issues to consider as they were explored in the research document. In today's world, designing with consideration of all the site constraints becomes crucial for creating legible environments which cater to the needs of the users rather than simply providing a visually appealing building to look at. Especially for the disabled, detailed design becomes the crux to the ways within which they navigate through and use their environments. Adhering to a site's constraints and context allows for an enhanced sensory design and appeal.

Education has a vital role in creating a fair society, building strong communities and thus developing a knowledge based economy. It can help people to realise their potential, especially at an early age. Therefore, designing an environment which helps support this, especially for the sensory impaired, is a critical aspect to ensuring positive outcomes in people's lives.

3.1.2 Concept Development

3.1.2.1 SENSORY ENVIRONMENTS

Creating sensory environments for disabled children encompasses a wide variety of elements to ensure that they have meaningful experiences. Materials, colours and forms which appeal to their senses enhance sensory experiences and ultimately; development. Phenomenology of architecture also applies to creating sensory environments but it also means taking into cognisance the site and context. Children thrive off environments which appeal to all of their senses and not just the visual and this becomes an important design generator and concept. Colour, light, scale, shapes, forms and textures all form part of creating sensory environments for children. Therefore, the following are considered in the design:

- Visual contrast and texture, which can be used for sensory wayfinding.
- Sensory elements – using colour, light, sound, texture and aroma therapeutically, in particular for children with complex health needs
- Appropriate levels of glare – free controllable lighting.
- Good quality acoustics, taking into account the needs of people with sensory impairments and/or communication and interaction needs.

3.1.2.2 METAMORPHIC VARIATION

The process of metamorphosis occurs in nature and is an interesting concept which can be likened to the growth of children because they undergo various changes in their lifespan and this is as a result of their environment, which teaches them about life and themselves. Metamorphic variation in architecture can be easily achieved through the use of colour, light, textures and patterns as well as shapes and forms. Massing in architecture and the synergy of form can also imply metamorphosis.

3.1.2.3 ACCESSIBILITY AND WAYFINDING

Designing for the disabled, blind and deaf requires certain approaches to the design which can ensure their ease of accessibility in buildings. From sizes of doors to the use of floor materials, every aspect of building design needs to be carefully considered. Children, in particular, need legible environments so that they do not feel lost. Creating protective and embracing environments is also important for the vulnerability of children. Convenient travel routes and distances makes life easier for children with disabilities. Children may be using wheelchairs or other mobility aids and all surfaces must be level, easily accessible, slip resistant and well – drained.

3.1.2.4 IMAGINATION AND INNOVATION

Children of all ages live in fantasy and imagination filled worlds. They turn everyday objects into surreal fantasies as part of their play. Play is the work of childhood and environments for children, both indoor and outdoor should reflect the concept of imagination. Buildings themselves can be designed like a toy to run through or interact with. That would allow for the creation of sensorial and phenomenological environments which are aimed at developing children’s minds and bodies.

3.1.2.5 ACCESS

An accessible environment helps children with disabilities take part in school activities alongside their peers. School designs should ensure:

- A simple, clear layout, easily understood by all users.
- Accessible circulation routes, broad enough for people using wheelchairs or sticks.
- Ergonomic details (such as door handles) that mean everyone can use them.
- Means of escape designed to take account of disabled people.

3.2 FINAL DESIGN PROPOSAL

3.2.1 Urban Design Conceptual Development

The urban design component does not encompass a large design due to the fact that the proposed school does not require an in depth intervention in terms of urban design. Upgrading of the surrounding sites with the addition of defensible trees, planting and fencing forms part of the main concept of the urban design and a play park is proposed on the site

next to the project site. The site opposite the project site is proposed to be the new festival grounds. An existing dirt road leading into the site is proposed to be turned into a formal road thus cutting the site in half with a turning circle as the central nodal point. These proposed changes and upgrades are aimed at enhancing the use and feasibility of the chosen project site. The proposed new road would also decrease the traffic congestion leading to the site as there would be high volumes expected in the mornings and afternoons.

3.2.2 Design Development and Resolution

3.2.2.1 PLANNING

The parking lot forms the front part of the site. There is adequate parking provided for staff, parents and visitors as well as disabled drop off bays. The plan has been arranged in such a way that the main entrance is the first point of view as one enters the site. Thus the road leading into the parking lot faces directly onto the main entrance. This entrance has a drop off zone directly in front for ease of access for the students, with a covered outdoor waiting area. The entrance has also been recessed in order to allow for a more inviting and intimate entrance point. On either side of the entrance lie the hall and hydrotherapy and the therapy rooms and facility. These have also been located facing the parking lot for the reason that they are seen to be the more public components of the building. It is envisaged that the hall and hydrotherapy pool could be used after hours, thus having money generated from this. Also, the therapy facilities can be open to children who are not enrolled at the school, thus enhancing its functionality.

The main entrance then leads directly to the various classrooms, including the kindergarten. All of the classrooms have been designed to be of the same size and proportion in order to allow for legible wayfinding at any given time. Sensory wayfinding clues have been allocated at various points within the plan and these will be discussed further on. The classrooms also lead to the library and audio visual which has been designed to connect to the bank located at the back of the site. The roof of the library meets the highest point of the bank and is thus a grass, living roof. The residential facility is located close to the parking and therapy facilities. A guide dog training facility has also been provided at the front part of the site and a wayfinding training trail and guide dog simulated training grounds has been designed to begin at the front part of the site and wind all the way up the ramping bank to the

top of that bank. That bank then ramps down to the other side to connect to the hydrotherapy building. In that way, the bank at the back of the site becomes a connecting element to the entire design allowing for a flow in the spatial planning which conforms to the deep curve and embracing form at the back of the site. A planted, living retaining wall has been designed for the support of the bank and this retaining wall has a variety of materials in order to enhance the sensory quality. It also serves the dual purpose of being a planted retaining wall. A food garden and gardening therapy section has been located at the top of the bank and the produce from here could get sold to generate revenue or it could be used in the residential facility. The retaining walls also serve to enforce the concept of embracing and protecting as they wrap around the site to enclose the buildings.

The main entrance is designed to be large and airy in order to emphasise its importance as the main spill out point. It is thus the highest point of the site and the rest of the buildings are kept at one floor in order to respond to the scale of children.

3.2.2.2 BUILDING FORM

The facility is comprised of a variety of buildings and thus they have been designed in terms of form to respond to their particular type of function. Materials and colour form part of the sensory enhancement of the buildings and add to the legibility of built form. The main entrance has been designed as a bold red colour to pronounce its importance as the main route into and out of the facility. Metal screens and timber pergolas accentuate the main façade, adding a playful element to the building.

The therapy component is the most playful and bold as it incorporates alternating, splayed walls which have cladding tiles attached to the structure in a playful arrangement of shades of red, yellow and orange. The use of the three different colours identifies the therapy building as being the part of the facility which caters to all of the children and not a specific age group. Colour is used as the main identifying and legible principle on the buildings to aid the children (especially the partially sighted) to easily locate their classrooms and spaces. Colour is thus used in a very ordered and specific manner ranging from age to age depending on what colour is best associated with those age groups.

The hall and hydrotherapy facility incorporate a variety of finishes such as planted walls, glass, screens of various materials and the use of colour. These elements are playful and are aimed at enhancing the legibility of the buildings.

The classrooms are the main spaces of the facility and have been designed in order to allow for natural light to enter the spaces from a high level. There are covered walkways to all of the classrooms to ensure that the children are covered during inclement weather. The design of the classrooms includes ablutions for both teachers and the children. The walkways for the classrooms are shaded with the roof overhang which is supported by steel columns. There is a low wall between each of the columns and these walls have been designed to be seating, planters or play sand boxes. Water drainage from the roofs can be channelled into the gardens and playgrounds adjacent to the classrooms.

3.2.2.3 WAYFINDING

One of the main aspects of the design was the concept of wayfinding. There are various elements which have been integrated into the building design to aid wayfinding and these are:

- The use of different floor materials for different spaces
- The use of tactile ground surface indicators (TGSI's) to help a blind child identify travel direction and changes in direction.
- Positioning of tactile low walls and handrails at appropriate heights for guidance.
- Location of smellscape (olfactory) landmark at the entrance to the kindergarten.
- A water feature for audible identification at the entrance to the hydrotherapy facility.
- A wind chime wall is located at the central point between the older age classrooms.
- Location of a braille wall at the entrance of the library.
- The use of colour for legibility and easy identification.
- Incorporation of trail rails on floor materials for guidance of cane tappers.

3.2.2.4 PLAYGROUNDS

The design of all the playgrounds was one of the most important elements in the overall facility. Play is naturally therapeutic and offers a multitude of experiences for children. All of the playgrounds offer some of the following types of play activities:

- Specialised play equipment for the disabled.
- Sensory gardens
- Edible gardens
- Music gardens

ARCHITECTURAL DESIGN DRAWINGS

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APPENDICES

APPENDIX ONE – BUILDING BULLETINS

The following extract is from a building bulletin, documents which have been set out as guidance for architects, town planners, designers, principals and teachers in the United Kingdom. These building bulletins are written to specifically highlight issues which surround designing buildings for special educational needs (disabled children). Many of them describe various aspects of school design specifically, recommending particular design considerations for disabled children. This includes the site, spaces, their typologies and uses as well as technical detailing. For these reasons, the building bulletins have been referred to for the schedule of accommodation and the final design project of a Child Development Complex for Physically Disabled Children.

Note: These bulletins were set out by the United Kingdom and thus take into account the specifics of building within those countries. Some of the information which was not relevant to the South African context was not referred to. This appendix only lists the parts of the bulletins which were most relevant and not the entire bulletin.

The following extract is from the following source:

Department for Education and Skills (DFES), 2005. *Building Bulletin 77: Designing for Pupils with Special Educational Needs and Disabilities in Schools*. United Kingdom, p. 1 – 100. Accessed 12 February 2011, www.torbay.gov.uk.

Key issues: Understanding SEN and Access to Learning

It is important to understand the key issues involved in designing to meet a range of special educational needs, so as to ensure that the appropriate provision is made and is fit for purpose. This section outlines the main needs about which designers need to be aware.

In all decisions that affect children, the primary considerations must be their best interests in terms of health, welfare and safety. For individuals, these interests may change over time. It is also very important to safeguard all pupils and to ensure that meeting the needs of one group does not disadvantage another. There are occasions when different types of needs have conflicting requirements and where some separate provision may be appropriate. Good design can help to provide appropriate interfaces which buffer and ameliorate difficulties.

School design should aim to meet pupil needs and include for:

- **Safety and Security:** All pupils need to feel safe, secure, and free from being stigmatised. They also need to feel a sense of belonging and to be enabled or

supported to participate fully in school life. Design can contribute to this by, for example, creating good sight lines and avoiding re-entrant or hidden spaces.

- **Health:** All pupils and staff should benefit from a healthy school environment in which to live, learn and work. Children with medical needs have the right to be treated with dignity and respect. Providing the appropriate facilities, such as hygiene, toilet and changing rooms spread around the school in convenient locations, as well as medical and therapy spaces, will support and promote their health and well – being.
- **Communication and Interaction:** Children who have communication difficulties will benefit from different teaching and support techniques or specialist equipment. Various systems of signs and symbols can be used to help them access the curriculum, as well as visual or tactile materials and objects of reference. Some children, however, will not be able to communicate their needs. Overall, therefore, it is important to design a communication – friendly environment with appropriate signage and a clear, easily understood layout.
- **Sensory Stimulus and Information:** Children who have sensory impairments use all of their other senses to compensate in order to understand other people and their environment. Using appropriate materials in response to sensory needs may assist them to access, understand and negotiate their environment. It is essential to provide the appropriate level and type of sensory stimulus so as to inform or calm, and not confuse, overload, or stress.
- **Mobility and Access:** Children who have physical difficulties may use different types of wheelchairs, frames and mobility aids, and should be able to move around the school alongside their friends. There should be sufficient space for circulation and storage of equipment. Some pupils may tire easily and will need a place to rest. Overall, circulation routes should be planned to minimise travel time, whilst maximising how such areas can be used to best effect.
- **Behavioural Development:** Children who have behavioural difficulties may require extra space to move around, or to ensure a comfortable distance between themselves and others. They may need access to a quiet indoor place or a safe, contained, outdoor space reasonably close to the teaching space.
- **Activity and Expression:** Different children have different needs relating to activity, whether for music and movement, physiotherapy or mobility training, a high level of structured activity or space in which to release emotions and calm down. Careful and thoughtful design can provide for both active and passive play in a variety of indoor or outdoor spaces.
- **Social Awareness and Participation:** Whatever school setting they are in, children with SEN and disabilities should be able to take part and participate in school life and out – of – school activities along with their peers. Designing age – appropriate environments using furniture, fittings and equipment to reflect pupil’s needs is essential.
- **Spiritual Support:** For a child or young person this means having their needs met appropriately, having a sense of belonging and a feeling of comfort, being able to make choices and experience challenges, unconditional acceptance whatever their condition or behaviour, and having a purpose for living and a good quality of life. Designs can support these needs by providing both the appropriate ambience and practical assistance.

The Learning Environment

Creating a positive impact on the learning environment through good design is essential. Understanding the use of space is likewise essential to ensure that designs are fit for purpose.

Aspects and types of provision to be considered include:

- **The user's point of view:** there should be enough space to move around and to have everything that may be needed within easy reach. Spaces should be light, airy and warm with comfortable furniture and pleasant colours.
- **Effective learning environments:** essential elements to provide are good quality natural and artificial lighting, good sound insulation and acoustics, adequate ventilation and heating with local adjustable controls, and all necessary support services.
- **Small – group rooms:** just off or near to the class base, these spaces can be used for focused individual learning, group work or behaviour support and are a valuable resource for supporting individual pupil needs.
- **Quiet space:** pupils may need to withdraw or retreat to a safe place for a break. A quiet place can be calm, still, creating a therapeutic environment or giving a sense of spirituality.
- **Low – sensory – stimulus environment:** for some pupils, perception of the world around is confusing. Providing low – sensory – stimulus, non – distracting, calming environments can assist focused individual learning.
- **Sensory stimulus and sensory rooms:** the use of multi – sensory stimulation, using light and sound with interactive training techniques can help pupils with learning difficulties to improve coordination, develop understanding of cause and effect, or promote relaxation.
- **Therapy rooms:** therapies make an essential contribution to education, supporting pupil's health, well – being and enabling them to access learning.
- **Storage:** good storage is imperative to support effective teaching and learning activities. Each space should be designed to have its own storage space which should be accessible and fit for purpose.
- **Outdoor spaces:** connection to and use of outdoor spaces is essential for pupils who have SEN and disabilities. A variety of different types of space are needed in and around the school for the outdoor classroom, sensory stimulation, sheltered or covered play, and social and recreational use.

This part of the building bulletin describes the main categories of special educational need (SEN) and the ways in which provision can be made to meet these in all schools. The impact on design is summarised for each group. The Code of Practice covers four broad areas identified for the purposes of education:

- Cognition and learning needs
- Behaviour, emotional and social development needs
- Communication and interaction needs
- Sensory and/or physical needs

The following table describes the categories of special educational needs and their abbreviated forms:

COGNITION AND LEARNING	
Specific learning difficulty	SpLD
Moderate learning difficulty	MLD
Severe learning difficulty	SLD
Profound and multiple learning difficulty	PMLD
BEHAVIOUR, EMOTIONAL and SOCIAL DEVELOPMENT	
Behaviour, emotional and social difficulty	BESD
COMMUNICATION and INTERACTION	
Speech, language and communication needs	SLCN
Autistic-spectrum disorder	ASD
SENSORY and/or PHYSICAL	
Hearing impairment	HI
Visual impairment	VI
Multi-sensory impairment	MSI
Physical disability	PD
Other	OTH

Moderate Learning Difficulty (MLD):

Pupils with moderate learning difficulties have attainments significantly below expected levels in most areas of the curriculum. Their needs may not always be met through differentiation. They often have greater difficulty with basic literacy and numeracy skills and in understanding concepts, especially those relating to mathematics and science. Some pupils may also have associated speech and language delay, mobility, hearing or visual impairment, low levels of concentration, low confidence and underdeveloped social skills. Others may also exhibit or have associated behaviour difficulty or be emotionally vulnerable. Most pupils with SpLD or MLD attend mainstream school and are included in general classes and tutor groups. For some subjects, however, they may be in smaller teaching groups or appropriate sets. Some pupils who have MLD with complex needs (also referred to as complex learning difficulties) can attend a local community mainstream school with resourced provision or a community special school, depending on their individual needs.

Provision for Pupils with SpLD/MLD and its Impact on Design:

Specialist SEN Facility:

Learning and behaviour support may be provided to suit individual needs within mainstream classes and designated SEN resource bases. Therapy support may be provided by sensory – impairment services or speech and language therapists or occupational therapists, who can be accommodated in the class base or in small – group rooms, a SEN resource base or a therapy base. This kind of input will affect the number and size of spaces to be provided. Some pupils with MLD may need access to a dedicated facility, for example, for pastoral support.

Resourced Provision:

Some pupils with additional needs such as SpLD or MLD may need access, on a timetabled basis, to resourced provision. Typically, different learning areas within a resourced provision

will be grouped around a social space. If required, an additionally resourced provision could comprise a couple of general – teaching class bases (55 – 65m²) with ancillary accommodation, for example:

- A small group room (10 m²) for learning support, calming, respite or one to one work.
- A small group room (16 m²) for discussions or role play and in which a small group can be taught.

Where such a suite of different learning spaces is provided, these can also be grouped around a social space. Specialist subject bases will vary in size from approximately 30 – 65 m², according to pupil groups.

Impact on Design:

Generally, pupils with SpLD/MLD will require careful positioning in the class base, with adequate workspace for any learning aids and specialist ICT, and allowing for a good seating posture and a clear view of the teacher and the whiteboard. Pupils attending both mainstream and special schools may receive learning and behaviour support from teaching staff or specialists working on a one to one basis, either in the class base or in a small – group room nearby. Adequate provision must also be made for storage and preparation of multi – sensory materials. Provision of sufficient space for all of these needs is vital. Clear signage will also assist them finding their way around the school.

Severe Learning Difficulty (SLD):

Pupils with severe learning difficulties have significant intellectual or cognitive impairment and will need support in all areas of the curriculum. They may also have mobility, coordination, communication and perception difficulties; some may use signs and symbols. Many pupils require help to develop social and self – help skills. A percentage of pupils with SLD may be non – ambulant, have sensory impairments, or have needs which fall within the autistic spectrum. Other pupils may have demanding or challenging behaviour. Multi – sensory teaching and practical work with specialist learning aids and ICT across the curriculum will take place in small groups with learning and behaviour support provided. Most pupils will attend a special school although some may attend a mainstream school with support, while others still may be on roll at both a mainstream and a special school.

Profound and Multiple Learning Difficulty (PMLD):

Pupils with profound and multiple learning difficulties may have physical difficulties, sensory impairments or a severe medical condition. Nearly all pupils require a high level of resources and adult support in order to help them access the curriculum and to assist with their personal care and medical needs. At least half of pupils will have sensory impairments such as VI, HI or MSI. They are likely to need sensory stimulation so as to have access to a curriculum, which will be broken down into very small learning steps. Some pupils communicate by gesture, eye – pointing or using symbols, others by very simple language. Pupils may have a variety of learning programmes throughout the day, including short intensive sessions of one to one communication and interaction.

Accommodation in all types of school should provide access to a broad, balanced and relevant curriculum, whatever the setting. Well – designed indoor and outdoor spaces are vital for learning, for sensory and mobility training, for behaviour support and for social development. Indoor spaces will include general and specialist class bases as well as small – group rooms for learning and behaviour support. It is essential that there be adequate space for the increased level of staffing required. Therapies such as sensory services, speech and language therapy, occupational therapy, physiotherapy and hydrotherapy require a range of specially designed accommodation, which may be provided in mainstream as well as in special schools.

In addition to the provision made for pupils who have SLD, sensory stimulation including communication boards, sound beam or resonance boards are often used. Additional space in the class base or specialist spaces should therefore be provided, in inclusive, age – appropriate settings so that all pupils can participate in school life. There must be provision to meet medical needs, as well as convenient toilet and changing facilities throughout the school. Inclusion in school activities and in the wider community is essential. Buildings should therefore enable mobility, sensory and independence skills to be developed in communication – friendly environments. It is essential that means of escape and evacuation procedures are developed in consultation with the local fire authority and building – control officers, so as to ensure the safety of pupils and incorporate their needs. The design process should also include briefing for provision to support inclusion, extended schools, and outreach links with local schools and the wider community.

Speech, Language and Communication Needs (SLCN):

Pupils with speech, language and communication needs have difficulty understanding and/or making others understand information conveyed through spoken language. Their acquisition of speech and oral language skills may be significantly behind their peers; they may have poor speech intelligibility and experience problems in articulation. Pupils with language disorders or impairments find it difficult to express ideas or have trouble getting others to understand what they are trying to say, which can affect their emotional and social development. Inability to communicate can give rise to feelings of frustration and anger which can lead to behaviour difficulties. Pupils with speech, language and communication needs cover the whole ability range. Most pupils attend a mainstream school where, for some, teaching assistants prepare worksheets or assist with the delivery of speech – therapy programmes. Pupils, who may be visual learners, may need to sit near the front of the class, with a clear view of the whiteboard and of the teacher demonstrating work. Access may be needed to ICT support which includes electronic communication aids or synthetic speech production equipment involving computer and keyboard.

Specialist Facilities:

Pupils may need access to speech and language therapy, on a timetabled basis, provided in a class base, a small quiet group room or a speech – therapy room of 10 – 15 m². Learning and behaviour support may be provided to suit individual needs within mainstream classes and designated SEN resource bases. Therapy support may be provided by speech and language therapists, who can be accommodated in the class base or in small – group rooms, a SEN

resource base or a therapy base. This kind of input will affect the number and size of spaces to be provided.

Resourced Provision:

This may consist of a large class base (65 m²), divided to provide:

- A small – group room (10 – 16 m²) for learning support or speech therapy. This should be a quiet room and may have some acoustic treatment.
- A small – group room (16 m²) for discussions and role play, with sound insulation and positioned at some distance from the quiet small – group room. If required, a larger additionally resourced provision could comprise a couple of general – teaching class bases (55 – 65 m²) with the ancillary accommodation above.

Hearing Impairment (HI):

Pupils with a hearing impairment range from those with a mild hearing loss to those who are profoundly deaf, and cover the whole ability range. For educational purposes, pupils are regarded as having hearing impairment if they require hearing aids, adaptations to their environment and/or particular teaching strategies in order to access the concepts and language of the curriculum. Approximately 40% of pupils with a hearing impairment also have an additional disability or learning difficulty. There are two main types of hearing loss: conductive and sensory – neural hearing loss. A mixed hearing loss is a combination of conductive and sensory – neural hearing loss. Hearing loss is measured on a decibel scale and four categories are commonly used to describe the level of hearing loss: mild, moderate, severe and profound.

Hearing – impaired children may learn to communicate through sign or spoken language, or a combination of both. There are three main communication approaches: auditory – oral approaches, sign bilingualism and Total Communication. Different communication approaches may involve a combination of sign languages such as British Sign Language, systems involving signs and symbols, finger spelling, lip reading and maximisation of the use of residual hearing through hearing aids, cochlear implants and other technology. Provision to support the use of hearing aids, radio aids (personal FM systems), sound – field systems and other assistive technology is a high priority. It is important that consideration is given to ensure that all such items of equipment in use in the school, or likely to be used by hearing – impaired pupils in the future, will be compatible and function correctly for all pupils.

HI is a low – incidence special educational need. As a result, most pupils with HI are included in mainstream schools, where they will need specialist facilities or a resourced provision in order to meet their needs. It is good practice for pupils who have HI in mainstream to be in a group, for example in an additionally resourced provision for 10 – 12 pupils, so as to avoid them becoming isolated. A minority of pupils may attend a special school for HI in order to meet their particular needs. Therapy support will be obtained from a hearing-impairment specialist and speech and language therapist. It is good practice that pupils are consulted about their preferences.

In class, hearing – impaired pupils may receive communication support from a teaching assistant, learning – support assistant, communication – support worker or teacher of the deaf. It will be important to ensure that there is room for the support worker to sit or stand near the child, so that the child can see both the teacher and the support worker. In mainstream class, pupils may find it helpful to sit near the front of the class.

A small – group room may be required to which some pupils may withdraw periodically for learning, language development and behaviour support. Pupils with HI may develop more sensory awareness to visual and tactile cues, and may use more of their peripheral vision. They use visual materials as learning aids, along with ICT to facilitate access to the curriculum. Sufficient workspace should be allowed for the use of video and television. Video materials should be available with subtitles or sign language where appropriate.

Specialist Facilities:

The following may be necessary to support pupils with hearing impairment in a mainstream school:

- A small – group room (10 – 16 m²) can be used as a quiet space for support work with a hearing – impairment specialist and can be dual – used by a speech therapist.
- A room for preparation and storage of curriculum materials and technical support for hearing aids and radio aids (6 – 10 m²).

Resourced Provision:

This may include one or two class bases in a mainstream school, for timetabled learning support for 10 – 12 pupils. Typically, it may comprise:

- Class bases (55 – 65 m²) for learning support with whiteboard or CCTV and seating in a horseshoe layout to aid language and communication development. (45 – 54 m² refurbished class base in existing school for smaller groups of 6 – 8 pupils).
- A small – group room (10 m²) for hearing impairment support or speech therapy.
- A small – group room (16 m²) for discussion or role play.
- A store (4 – 6 m²)
- A quiet room (10 m²), which can be used for calming and respite or behaviour support, especially if pupils have behaviour that challenges.

Special Schools:

These are available for a minority of pupils who cannot have their needs met elsewhere. These schools may cater for a wider ability range. They may act as outreach resources for the local community. Specialist facilities for an audiology department may be included.

Impact on Design

The following should be considered:

- A social – skills base (20 – 30 m²) may be provided.
- The provision of clear signage and routes along with visual signal alarms, to enable orientation and mobility, makes a significant impact. The design of the school environment should support this.

- For visitors attending a school there should be an induction loop at reception and good – quality lighting so that the receptionist’s face can be seen (down lighting should not be used in order to avoid cast shadows which make lip reading difficult).
- The main hall should have acoustic treatment and an amplification or sound field system where appropriate.
- Good – quality lighting and window blinds should be provided in class bases.
- Room layouts should prevent teachers having to stand with their backs to the window.
- Adequate space is required for pupils to sign and gesture to communicate and for role play.
- A high – quality acoustic environment should be a priority, with good – quality room acoustics for speech intelligibility and sound insulation to ensure low background noise. Acoustic – absorbent surfaces should be used for ceilings, high level wall finishes and flooring.
- Avoid noise interference from highly reflective or highly reverberant surfaces, such as wood – block floors, hard – plastered walls, and ceramic tiling or glass blocks. Metal reflective surfaces for venetian blinds, window frames, panels, balustrades and railings should be used carefully.
- Furniture and equipment should be locatable to face inwards to the teacher, allowing for cable management and floor boxes as required.
- Visual alarms, including fire alarms and lesson – change signals, should be provided.

Visual Impairment (VI):

Visual impairment refers to a range of difficulties from minor impairments of sight through to blindness. Its effects may include total sight loss, loss of acuity, limitations of visual field or disturbance of colour vision. These effects may be exacerbated by environmental conditions, or they may be general. Visual impairment may be of ocular origin, it may be as a result of difficulties in visual processing or it may be the result of a combination of causes. Pupils who have visual impairment cover the whole ability range. For educational purposes, a pupil is considered to be visually impaired if they require adaptations to their environment, specific differentiation of learning materials or special equipment in order to access the curriculum. This section is also relevant for those pupils who have visual impairment and additional disabilities.

Provision for Pupils with VI and its Impact on Design:

Specialist Facilities:

The following may be necessary to support pupils with VI in a mainstream school:

- A vision – testing area based in a quiet room where there is a dimension of at least 6 m on the diagonal.
- A 56 – 60 m² class base with sufficient space for learning aids and equipment, as well as teaching or specialist – support assistants (45 – 54 m² refurbished class base in an existing school will be sufficient for 8 – 10 pupils).

Smaller rooms can be used as follows:

- A small – group room (10 m²) for learning support.
- A small – group room (16 m²) for discussions and role play.
- A space for preparation (10 – 16 m²) and technical work.
- A resource store (6 – 10 m²).

Resourced Provision:

This may include one or two class bases in a mainstream school, for timetabled learning support for 10 – 12 pupils. Typically, there may be:

- Two class bases (55 – 65 m²) for learning support including mobility training (or 36 – 54 m²) for refurbished rooms with smaller pupil groups).
- A small – group room (10 m²) for learning support.
- A small – group room (16 m²) for group teaching and discussions or role play.
- A technician’s room (16 – 20 m²).
- Storage for resources (6 – 10 m²).
- A sensory dark room (12 – 24 m²) for light-tracking and training for coordination skills which may enable use of ICT.

Special Schools:

Most pupils who have a visual impairment will be encouraged to use whatever is available of their residual sight and to develop their other senses (hearing, touch, taste, smell and kinaesthetic awareness) to promote their abilities for communication, learning, mobility and independence. The spoken word, auditory cues, tactile and hand on hand approaches are all beneficial as learning approaches. Some pupils who have visual impairment develop heightened sensory awareness to auditory and tactile environmental cues. They can detect changes in the resonance of spaces due to their different materials, changes in floor finishes, tactile symbols and other stimuli or aromas. All of these facilitate orientation and mobility. The design of the school environment should support this. It is essential that advice is obtained from a VI specialist and a mobility officer so that pupil’s needs can be met in both the class base and the general environment of the school. It is good practice, wherever practicable, for pupils to be consulted about their learning preferences.

Partially sighted pupils need a range of learning methods; these will necessitate differentiated materials and space for additional learning aids and large items of equipment. For example, enlarged print materials and equipment for reproducing it, sloping desktops and bookstands to enable close viewing and facilities to allow the use of on – task lighting (without trailing leads) may be required. A range of low – vision aids may be needed, including low – tech ones such as magnifiers and high – tech aids such as CCTV viewers and other ICT for text magnification, speech or sound output. Pupils may need to be positioned favourably to see the teacher and learning materials. This need will vary depending on the nature of individual’s special needs and specific learning activities so design should allow for flexible use of space. Pupils who are blind may require a range of tactile methods of learning and will need to make optimal use of hearing. Therefore, sufficient space and good room acoustics are needed throughout the school. Access to learning for pupils who are blind may include a range of approaches, for example exploration of real objects and three dimensional learning aids, the use of raised diagrams and tactile graphics such as Moon or Braille, the use of vibro

– tactile feedback equipment such as resonance boards or sound boxes, and the one to one support of a pupil in learning activities by an adult.

The use of these approaches requires sufficient space. In addition, classrooms may need space to accommodate equipment to produce tactile graphics for pupils who use Moon or Braille, or ICT equipment for auditory access. The successful social inclusion of pupils who are blind will have implications for school design, especially in relation to accessibility to recreational and play areas. Providing visual contrast, tactile trails, or cues (such as giving paths definition) assists with wayfinding, and enables participation and social integration. A large store room with shelving will be needed for curricular resources and three dimensional learning aids. Large print or Braille books take up considerable shelf space (one A4 book may take up 1.8 m of a shelf as a large – print or Braille book).

Many special schools make use of multi – sensory stimulation rooms. These are sometimes known as white rooms or dark rooms. Their uses vary and may include visual and auditory stimulation using equipment designed or modified for the purpose. Aspects of assessment of functional vision are sometimes carried out in these rooms. A specialist technical room is needed for equipment to support Braille transcription and tactile – diagram production. In addition, space will be required to produce and store learning aids and materials.

A small percentage of those with visual impairment attend a special school catering wholly for this disability. All of the above is relevant, but group sizes may be smaller, as in special schools there will more resources and equipment and specific arrangements for pupils who are blind. Specialist advice should, therefore, be obtained at the briefing stage.

Impact on Design:

For all pupils, safety considerations should be reviewed to avoid trip and impact hazards, protruding elements and the proliferation of cluttered spaces.

Designing to assist wayfinding and accessibility for VI will involve:

- Use of coloured stripes, tactile cues, signs and symbols, and tactile maps in reception (it should be borne in mind that these may need to be of a temporary nature and need to change during the life of the school).
- Different ‘sounders’ for lesson changes and alarms for emergency escape.
- Manifestations (i.e. visual markers) on large glazed areas.
- Speech/voice announcements in lifts.
- Colour contrast which provides sufficient tonal contrast, for identifying changes between wall and floor surfaces, changes in level, stairs and lifts, and doors and door furniture.

Providing visual tonal contrast of objects, materials and surfaces finishes is important for all situations. High Chroma bright-colour contrast may be appropriate for situations where pupils have severe visual impairment. Avoidance of excessive stimulation with strong colours will assist where there are conflicting needs (e.g. pupils with epilepsy, autism, or hearing impairment).

Provision of good-quality low-glare natural and artificial lighting and effective means of controlling the levels of lighting using blinds and adjustable or dimmable controls should be made. It is also essential to:

- Make provision for safe cabling routes for task lighting to allow for their use without trailing electrical leads.
- Allow cable management to furniture.
- Avoid or give clear indication of the presence of hot surfaces and have controls for hot-water temperatures.

Multi – Sensory Impairment (MSI):

Pupils who have multi – sensory impairment have a combination of visual and hearing difficulties. They are sometimes referred to as deaf – blind, but may have some residual sight and/or hearing. Many also have additional disabilities, but their complex needs often mean that it may be difficult to determine their intellectual abilities. The impact of such dual-sensory impairment affects:

- access to sensory information
- social interaction and communication
- mobility
- conceptual development
- anticipation and choice making
- learning strategies

As a result, pupils may have greater difficulty in communicating and accessing the curriculum and the physical environment than those with either visual impairment or hearing impairment. The combination of complex needs results in a unique pattern of learning difficulties. Pupils will need a high level of support provided both by school – based staff and a range of visiting professionals. Their developmental programmes should reflect a multi – disciplinary approach, including contributions from an appropriately skilled occupational therapist, physiotherapist, speech and language therapist, an educational psychologist and teachers of pupils who have hearing impairment or educational audiologist and mobility officer, coordinated by a teacher of pupils who have MSI.

Facilities should therefore be designed which promote this multi – disciplinary practice. A few pupils may use Braille or Moon but most pupils require individually adapted and augmented forms of communication, making use of real objects associated with activities, and visual or tactile identifiers or symbols. Many pupils who have MSI need space for supportive seating, standing or lying equipment, ICT equipment to support access to learning and to receive the one to one support of an adult to provide access to activities and to support inclusion. In addition to access to a broad and balanced curriculum, pupils who have MSI will need facilities for: multi-sensory stimulation, hygiene and personal care, therapy support (this may include hydrotherapy), assessment of functional vision and hearing, appropriate technology and acoustic considerations to support hearing needs.

Provision for Pupils with MSI and its Impact on Design:

Provision to meet the needs of pupils with MSI is usually made in special schools. In addition to considering the design notes for VI and HI, there are particular issues which are relevant for MSI and which are set out below: Pupils often have some useful hearing or vision, but do not function as either as HI or VI pupils. It is important to provide good-quality acoustics, lighting levels with flexible controls as well as silent heating and ventilation.

Multi – sensory and tactile information is important, but in many cases the way this is used varies widely depending on the individual pupil. Generally speaking, pupils use a range of tactile and sensory sensations to inform themselves, for example, about their whereabouts en route from one part of the school to another. This is likely to include information from floors and walls, aromas, draughts and temperature changes. Some pupils use tactile symbols and markers which are attached to doors, walls and other parts of the environment. Facilities for assessment of functional vision, hearing and other senses should be provided. Space will also be needed for one to one support from an adult in learning activities and for ICT equipment for access. A multi – sensory stimulation room should, ideally, allow for flexible use of space. To avoid over stimulation, it should be possible to either store some stimulation equipment out of sight or to screen it off. Pupils may often experience frustration and emotional upsets and so a quiet space for respite and calming may be needed. Many MSI pupils have complex needs and medical conditions and so appropriate facilities for care, hygiene and educational support may be required. Mobility equipment for supported sitting, standing and lying in teaching spaces is often needed. There should be sufficient space for this and for its storage when not in use. Facilities for hoisting and moving pupils may also be required.

Physical Disability (PD):

There is a wide range of physical disabilities and pupils cover the whole ability range. Some are able to access the curriculum without any additional educational provision: they have a disability but do not have a special educational need. For others the impact on their education may be severe. In the same way, a medical diagnosis does not necessarily mean that a pupil has SEN. It depends on the impact the condition has on their educational needs. There are a number of medical conditions associated with physical disability which may impact on mobility. These include cerebral palsy, spina bifida, hydrocephalus and muscular dystrophy. Some pupils are mobile but have significant fine – motor difficulties which require support. Pupils with physical disabilities may also have sensory impairments, neurological problems and learning difficulties. Others may need augmentative or alternative communication aids.

Medical conditions which constitute specific disability include:

- Neurological damage and its effects.
- Secondary disabilities, such as epilepsy and sensory problems.
- Bowel and bladder incontinence, kidney and other infections or skin lesions.
- Low immunity.

As a result of their disability, some pupils may, on occasions or on regular basis, suffer from tiredness, fatigue or illness, or they may need to recuperate (for example after a seizure) and have access to a rest room for respite and rest. Other pupils with physical disabilities may be active, alert and more readily able to engage and participate in school life along with their

peers, provided that suitable access and inclusion support is in place to meet their individual needs. Therapy support, such as physiotherapy or occupational therapy, may be required, as well as access to hydrotherapy. Provision of support for medical and personal care needs may be required. A range of aids may be needed for education, mobility, communication, seating, personal care and daily living. Pupils may use sticks or crutches, or a self – propelled or electrically operated wheelchair, or they may need to be assisted. Wheelchairs may have a space for a bag or equipment behind the seat, adjustable foot rests and reclining modes which mean that they take up a considerable amount of space. They may also have a tray fitted to support learning or communication aids. Pupils may also need communication aids or medical equipment. Though pupils span the whole range of ability, most attend mainstream schools with or without specialist facilities or resourced provision. Other pupils with learning difficulties and complex needs may attend a special school.

Provision for Pupils with PD and its Impact on Design:

Specialist Facilities:

The following may be necessary to support pupils with PD in a mainstream school:

- A dedicated medical facility which may comprise a suite of accommodation including any or all of the following: nurse’s office, medical treatment room, rest room, sick bay and first – aid area.
- A SEN therapy room for physiotherapy (20 – 30 m²) with an associated store (4 m²) for equipment.
- A hygiene room (15 – 20 m²) for assisted toilet and changing.
- A central equipment store (20 m²).
- Mobility storage (10 m² per bay).
- A technician’s room (16 – 20 m²).

Resourced Provision:

This may include one or two class bases in a mainstream school, for timetabled learning support for 10 – 12 pupils, and ancillary accommodation which may comprise:

- A medical room (20 – 25 m²).
- A physiotherapy room (25 – 30 m²).
- A multi – purpose general teaching class base (65 – 75 m²), including ICT workstations.
- Ancillary accommodation, hygiene spaces, a separate laundry and a variety of different types of toilet provision.

Special Schools:

Provision will be as for pupils who have a range of SLD/PMLD needs, with requirements including mobility training, access to the curriculum and independence skills development. Provision of portable or overhead hoists and mobility – equipment storage may be essential. Access to physiotherapy and hydrotherapy may be requirements.

Impact on Design:

The following should be considered:

- In mainstream and special schools, there must be sufficient space in each class base to allow for pupils to access the curriculum and participate in school life alongside peers.
- Adequate space and a suitable shape of class base must be provided for pupils who may have three pieces of equipment – an outdoor wheelchair, an indoor or classroom chair and a standing frame.
- Those who need support with mobility or scribing may require space for an assistant.
- Adjustable – height furniture and accessible workstations for specialist subjects should be provided as appropriate.
- Space – planning for ergonomic layouts should be incorporated for pupils with varying degrees of disability.
- Space for storage of equipment in mobility bays and provision of a central equipment store may be needed, along with battery – charging facilities.
- Access audits may be required to ensure that designs are fit for purpose.

Consideration should also be given to the following:

- The varying need for independent access for those with physical disability, depending on the gross and fine body – motor skills (for example, whether there is upper body mobility) and therefore for assistance.
- Health and safety for both pupils and support workers with regard to the manual handling, transferring or moving of pupils by support workers, in a way that allows for dignity and respect to be maintained.
- provision of shallow ramps, a shallow pitch of stairs, a limited number risers to a landing for a rest, guardings and handrails at two heights for smaller and larger pupils
- Access to a range of outdoor spaces with facilities such as accessible play equipment, or raised planters.

GENERAL DESIGN CONSIDERATIONS:

Nurseries have large class bases with a large open space for arranging different layouts according to areas of experience. Facilities and areas may comprise:

- Smaller scale furniture and fittings, toys, play equipment, furnishings, curtains and cushions, bearing in mind the children’s needs.
- Small bays for practical areas or learning resources in trays or on trolleys.
- Computers for early years.
- Views out at low level for children who spend a lot of time near to or on the floor.
- Wet and dry spaces for different activities.
- Ample storage for play equipment, buggies and prams.
- Space for mobility equipment.
- Safe, clean, non-abrasive and non-slip sheet flooring or carpet according to the activities being undertaken.
- Adjacent kitchen areas (gated off as necessary), toilet and staff facilities.
- Direct access to a sheltered outdoor play area, a separate dedicated external play area and also some covered outdoor play space.
- A range of different outdoor spaces to meet pupil needs.

- The appropriate scale and volume of spaces for early years, remembering that scaling down rooms could make them constricting and inflexible. For some children a large space can be confusing, whilst for others it gives a sense of freedom.

The number of pupils in a group should be based on the current teacher pupil-ratios for best practice. The following table lists the special needs and the recommended pupil per class.

TYPE OF SEN	PUPIL NUMBER IN A CLASS FOR ONE TEACHER
BESD	6 – 8
PD	6 – 8
VI	6 – 10
HI	6 – 10
SLCN	6 – 10
MLD	6 – 10
SLD	6 – 8
MSI	5 – 7
PMLD	5 – 7