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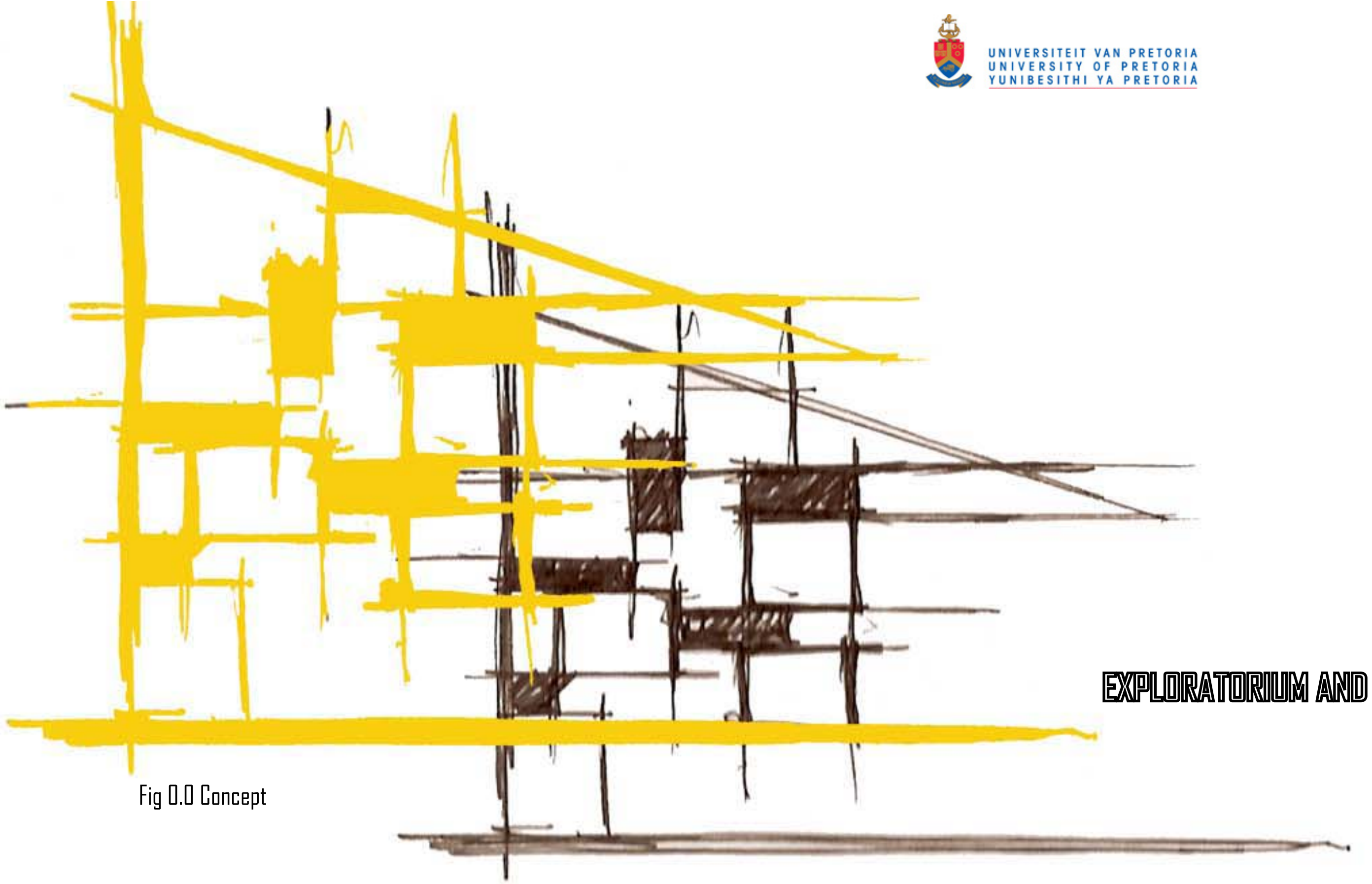
Fig 0.0 Concept

SOUND SPACE

EXPLORATORIUM AND TRAINING FACILITY FOR THE DEAF AND HARD OF HEARING

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Submitted in partial fulfillment of the requirements for the degree Master of Architecture (Professional), in the faculty of Engineering, the Built Environment and Information Technology.

Faculty of Engineering, Built environment
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Contents:

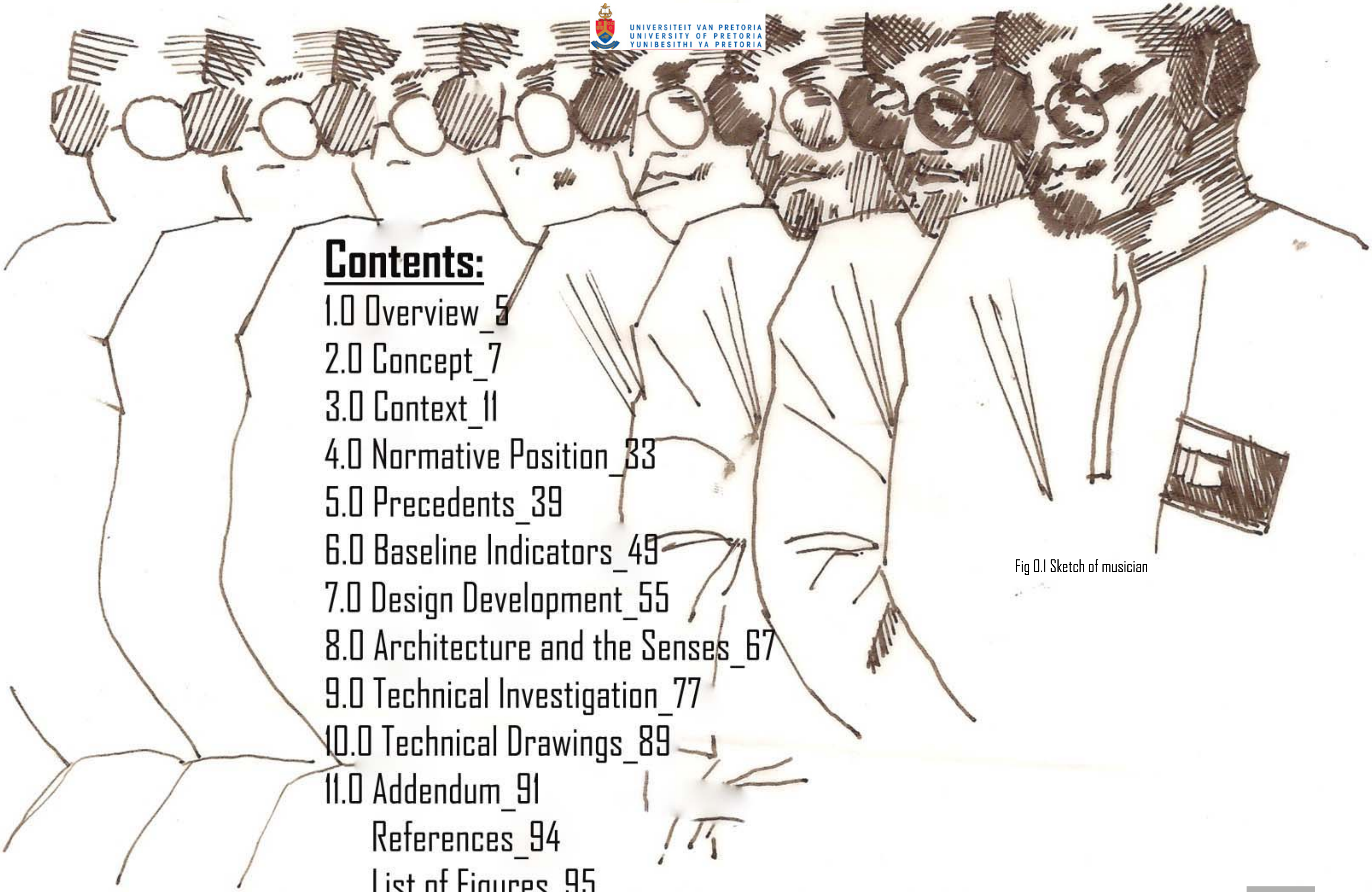


Fig 0.1 Sketch of musician

1.0 Overview

The Central Statistical Services (CSS) currently estimates that there are approximately 412 421 profoundly deaf people and approximately 1 237 264 extremely heard-of-hearing people in South Africa.

Irene Bester of the SABC has noted that there may even be around 2 million people in South Africa who regard sign language as their first language. It is estimated that the number of deaf and hard of hearing people stands at 5 million (Kruger 2000:35).

According to Ethnologue there are 12 100 deaf persons in South Africa, including 6 000 Black, 2 000 English white, 2 000 Afrikaans white, 1 200 Coloured and 900 Indian (Gallaudet University 1986).

Whilst there are a number of primary and secondary institutions dedicated to the education of the deaf and hard of hearing, facilities which function on a tertiary level are limited. Research has indicated that there exists a dire need for a facility to fill this void, and to simultaneously accommodate experiential spaces as well as the administrative functions required for the proper management of the needs of this sector of the population.

The main objective of this dissertation is to create a centralized facility for the deaf and hard of hearing in Tshwane. This facility would focus on the wellbeing of the student and facilitate his or her introduction into society as a productive and well adapted individual through specialized and career orientated training and experiential exposure. As discussed in this document, the facility will serve as the headquarters for DEAFSA in Pretoria and also as a training facility in various fields. The provision of adequate and well-appointed facilities for the development of life skills for the deaf and hard of hearing is of paramount importance to achieve this objective.

Apart from the educational and administrative components, one of the main features of the facility will be a Sound Exploratorium. This will be a space where sound will be introduced through the four other senses, making it possible for those who are hearing impaired to experience sound.

Curiosity is intensified when the use of one sense is limited or totally absent. Sound will become another dimension of the architecture and will be introduced through the building fabric and other media. The individual will be guided through the building and experience the sounds of the city and their environment through their other senses.

Tagged sensory movement will guide the user through the facility, giving the individual a sense of power and accomplishment, and thus increasing the intensity of the experience. The architecture becomes a stage for activities where the visual and experiential dominates spatial understanding.

The facility will enable the user to experience the city in a different way and become aware of how sound influences us within the built environment.

2.0 Concept

Fig. 2.1

Client requirements:

DEAFSA requires a facility to accommodate the administrative and management component of the organization, as well as lecture spaces for the transfer of skills and training to cater for persons who have completed their formal school training. In addition, specialized spaces are required to facilitate sensory exploration for the deaf and hard of hearing.

Various facilities are currently catering for the deaf and hard of hearing in Tshwane. However, it has been established that no institution exists to facilitate tertiary training on a specialized level.

2.4 Associations and Departments:

- The Tshwane Deaf Association
- The Office for Disabled Persons

2.5 Schools:

- Sonitus School for the Hard of Hearing
- Transoranje School for the Deaf
- Dominican School for the Deaf (Pre-Gr12)
- Feladelfia School for the Deaf/Physically disabled/Blind
- Kommunika (University of Pretoria)
- The Eduplex

Within the deaf community, schools play an important role but it has been found that no facilities are provided for after-school activities or further training.

The aim of the proposed thesis project is to attract the general community and not only those with hearing difficulties. The facility will attract people from all social structures and backgrounds and make them aware not only of the issues that deaf people are faced with, but also of how the city is perceived through all our senses – especially sound.

2.6 FUNDING:

Funding will be provided in various ways:

- By DEAFSA (a government-supported agency)
- Through government funding and grants

2.7 DEFINITIONS:

- **HEARING LOSS:** Hearing loss in general entails the impairment of the sense of hearing to an extent that it interferes with communication and affects the social, emotional, educational and vocational aspects of the life of an individual (www/deafsa.co.za). People with hearing loss could be divided into two main groups:

- **HARD OF HEARING (H.O.H.):** This term refers to a person with minimum to moderate hearing loss, whose primary mode of communication is the spoken language and who could in most circumstances benefit from the use of a hearing aid (www/deafsa.co.za). The term "Hard of Hearing" will be referred to as H.O.H. throughout the document.

- **DEAF:** Deaf people can be divided into two sub-groups depending on the time at which the hearing loss set in:

- **Prelingual/congenital deafness (Deaf with a capital "D"):**
  This refers to a person who was born Deaf or became Deaf before the acquisition of the language of the immediate family. Such a person has moderately severe to profound hearing loss, belongs to Deaf culture and uses sign language as the prime mode of communication (www.deafsa.co.za).

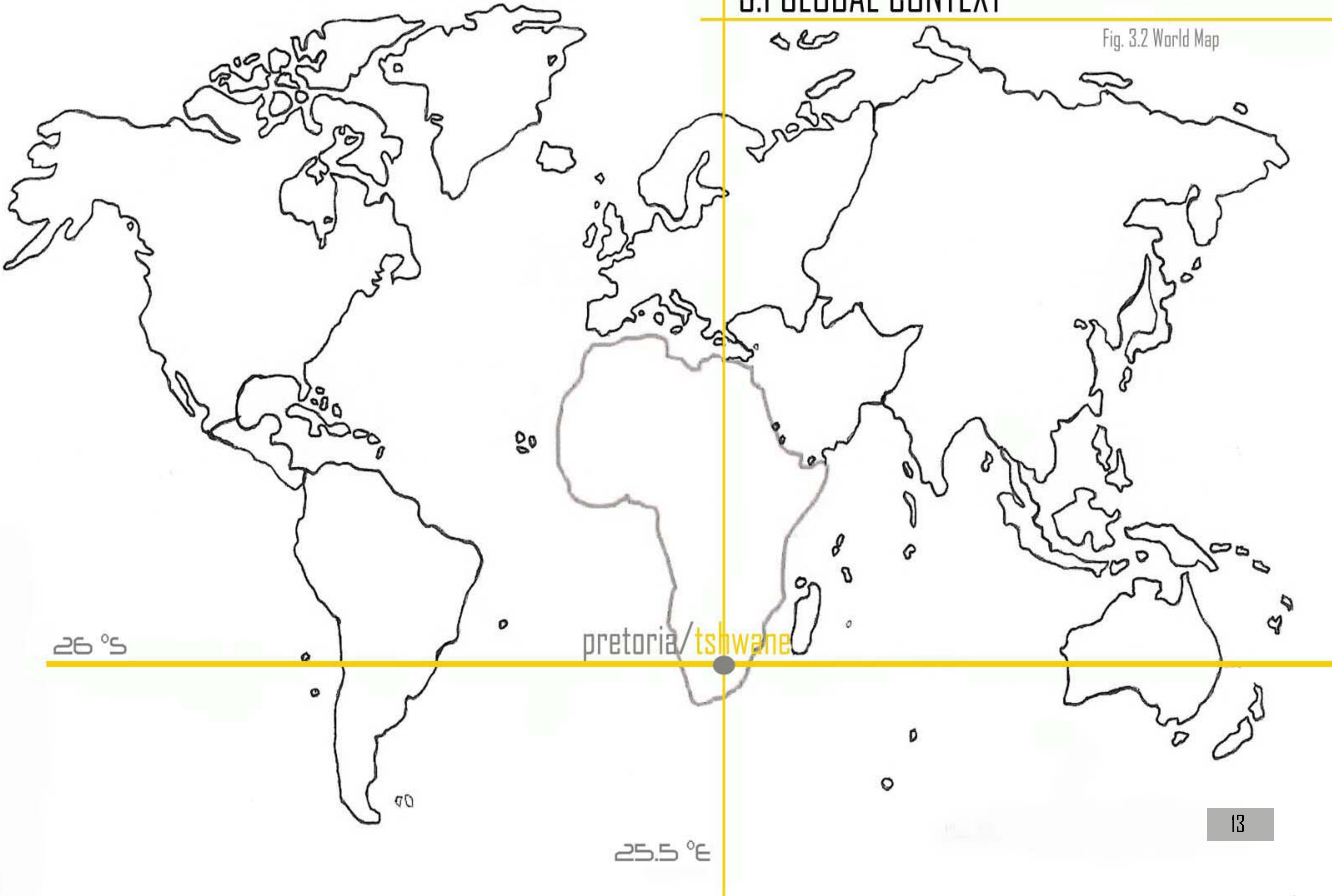
- **Post lingual/deafened:**
  This refers to a person who acquired moderately severe to profound hearing loss after the acquisition of a spoken language and who is dependent upon the visual sense for additional information for the purposes of spoken communication (www.deafsa.co.za).

3.0 Context

Fig. 3.1

3.1 GLOBAL CONTEXT

Fig. 3.2 World Map



1910 The Government buys a part of the Meintjieskop area for R32 500 for the Union Buildings
Union of South-Africa is formed, Pretoria remains administrative capital, Cape town - Legislative seat of parliament

1929 Founding of South-African National Council for the Deaf

Fig. 3.2.4

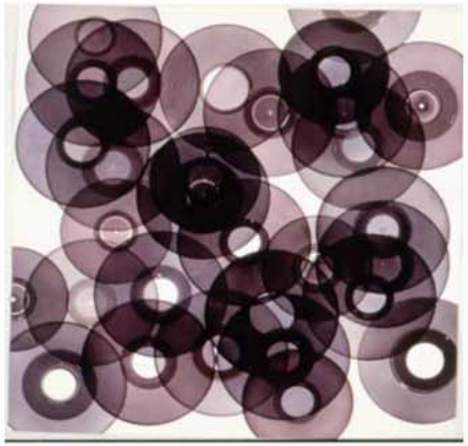


Fig. 3.2.3

1954 Establishment of Transoranje in Pretoria West

1961 South-Africa becomes republic outside the commonwealth

1976 Introduction of black languages to primary school level

1984 FDA approves first cochlear implant for marketing

1994 South-Africa's first democratic elections
5 May: N.Mandela sworn in as President of the new democratic R.S.A.

Interim constitution: 11 official languages
Only document accommodaging all official languagesf: Constitution on Languages

1996 Deaf TV is launched on SABC 3

2000 T. Mbeki is sworn in as President

Fig. 3.2.5

CLIMATIC DATA:

Position: 25º 44'S, 28º 11'E
Altitude: 1330m

Summer Temperature: 15º - 30º C (Ave: 25º C)
Winter Temperature: 6º - 25º C (Ave: 12º C)

Summer Rainfall: 125 – 375mm
Winter Rainfall: 62 – 250mm

Prevailing winds: N-E in summer, N-E to N-W in winter

Relative Humidity: 30 – 50%
Hours Sunshine: 60 – 80%

Optimum conditions for thermal comfort:

- Air Temperature 20º - 25º C
- Humidity 20 - 80% (80% at 25 ºC)
- Air Speed comfort up to 3.5m/s

Fig 3.3.2 Sun Angles: Tshwane

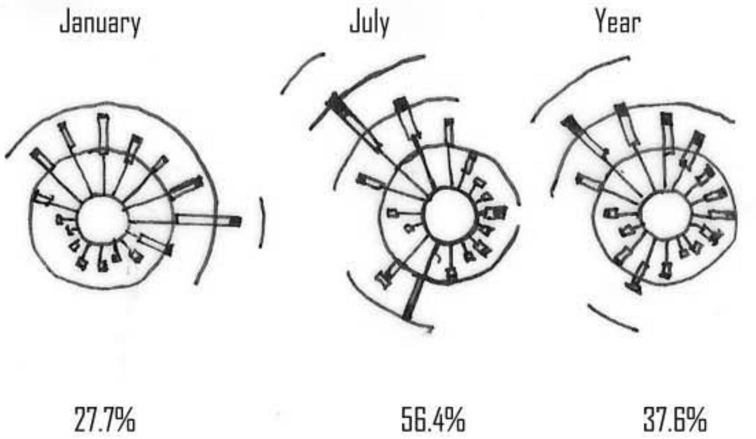
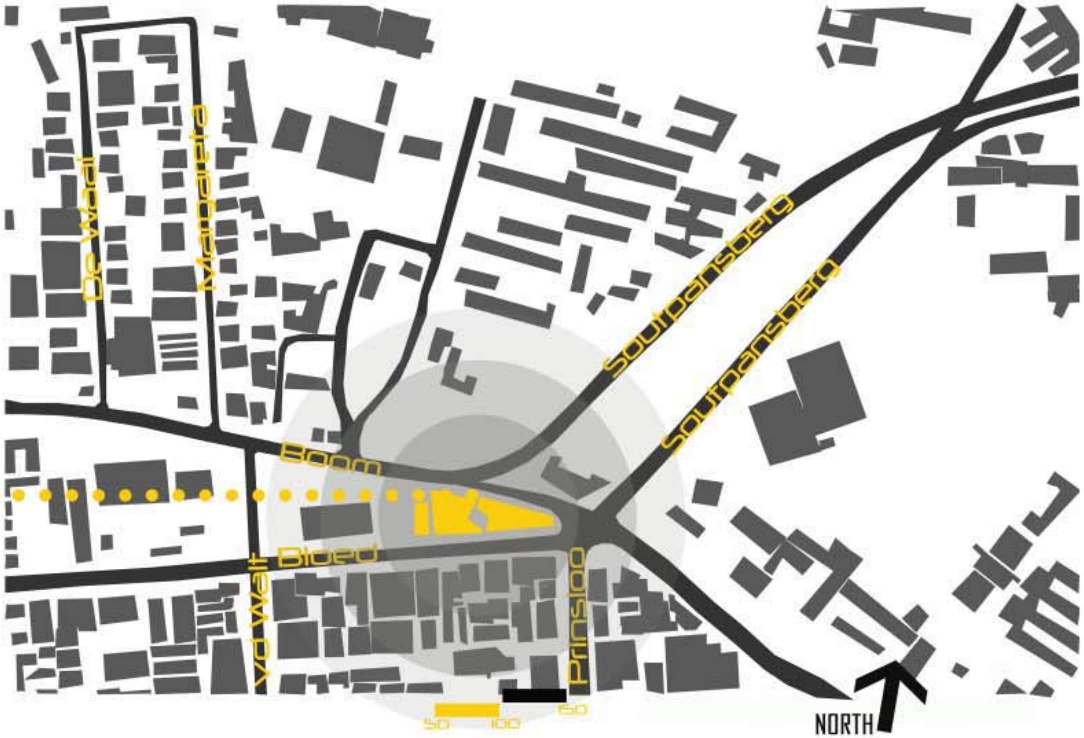


Fig 3.3.3 Windfans for Tshwane

3.4 CONTEXT: SITE

Fig 3.4.2 Figure G



Precinct 5 Paul Kruger North Precinct:

The proposed site is located in the Paul Kruger North Precinct on the edge of the Paul Kruger corridor and it is the first precinct on arrival from the north along Paul Kruger street. The area is defined by Boom Street in the north, Prinsloo and Andries in the east, Proes in the South and Schubart in the west. The precinct is characterized with city edge uses, vacant property and some unique facilities (such as the National Zoological Gardens, Blood Street Taxi facility, part of the el Ombre rail facility) as well as key heritage sites such as the Synagogue site and Jansen House. The precinct is one of the entry precincts to the TICP SDF (Tshwane Inner City Project Spatial Development Framework).

The redevelopment of the precinct should focus on an imageable gateway in the Inner City from the North, as the precinct is situated between the activity of the Church Street corridor and the arrival points, in terms of public transport and the institutional belt of the Zoological Gardens, educational institutions and the Pretoria State Hospital. (City of Tshwane 2005:199) The role of this precinct to act as connector between these components and the Inner City is important. "The thematic for the area is gateway, gateway in terms of learning access to health, education, information and public transport as well as access from the north. This builds on the existing initiatives of the Department of Education, the New National library and the Department of Health."(City of Tshwane 2005:200)

Site:

The site is located on the corner of Bloed and Boom Street where it joins with Prinsloo Street, this is a major link with the city zone as it joins with the Soutpansberg roads. The site is located within a gateway as determined by the TICP SDF and is currently not being utilized to its potential.

The site is located on the egde of the CBD, the city grid changes from an orderly structure to a dispersed structure towards the North. The figure ground study as shown in fig 3.4.2 indicates the change in density from the South to the North. The facility will act as a link between the busy hustle and bustle of CBD and the quiet medical precinct of Prinshof. Its aim being to capture the energy loss towards the North.

Currently most of the medical facilities in the city are located within the Prinshof area. Through its isolation from the CBD the general public are not exposed to education and health facilities.

The site was specifically chosen to bridge the gap between the Pretoria State Hospital and the CBD, and to act as a connector between the two areas. The facility aims to merge education and health and by not being isolated but within the CBD involve and educate the general public and not just the deaf and H.O.H. communities.

Reasons for choosing this site:

- Located on the periphery of the CBD grid between Prinshof and the CBD
- Underutilized Gateway site
- Surrounded by diverse functions and a rich urban fabric
- Strong visual links: Union buildings view to Gateway
- Easily Accessible
- Acts as connector between Prinshof and CBD

TREES:
Oriental Platen trees are found in Bloed and Boom Street

OPPORTUNITIES:
- Development of Gateway site
- Upliftment in area through education
- Development to bridge the loss of energy towards Prinshof

THREATS:
- Sound pollution
- Bad odour
- Pedestrian crossing through busy intersection
- Security

TRAFFIC DIRECTION:
Boom and Bloed street are both one way streets.

GATHERING PLACES:
Gathering places are mainly along sidewalks, shops, taxi ranks and street corners

Fig 3.5.2

Fig 3.5.5

Fig 3.5.3

Fig 3.5.4

Fig 3.5.8 Aerial view of proposed site towards the North.

Fig 3.5.9 Aerial view of proposed site towards the West.

ZOO:

The Zoo and other facilities affiliated with it is located on the North-Western side of the proposed site. This is a major tourist attraction and draws a lot of energy towards this part of the city.

RESIDENTIAL:

The residential component in this area lies to the North-West consisting of old delapidated houses. Most of the residence work in the nearby areas. (Urban Analysis group work)

COMMERCIAL:

Most of the area functions as general commercial and trade.

INSTITUTIONAL:

The medical precinct of Prinshof lies to the North-East of the city and this is where the city grid and density changes.

PARKING:

Parking is provided offstreet and undercover parking on-site is available for permanent staff. The new facilities developing ac-cross the will provide basement parking which is also available to use.

GREEN SPACES:

Coverage on the site currently is very high and very little green space is provided. Outside areas are to be created using court-yards.

MARKETS:

Street markets are all along the sidewalks. Containers are blocking the sidewalks currently and the buildings relate very little to the sidewalk in Boom street where in Bloed street all the shops open up to the street.

LOSS OF ENERGY:

Loss of energy is to the North-East of the CBD towards the medical precinct of Prinshof.

Fig 3. 6.2

Fig 3.6.3 - Fig 3.6.4 Figure Ground studies

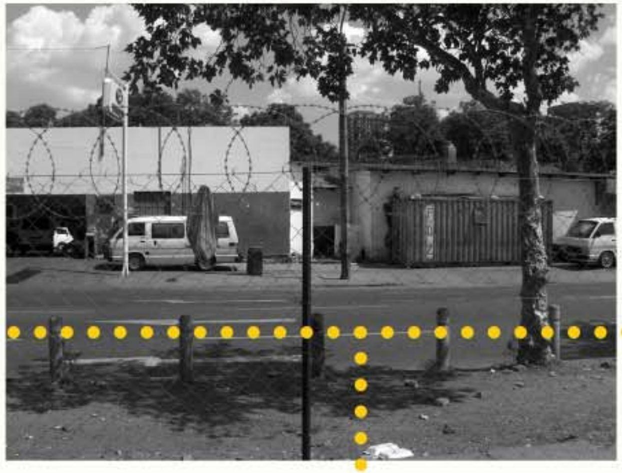


Fig 3.6.5

Fig 3.6.6

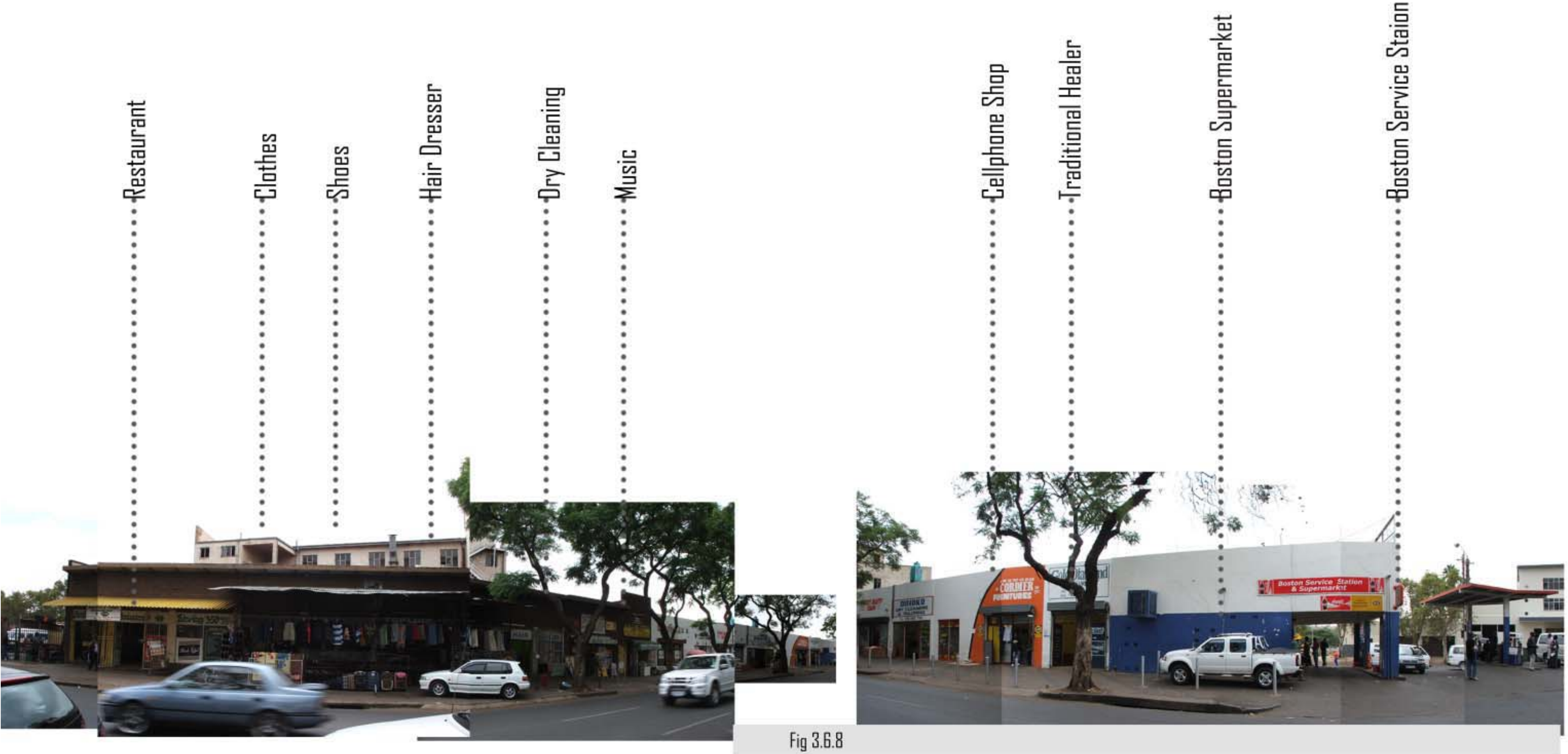


Fig 3.6.8

Existing panorama across proposed site from Bloed street - 27 March 2007

BUSES:
Main bus routes pass the site on the North in Boom street and then turn South into Prinsloo street.

PRIVATE VEHICLES:
Private Vehicles pass the site on both Boom and Bloed street.

CYCLISTS:
Very few cyclists were found in the area.

TAXIS:
Taxi's pass the site on both Bloed and Boom street. The Boston filling station on the corner is a major generator as is the Taxi ranks found in the area.

PEDESTRIAN ROUTES:
Pedestrian routes are mainly along sidewalks and through the taxi ranks.

Fig 3.7.3

Fig 3.7.2

Fig 3.7.4

Land use/uses permitted:

Business, government, parking garages, parking sites, places of instruction, places of public worship, places of refreshment, residential buildings, restricted industries, shops, social halls, vehicle sales marts (City of Tshwane 2007:1)

Uses with consent:

Dwelling houses, filling stations, institutions, motor workshops, places of amusement, public garages, restricted industries, special buildings, sports grounds, warehouses(City of Tshwane 2007:1)

Uses not permitted:

Panel-beating and spray painting, other uses not above.(City of Tshwane 2007:2)

Density: N/A(City of Tshwane 2007:2)

Coverage: In accordance with the approved site development plan(City of Tshwane 2007:2)

Height: 15m

Floor space ratio: 1:1(City of Tshwane 2007:2)

Building lines: In accordance with the approved site development plan (City of Tshwane 2007:2)

SERVICES:

Service connection will be made to already existing municipal connections

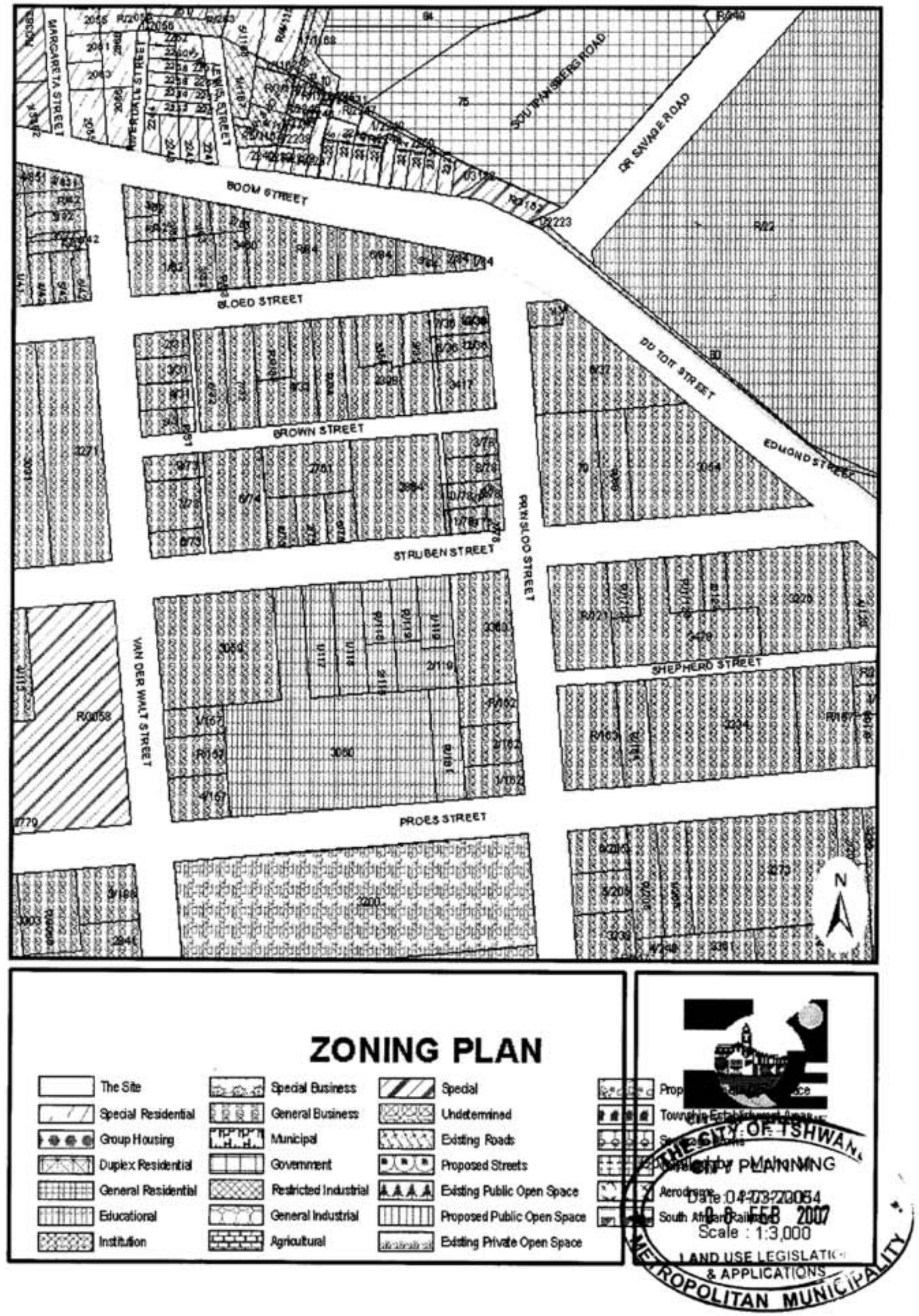


Fig 3.8.2

Fig. 4.1

4.0 Normative Position

"The planner of an exhibition attempts to foresee people's behaviour and predict where they will hurry, stop, look, or drift on. His aim is to control the flow and arrest it where he wants; but controlling the flow does not mean that people are to be moved along predestinate grooves like trams or shuffled around hurdles like sheep. Ideally the planner is aiming to direct people's movement in such a way that they see what there is to see with ease and in their own time. He must also ensure that the public does not get lost, tired, or bored with the whole affair." James Gardner

Caroline Heller (Simonds 1961:147)

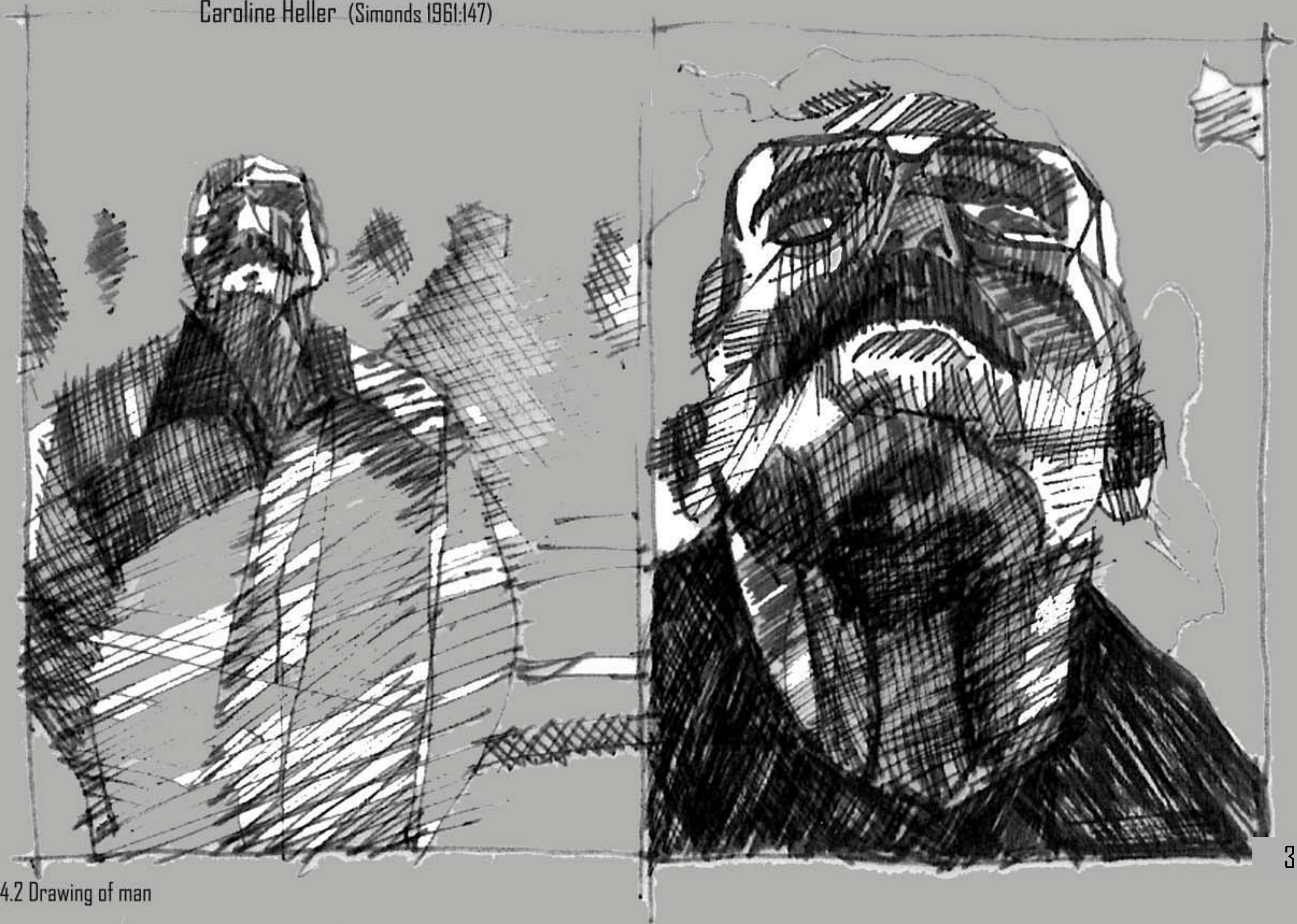


Fig. 4.2 Drawing of man

The design facilitates the above through a comprehensive electrical and data network linked to electronic signage. An easily negotiable linear axis, free of obstruction, is applied in the design.

When a sound message addresses a specific visual cue, the user will normally do a visual search for the information when it is perceived in the verbal message. For a deaf person this becomes a problem, and therefore all sound messages must be accompanied by subtext, for example revolving electronic sign boards which will attract the user's attention.

Multiple mode information systems denote the following:

- The user's current location, including the direction the user is facing/traveling which is clearly marked and indicated with brightly coloured signage throughout the facility.

- Directions to the destination: Upon arrival at the facility, external information boards on the building facade will clearly state where each component is located.

- The Layout of the environment: The building components are placed along the east-west and north-south axes, making it easy for the user to orientate himself within the facility. The plan is kept simple and easy to navigate.

- The Pedestrian Crossing: As the facility is located next to a taxi rank it is important to create a traffic calming zone where pedestrians cross. Sufficient lighting is provided at the crossing and a running light strip is recessed into the road to indicate when it is safe to cross.

5.0 Precedents

Fig. 5.1

Plettenberg Bay, South Africa
Architects: OMM design workshop

Source: Digest of South African Architecture 2006/2007 p. 196-199

The house is designed as a continuation of the rolling dune. The dune becomes the front living deck, which becomes a (not) vertical slatted timber veil to the front elevation, which rolls over the top of the extruded house length, forming a new horizon along the top of the ridge. The timber screen, becoming grey over time, is a camouflage, skin, with the surrounding fynbos nestling up to its edges. Only when the panels of the screens are hydraulically raised to connect the inside space more directly with the outside living areas, forming horizontal shading panels, are glimpses of an internal world allowed.

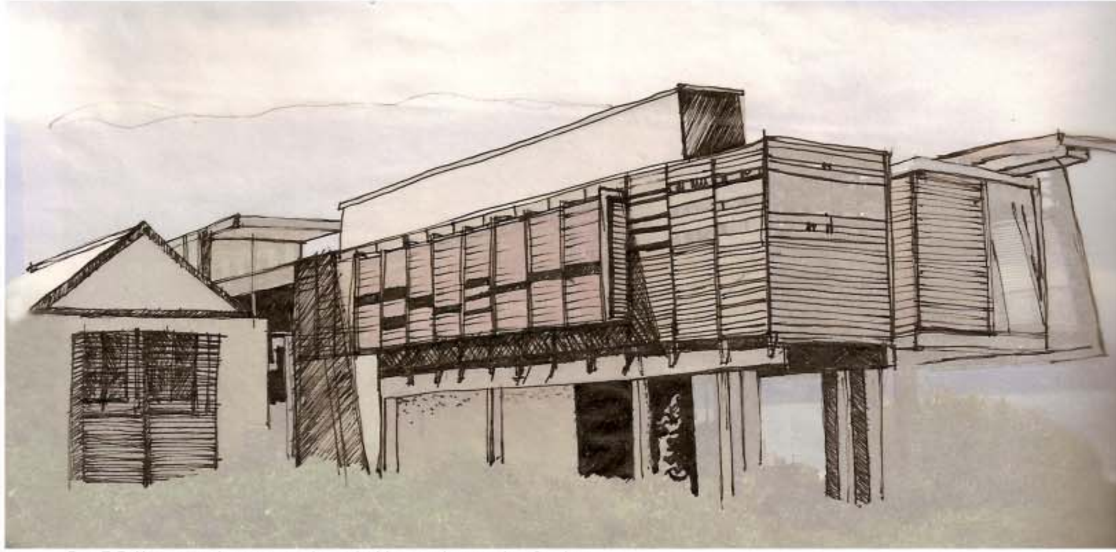


Fig. 5.2.4Image indicating timber cladding to be used in facility

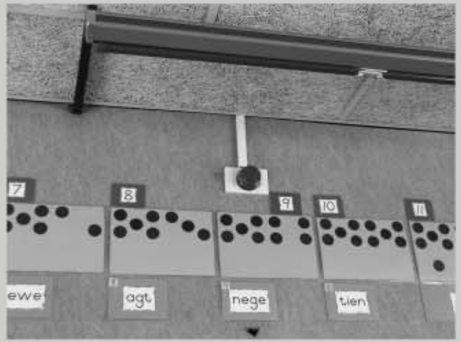
Fig. 5.2.1

Fig. 5.2.2

Fig. 5.2.3

LESSONS LEARNED:

- Permeability of building to be incorporated in circulation spaces
- The use of timber decking and cladding
- Light filtration and shadow-fall to be incorporated into design



Acoustic materials applied to walls in classrooms and flashing light indicating. Fig. 5.3.4

Layout of classroom Fig. 5.3.5

Fig. 5.3.6

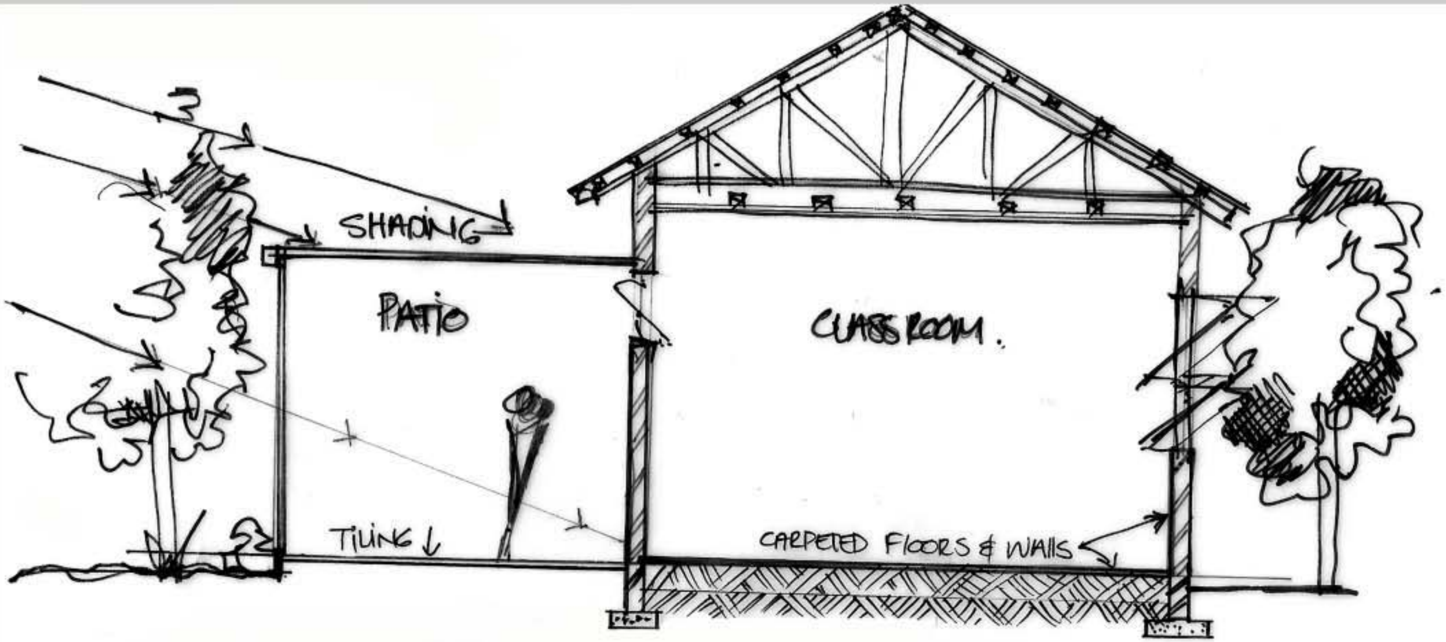


Fig. 5.3.9

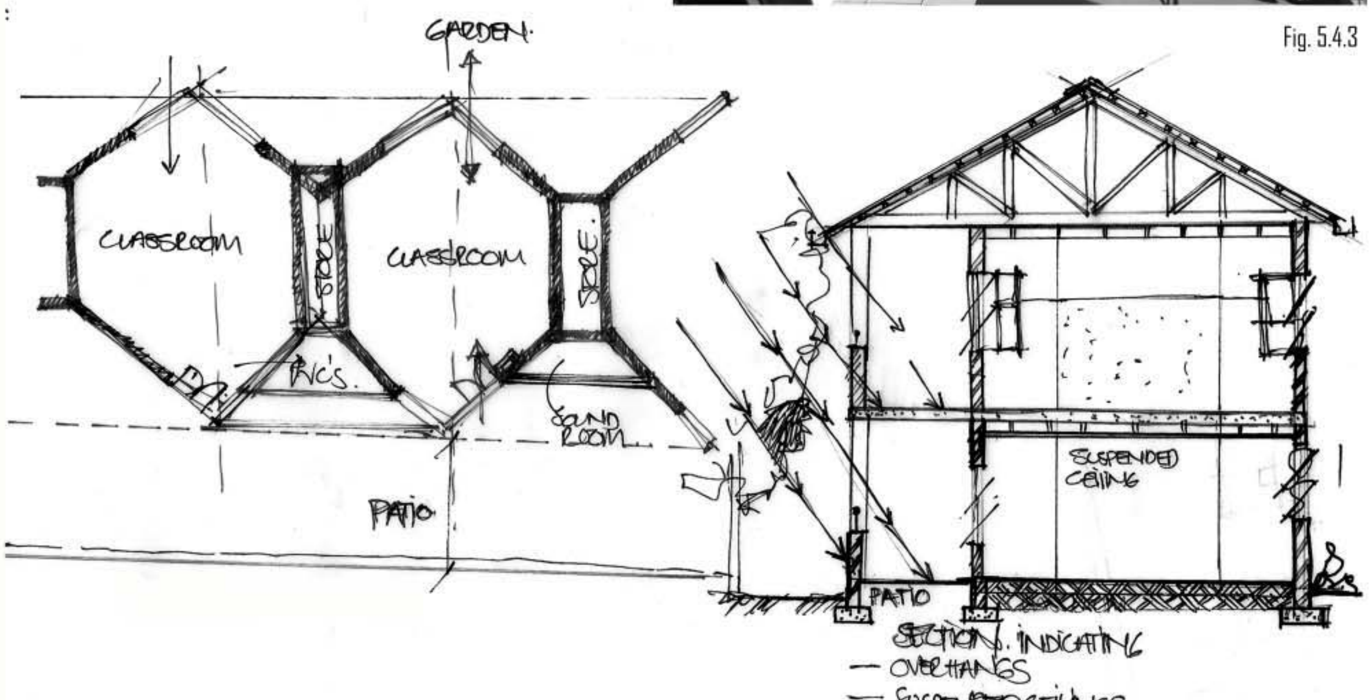
Fig. 5.3.7

Fig. 5.3.8

LESSONS LEARNED:

- Carpeting on walls and floors
- Acoustic material used within ceilings and walls
- FM system incorporated into all rooms
- Cross ventilation
- Power skirtings
- Placement of storerooms and test rooms for individuals between classrooms to prevent sound bridging
- No direct sunlight into rooms
- Security to facility
- Visual links throughout facility
- Inside outside relationship between classrooms and landscape
- Sensory experience of the landscape
- Cross ventilation
- Facility should be suitable for the disabled as many of the hearing impaired are disabled.
- No direct light into classrooms to ensure visibility of teacher
- Coloured lights mounted in front of classroom indicating bell ringing or danger
- White board in front of class with projector for visual media
- Carpets on walls and floors for sound absorption.
- Speaker should be visible at all times
- Proper lighting to be fitted – twice as much as in a usual classroom- so as to make individuals clearly visible
- Speaker and students should have full view of each other
- Big television screens
- Information boards are to be used throughout facility
- All visual media should be translated and conveyed through subtitles
- ATM facilities should make use of images

Fig. 5.4.3



Plan and Section through typical classroom indicating overhangs, suspended ceilings and acoustic treatment of rooms.

Fig. 5.4.4

5.6 HELSINKI MUSEUM OF CONTEMPORARY ART

Finland Helsinki
1993/1998
Competition First Prize
Architect: Steven Holl
Source: Richard C. , Levene y Fernando Marquez Cecilia. 1999.
... *In search of a poetry of specifics, Steven Holl 1996-1999.* El Croquis Editorial,Madrid, Spain.

Kiasma, Museum of Contemporary Art, located in central Helsinki at the foot of the Parliament building to the west. The challenging nature of the site lies in the confluence of various city grids at this junction.
(Richards et al 1999:50)

Fig. 5.6.3

LESSONS LEARNED:

- The use of timber shuttering for concrete shuttering
- Ramp curving into concrete wall
- The use of reflected light against ceiling
- Building shape on a similar shape site and confluence of city grids

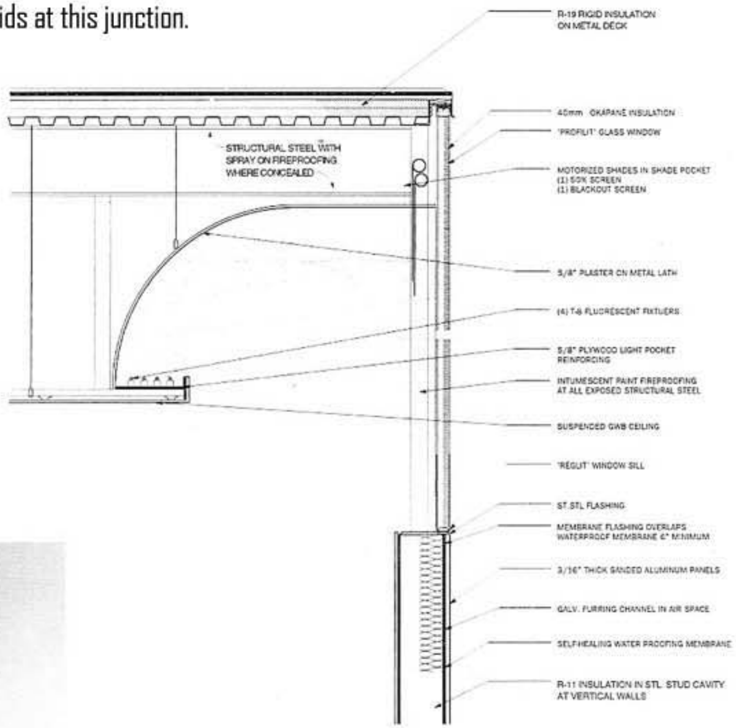
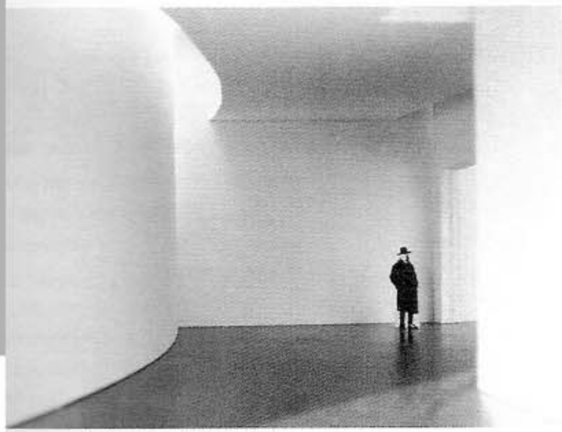


Fig. 5.6.4



Estudio de iluminación y detalle en sección de Galería Sur
Lighting study and section detail of South gallery

Fig. 5.6.2

THE USE OF REFLECTED LIGHT AGAINST SUSPENDED CEILINGS WILL BE INCORPORATED WITHIN THE CIRCULATION/WAITING AREAS.

Fig. 5.6.1

6.0 Baseline Indicators

Fig. 6.1

6.1.2 INCLUSIVE ENVIRONMENTS:

Buildings can be designed to accommodate everyone. Ensuring that buildings are inclusive supports sustainability as replication is avoided and change of use supported (Gibberd 2004: SBAT).

Public transport:
The facility links up with public transport systems and is located next to a taxi rank. Major bus routes pass the site on both streets flanking the building and are easily accessible. Off-street parking is provided for both visitors and staff. Disabled parking is provided near the entrances, and delivery areas are located in the same area. Designated parking for bicycles is provided. Basement parking is available in the adjacent building, which is in close proximity to the site.

Routes, signage and level changes:
All pedestrian routes accommodate wheelchair users. Surfaces are treated with acoustically sound materials to limit noise. A ramp with an incline of 1 to 12 provides access for wheelchair users to the upper floors. The main entrance is accentuated for easy visual recognition, whilst a separate entrance is provided for deliveries.

Clearly visible signs and computerised boards aid orientation and incorporate visual signals as well as audible warning signals connected to fire alarms and door bells. Road crossings are indicated by recessed red light strips on the tarmac (for more details, see 'Communication' below).

Toilets and ablutions:
The required number of facilities is provided in accordance with the National Building Regulations (SABS 0400). Dual-flush toilets are to be installed throughout the building. Disabled toilets with handrails and large doors which open outwards are provided in each building. The height and position of water controls allow for operation by all users. Occupied signs that light up are fitted to all toilet doors to indicate when a unit is occupied.

6.1.3 ACCESS TO FACILITIES:

"Conventional living and working patterns require regular access to a range of services. Ensuring that these services can be accessed easily and in environmentally friendly ways supports sustainability by increasing efficiency and reducing environmental impact" (Gibberd 2004: SBAT).

The cafeteria and restaurant:
A restaurant is provided within the complex where deaf people will be employed and trained to work as kitchen staff. It will act as a cafeteria during the day and as a restaurant for the general public during the evenings.

Banking:
An ATM machine is provided within a 3 km radius of the complex.

Communication:
Telephones are provided for the general public, and systems that convert audio into text on screens are provided for all deaf visitors and users. Internet and broadband systems are available throughout the complex; visual boards are mounted onto walls with subtext making it possible for all users to understand the information provided. Flat-screen television monitors with direct access to the Internet are provided in each training room. Power skirtings are provided for cabling throughout the building. Wireless systems are also employed in the building.

6.1.4 PARTICIPATION and CONTROL:

Environmental control and user adaptation:
Users should have a reasonable amount of control over their immediate environment, such as openable windows. People using the cafeteria can choose between the air-conditioned area inside or the naturally ventilated areas outside. Individual door panels can be moved to suit the user. Areas are provided for personalisation within the complex, such as pin-boards, graffiti walls and visual interaction via the computer room.

Social spaces:
Spaces are provided for both formal and informal interaction. Formal interaction takes place in lecture rooms and auditoriums. Seating is provided in informal areas in circulation spaces throughout the facility to promote interaction.

Community involvement:
Spaces such as the Exploratorium, restaurant, and internet café are provided for the public. These spaces involve the general public and make them aware of the deaf and deaf culture.

6.1.5 EDUCATION, HEALTH AND SAFETY:

"Buildings need to cater for the well being, development and safety of the people that use them. Awareness and environments that promote health can help reduce the incidence of diseases such as AIDS. Safe environments help to limit the incidence of accidents and where these occur, reduce their effect. Learning and access to information is increasingly seen as a requirement of a competitive work force. All of these factors contribute to sustainability by helping to ensure that people remain healthy and economically active, thus reducing the 'cost' (to society, the environment and the economy) of unemployment and ill health" (Gibberd 2004: SBAT).

To limit water use, efficient devices such as dual-flush systems are used. Run-off is collected and directed towards planted courtyard areas. Pervious/absorbent surfaces are used in paved areas to reduce run-off. Rainwater is collected, stored and used for the watering of plants, etc.

6.3.2 ENERGY:

"Buildings consume about 50% of all energy produced. Conventional energy production is responsible for making a large contribution to environmental damage and non-renewable resource depletion. Using less energy or using renewable energy in buildings therefore can make a substantial contribution to sustainability" (Gibberd 2004: SBAT).

Lighting:
Natural lighting is used throughout the building. Direct sunlight is screened off on the east façade during the early mornings, to avoid unwanted glare which may prevent the deaf user from seeing individual facial expressions clearly. Artificial lighting is available at all times to ensure adequate visibility. Light fittings are fitted with low-energy fluorescent luminaires (refer to Lighting in Chapter 9.0).

Ventilation:
The auditorium and lecture rooms are fitted with air-conditioning. In the lecture rooms, where windows with opening sections cannot be used due to sound bridging, mechanical ventilators are employed to remove stale air.

The use of air-conditioning is kept to a minimum due to the increased energy consumption and noise generated by the units. To cool internal circulation areas, natural ventilation is maximized by means of high level windows with opening sections to allow warm, stale air to escape. Extractor fans are used in areas such as kitchens to aid ventilation (refer to Ventilation in Chapter 9.0).

Heating and cooling:
Energy-efficient systems are used in the building to control temperatures passively.
Passive heating occurs throughout the building through direct heat gain and thermal massing.
Passive cooling is achieved by utilizing ventilation and the building's thermal mass. Openings are shaded and the northern façade of the building is protected by overhangs and horizontal timber louvers to prevent uncontrolled solar gain.

6.3.3 THE SITE:

Landscape inputs:
Plantings for the sensory garden are mainly indigenous, although exotic plants not native to South Africa are utilized for specific purposes. Plants have been chosen according to the prevalent microclimate. Trees in courtyards have large canopies to provide maximum shading.

6.3.4 RECYCLING and RE-USE:

"Raw materials and new components used in buildings consume resources and energy in their manufacture and processes. Buildings accommodate activities that consume large amounts of resources and products and produce large amounts of waste. Reducing the use of new materials and components in buildings and in the activities accommodated and reducing waste by recycling and reuse supports sustainability by reducing the energy consumption and resource consumption" (Gibberd 2004: SBAT).

Inorganic waste:
A management policy and strategy should be implemented for inorganic waste to be sorted, stored and disposed of at a recycling plant in the area.

Organic waste:
Organic waste is to be recycled and disposed of on site; grey water is to be recycled and re-used through a dual pipe system and gravity pumps.

Construction waste:
Construction wastage is to be limited through design to comply with the modular dimensions of materials, and through the careful management of the construction process.

6.3.5 MATERIALS and COMPONENTS:

"The construction of buildings usually requires large quantities of materials and components. These may require large amounts of energy to produce. Their development may also require processes that are harmful to the environment and consume non-renewable resources" (Gibberd 2004: SBAT).

Materials are chosen for their low embodied energy values, limited potential environmental damage, for their recycling and re-use

Fig. 7.1

7.1.2 STEEL STRUCTURE DESIGN:

The initial structural concept of the facility was set out on a grid of 1200mm increments.

The buildings structure would consist of profiled I-beam columns and beams the greater the span of the building becomes the closer the spacing of these structural elements become.

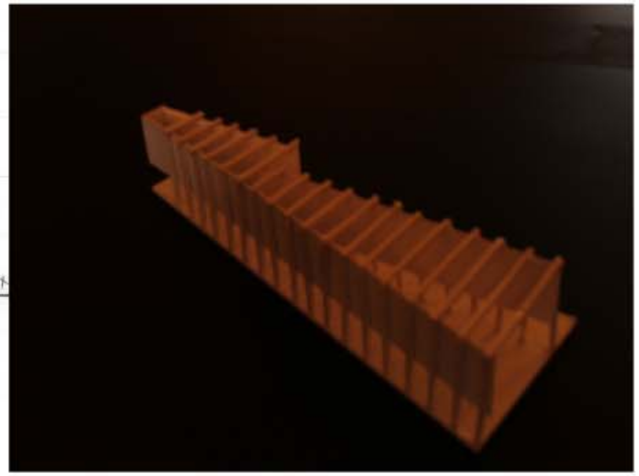
The concrete infill [illegible] pose made prestressed hollow core concrete slabs. Walls would be off-shutter concrete cast in 2500mm portions.

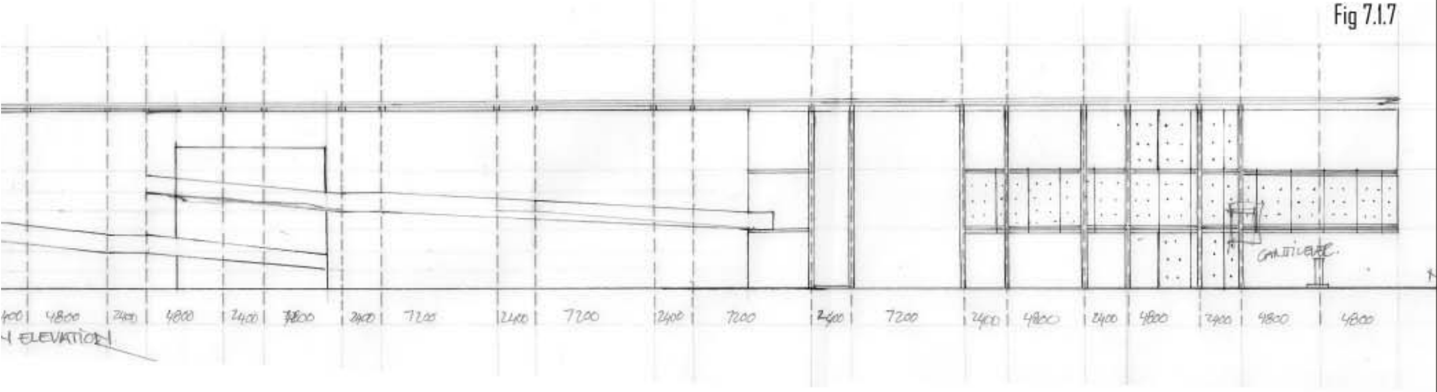
The steel structure would be exposed and the concrete pods would be suspended within the steel structural elements .

It was decided that the steel infill structure was an impractical solution for the facility and that a concrete structure would be more suitable.

Fig 7.1.8

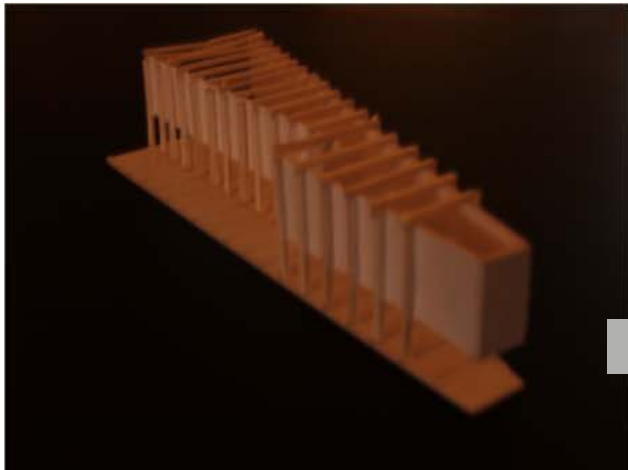
Fig 7.1.7

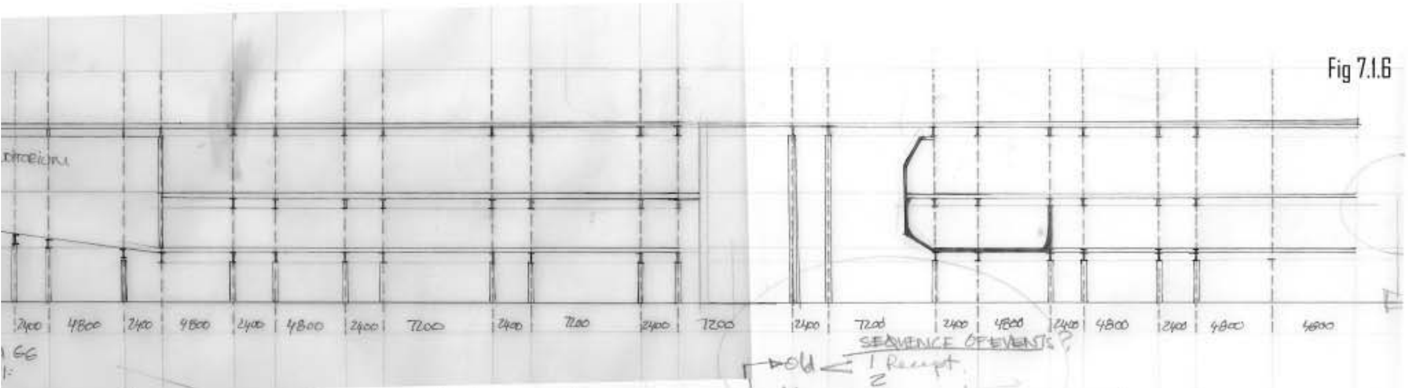




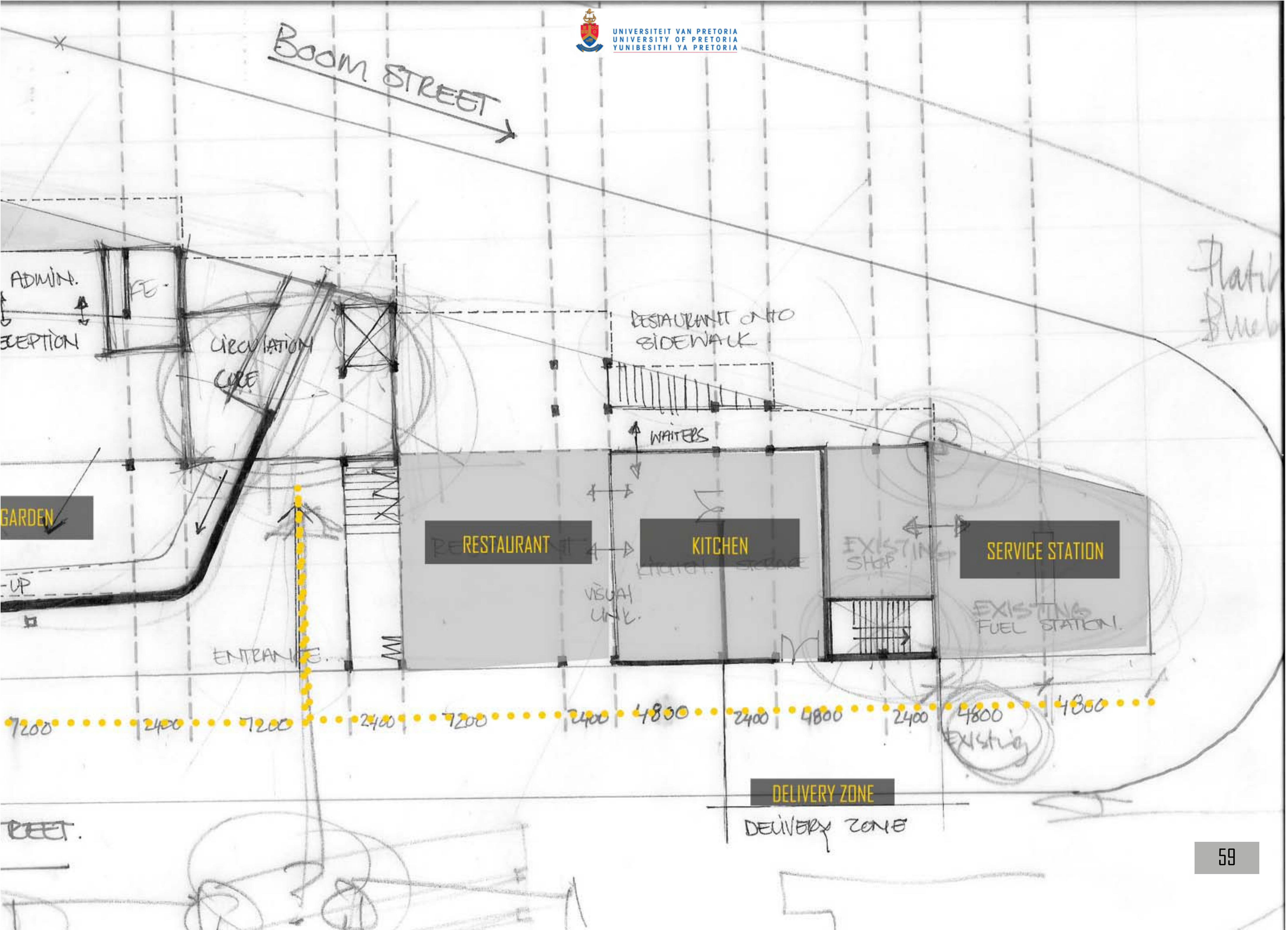
Concept elevation indicating structural steel profiles Fig 7.1.4

Fig 7.1.6





Concept section indicating steel column and beam structure Fig 7.1.5


Boom STREET
ADMIN.
CIRCULATION CORE
RESTAURANT ONTO SIDEWALK
WAITERS
GARDEN
RESTAURANT
KITCHEN
SERVICE STATION
VISUAL LINK.
EXISTING SHOP
EXISTING FUEL STATION.
ENTRANCE.
7200
2400
7200
2400
7200
2400
4800
2400
4800
2400
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4800
DELIVERY ZONE
DELIVERY ZONE

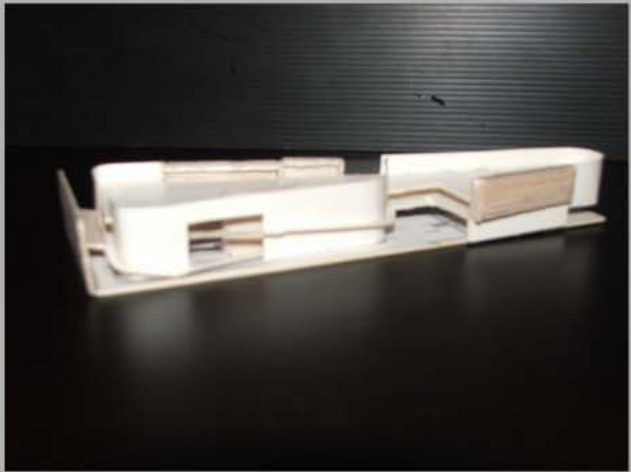


Fig 7.2.4 Southern view from Bloed Street

COMPONENTS OF THE DESIGN:

Administration, Liaison and Offices:

Located at the entrance to the facility and grouped togehter due to interaction between functions.

Computer Room:

Situated close to the reception area for easy access by students, public and for maintenance purposes.

Lecture rooms:

Lecture rooms have been designed to be flexible to varying programmes. The lecture rooms have been kept to a moderate size except for the auditorium. Lecture rooms are quiet intimate places and the user needs to be in close visual contact with the speaker. Windows are placed at a high level behind the students in Lecture rooms one and two. Where in the other three lecture rooms the windows are placed at the front of the room or on the side. These windows are covered with the timber shading devices letting filtered light enter the rooms.

Movement routes:

Movement routes through the facility were a major factor in the planning of the building. These routes arent merely for circulation, but become 'places' along the route. and are defined by seating areas, activity areas, balconies/corridors. Thus the movement route becomes a connector to these various "pauses" changing the function and meaning. These routes allow interaction between users and create opportunities for informal activities.

Fig 7.2.5 Perspective view from Bloed Street

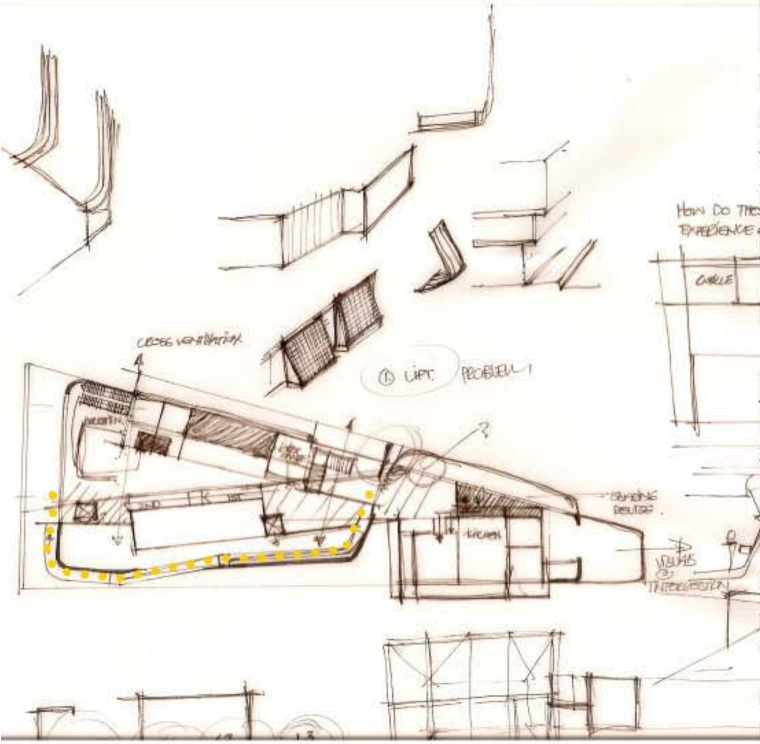


Fig 7.2.7 Concept First Floor Plan

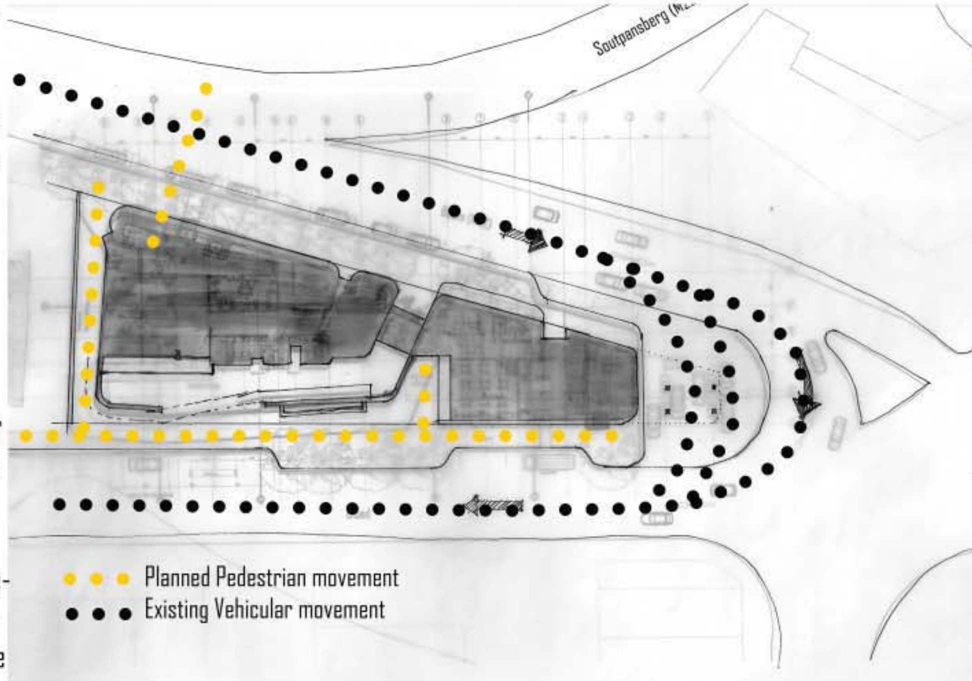


Fig 7.2.8 Concept Footprint and planned movement on site

Fig 7.3.2 Southern Perspective

Fig 7.3.4 Northern Perspective

Fig. 8.1

8.0 Architecture and the Senses

Fig 8.2.1

8.2 SOUND

Introducing sound in architecture for the deaf community can be accomplished in the following manners:
- Designing the building acoustically correct
- Enhancing the sound through installing Phonak FM systems throughout the facility.
- Enhancing wanted sound

FM Systems:

A multi frequency FM system is a system that picks up the voice of the teacher through a Campus S transmitter transmitting it through an integrated microphone wirelessly to the pupil's/user's receiver. The "Wallpilot" eliminates the need to re-set frequencies manually as each room is fit with its own "wallpilot" with a specific frequency.

This system brings decreases the distance that sound has to travel from the speaker directly to the listener.

PHONAK:

Phonak FM receivers:

MLxS

The MLxS is the world's smallest high-performance FM receiver and allows frequency synchronization with WallPilot, Campus S and SmartLink.

It has an intelligent sleep-mode function. The MLxS enables students to move between classrooms without having to manually adjust the frequency of the receiver.

Fig 8.2.2

ML8S and ML9S

These instruments include all the features of the MLxS and have been designed specifically to be worn behind the ears.

Wall Pilot

The WallPilot synchronizes the frequency for all Phonak multi-frequency receivers and sets the students to the correct channel as they walk through the door of any class-room. This enables students to move be-tween classes without interference from other classes.

Phonak FM transmitters:

Campus S

Campus S is best suited for the classroom and allows Direct Frequency Synchroinization (DFS) of the FM receiver, simple channel selection, keypad lock amongst others. Using DFS and the pressing of a button, a teacher is able to change the channel of a receiver (MLxS, ML8S and ML9S) to enable individual discussion whilst allowing other students to continue with their work, without being disturbed.

EasyLink

The EasyLink transmitter is an easy to use device with high sound quality.

Fig 8.2.3

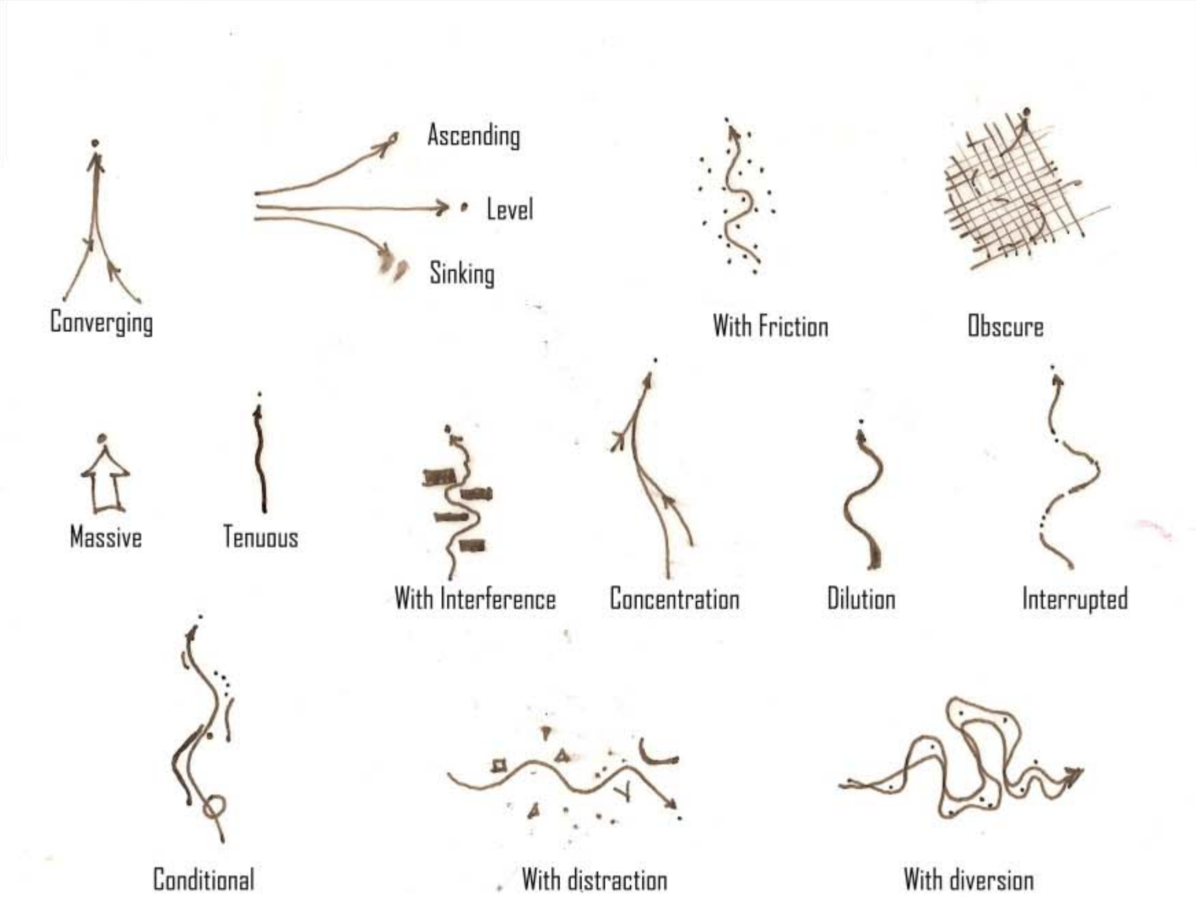
Fig 8.2.4

Fig 8.2.5

Fig 8.2.6

Fig 8.4.1

8.6 KINEMATICS OF MOTION



In the design of the pivot walls pure motion was investigated. Movement of these walls dont merely create interesting light fall on the walls but also allow the user to experience various forms of movement as seen in the diagrams below.

The allignment, speed and nautre of motion produces in a subject a predictable emotional and intellectual response and has to be carefully considered and controlled. The abstract qualities or a line or path by which the walls are approached by must also be considered carefully. (Simmonds. 1961:147)

Motion becomes induced within the movement of the wall as the individual takes control over the environment and manipulates it to create various forms of movement.

Fig 8.7.9

SOUND:

Although a Deaf person cannot actually 'hear', they can experience sound in a variety of ways. Sound can be experienced by the Deaf person through means of the haptic sense. e.g. the feeling of dry leaves crunching underfoot, or the sense of walking on a pebbled walkway or chips of bark etc.

The Deaf person's sight will zoom in on the movement of leaves rustling in the wind, water trickling, birds, or any other moving thing, and in they will compensate for the inability to hear in this manner. The vibration of bamboo stems moving in the wind can be sensed by the Deaf person

TOUCH:

A wide variety of items can be experienced through the sense of touch. Sharp thorns, a variety of textures, sticky fruit, different temperatures, i.e. hot and cold water, rough bark etc.

Fig 8.7.12 Acacia xanthophloea

Fig 8.7.13 Typha capensis Bullrush

TASTE:

A variety of plants and fruits tantalise the taste buds, and can be experienced by an impaired individual. This sense is further reinforced by the olfactory sense.

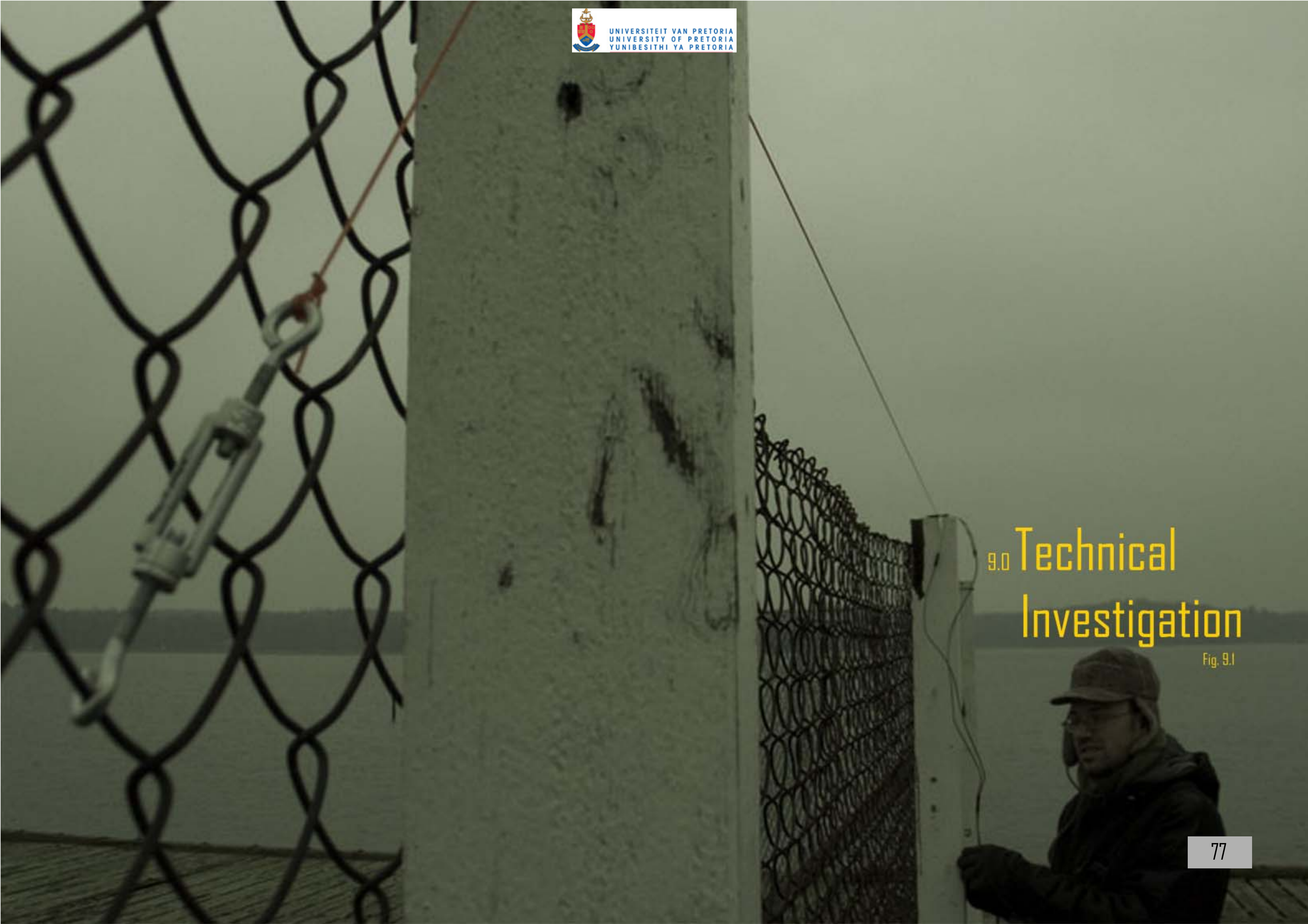
Fig 8.7.14 Dovyalis caffra

Fig 8.7.15 Cyathea dreigei

Fig 8.7.9 Cynodon

Fig 8.7.10 Juniperus communis

Fig 8.7.11 Rhus lancea



9.0 Technical Investigation

Fig. 9.1

9.3 THE BUILDING STRUCTURE:

The structure of the building consists mainly of an in situ column and beam system with cast in situ slabs and infill panels. In addition, sheer concrete walls form a major part of the supporting structure, and function simultaneously as noise barriers, free-form aesthetic elements and primary orientation elements.

The basic structure consists of 400 x 400 cast in situ concrete columns set out at intervals.

The greater the depth of the building, the closer the spacing of the columns.

The main structural elements:

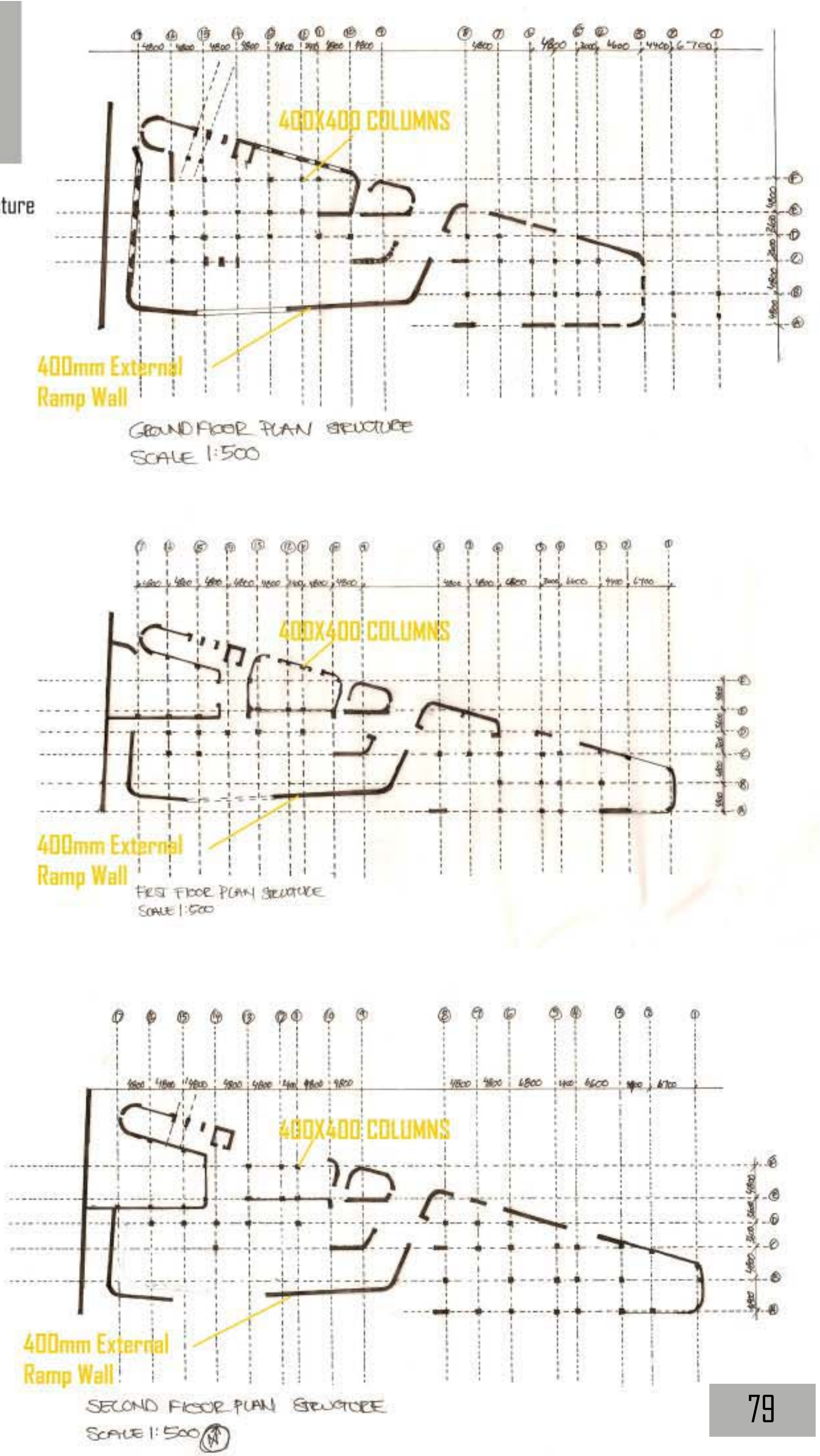
First and second floor slabs: 255 mm cast in situ concrete slabs.
Roof: 150 mm cast in situ concrete with waterproofing as detailed.

External concrete walls: 400 mm off-shutter concrete with a timber shutter finish. The concrete is cast in 2500 mm portions separated by construction joints and are sealed after curing.

Internal walls: 110 mm and 220 mm brickwork, plastered, painted and covered with carpet or timber cladding as specified.

Internal concrete walls:
- 400 mm off-shutter concrete walls
- 200 mm off-shutter concrete walls with 19 mm perforated commercial plywood boards on 38 x 38 mm bearers at 400 mm centres, fixed to the wall with masonry nails @ 400 mm centres, and backed with sound absorbing material

Fig 9. 3.1 Diagram indicating concrete structure



9.5 WATER:

Rainwater:

The greatest part of the drainage surface of the roof consists of 150 mm cast in situ concrete. The cement screed and waterproofing are laid to fall and the roof is drained by cast iron rainwater outlets cast into the slabs, with 80 dia. mild steel galvanised down pipes placed in the columns. Waterproofing is modified bitumen sheeting, consisting of a polyester core impregnated with polymer-modified bitumen, of type APP (atatic polypropylene) wax-modified bitumen membrane. The greatest volume of the rainwater collected from the roof drains into a 340 mm storm water channel that runs on the pavement past the building and leads to the underground storm water harvesting system. The rest is directed to the courtyard and used to water the planted areas.

9.8 ORIENTATION:

The orientation of the building is pre-defined by the orientation of the site. The shape of the site forms a boundary for the building and places constraints on its shape. The two longitudinal sides of the building face north and south. Areas for computerised exhibits are mostly accommodated on the cooler southern side, or otherwise within well insulated areas on the northern side. Through its insulating properties, the mass of the building plays a major role in overcoming unsatisfactory orientation constraints. All offices and classrooms are placed on the northern side of the building and exhibition areas are provided in the circulation spaces, taking advantage of the southern light.

9.9 NATURAL LIGHT:

Natural lighting is used as far as possible to illuminate interior spaces. Direct sunlight and glare which have a negative impact, especially in educational spaces, are minimised and controlled by louvered screens, the shape of the building, and the placement of glazed panels. The use of natural light reduces the energy consumption of electric luminaries, the use of which is limited to the circulation areas which do not require high lighting values. Natural lighting conditions remain an important component of the visual experience of the deaf and H.O.H., and are therefore applied as far as possible to facilitate this fact. As previously discussed, natural light control is achieved by louvered screens or other devices, where required.

9.10 SOLAR CONTROL:

The building houses a variety of functions with variable climatic requirements. These necessitate careful design strategies to ensure optimum human comfort levels through solar control.

The main passive solar control elements are the following:

- High thermal mass: concrete roof and walls
- Brick walls: fly wheel effect
- Light-coloured concrete: exterior walls of the building reflect solar heat instead of gaining it through absorption
- Minimisation of glazed surfaces: on the western and eastern sides of the building to reduce solar heat gain / loss
- Louvered timber cladding: slatted timber louvers are applied in varying densities to facilitate control of direct solar heat, especially on the northern façade. Office spaces need to provide high human comfort levels for users to be productive.

The building faces north, taking advantage of the indirect heat gain from that side. Direct solar heat gain from the east is eliminated through a small elevation and no openings on this elevation.

Door openings are kept to a minimum and sun angles are used to eliminate eastern heat gain due to direct sunlight. Openings are cut into the building and set back so that the structure creates a shadow.

Panel absorbers

A sound wave incident on a panel will set it into vibration. A panel over an air gap constitutes a resonating system with the resonance frequency determined by panel mass and air stiffness. If the sound wave contains energy at the resonance frequency, the panel will resonate and extract (absorb) energy from the sound wave (Van Zyl, 2001:6-3).

	FREQUENCY (Hz)					
Description	125	250	500	1k	2k	4k
Brick unplastered	0,02	0,03	0,03	0,04	0,05	0,07
Brick plastered	0,01	0,02	0,02	0,02	0,03	0,03
Concrete smooth painted	0,01	0,01	0,01	0,02	0,02	0,02
Plastered wall unpainted	0,03	0,03	0,02	0,03	0,04	0,05
4mm glazing	0,35	0,25	0,18	0,12	0,07	0,04
6mm glazing	0,18	0,06	0,04	0,03	0,02	0,02
12,7mm gypsum on brandering under pitched roof	0,33	0,15	0,08	0,04	0,07	0,09
12,7mm on 38mm brandering against concrete roof	0,29	0,10	0,05	0,04	0,07	0,09
50mm 48kg/m³ glass wool against solid backing	0,23	0,47	1,09	1,05	1,02	1,08
100mm 48kg/m³ glass wool against solid backing	0,83	0,78	1,20	1,09	1,07	1,15
50mm 60kg/m³ mineral wool against solid backing	0,28	0,60	0,99	1,06	1,02	1,02
100mm 60kg/m³ mineral wool against solid backing	0,69	1,13	1,08	1,04	1,05	1,02

ig 9.11.1 Table –Sound Coefficients of certain building (Van Zyl, 2001:6-4)

A material should be used that is thin and has high density for isolation. The bigger the cavity, the better the isolation capability. The cavity must be filled with isolation material (glass wool) to obtain optimal results.

The entrance on the west facade must be provided with a mechanical glass entrance door to limit the amount of traffic noise that would enter the building if the door were left open. The door will open on entry and will close immediately. Double-glazing is used to dampen the amount of noise outside the building. All the windows on the west facade should be of 6 mm or 10 mm glass with a cavity of 40 (a smaller cavity will not be effective).

Suitable wall construction for sound isolation to comply with Building Regulations 1976, G2(2):

1. A solid wall consisting of:
   - Bricks or blocks with plaster not less than 12,5 mm thick on at least one face; or
   - Dense concrete cast in situ or panels of dense concrete having all joints solidly grouted in mortar; or
   - Lightweight concrete with plaster not less than 12,5 mm on both faces of the wall.

In each case the average mass of the wall (calculated over any portion of the wall measuring 1 meter square and including the mass of any plaster) being no less than 415 kg/m2.

2. A wall having a cavity not less than 50 mm wide constructed of two leaves each and consisting of bricks, blocks or dense concrete with plaster not less than 12,5 mm thick on both faces of the wall, and having any wall ties of the butterfly wire type, the average mass of the wall (calculated over any portion measuring 1 meter square and including the mass of the plaster) being no less than 415kg/m3.

3. A wall having a cavity not less than 75 mm wide constructed of two leaves each consisting of lightweight concrete with plaster not less than 12,5 mm thick on both faces of the wall, and having any wall ties of the butterfly wire type, the average mass of the wall (calculated over any portion measuring 1 meter square and including the mass of the plaster) being no less than 250 kg/m2.

Single walls:	**Average 100 – 3150Hz**
110 wall (unplastered)	43
110 wall (plastered – both sides)	48
220 wall (plastered)	54
330 wall	55
Cavity walls:	
110 – 50 – 110 (plastered)	55
110 – 80 – 110 (plastered)	52
220 – 120 – 220 (plastered, glass wool)	101
Windows: (Closed)	
Single 3mm glass	23
Single 4mm glass	24
Single 6mm glass	26
Single 10mm glass	28
Single 6mm laminated glass	30
Double 10 – 50 – 10mm	35
Double 3 -100 – 3mm	35
Double 6 – 100 – 4mm	39
Double 6 – 100 – 6mm	38
Windows: (openable)	
4mm glass in steel frame	18
6mm glass louvers	17
4mm – 30 degrees	8
Doors:	
Hollow core	16
60mm solid core	34

Table 9.11.4 Noise isolation values (Van Zyl, 2001:7-3)

Fig. 10.1

10.0 Technical Drawings

Fig. 11.1

Fig. 11.2

11.0 Addendum

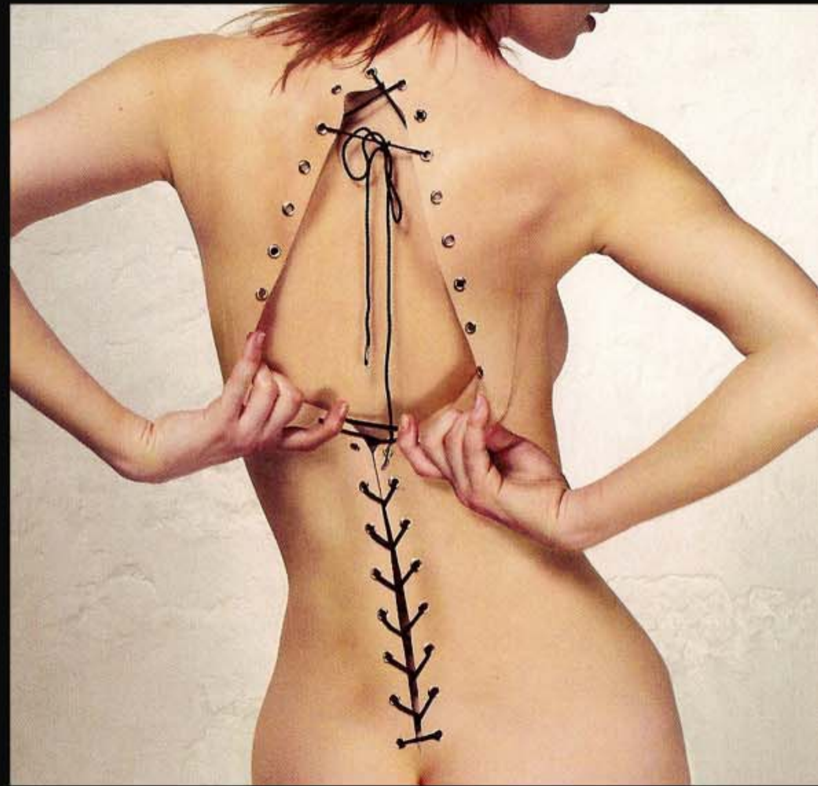


Fig. 11.3

2. Letter received after an interview with deaf teacher Karin Koen in June 2007:

I wish to express my gratitude to Miss Ilse Botha for the enormously challenging task to make the way of living of the deaf more accommodating and accessible. Thank you for acknowledging the void of the 'World of the Deaf' and for attempting to make a difference in your own way.

Helen Keller said that Deafness is the worst affliction that a person can have because it cuts one off from people, resulting in being cut off from life itself. Blindness cuts one off from 'things' and not from people.

A person is a social being and the whole meaning of 'being' has its foundation in relationships, rubbing shoulders with, and communication with other people.

The deaf person is cut off from people because he/she is unable to communicate normally. I would describe it as follows …

Deafness locks one in a 'jail', in his/her body. The deaf person is isolated even when he/she is surrounded by other people. The deaf person is most often not aware what people are talking about, or what they are laughing at … are they perhaps laughing at him/her?

I am privileged. Normal verbal communication has been the key to the doors of my 'jail'. I am able to a degree to move out of this jail, although I often feel isolated when I am in a group.

The isolation of the deaf is not an obvious one, and it is therefore easy for one to exclude them and they are overlooked and it is seldom that their need is recognised.

Everyday aspects which make my life difficult are for example:

- When I knock on a door. How would I know whether I may enter, and how would I know whether someone is knocking on my door?
- When watching television, especially the news, I would appreciate a magnified insert of the reader to enable the deaf to lip read. Text would also facilitate this need. Sign language differs from school to school and area to area and interpretation is therefore not always adequate.
- All music, radios and televisions which are switched on create a distorted sound and noise in my ears which results in a rumbling in my head and a feeling of drunkenness. As a result of this, I avoid the situation by withdrawing to a quiet place, and I feel guilty toward the rest of my family.
- It is problematic for me to be at home on my own because I do not know when people arrive to visit. I must keep in mind to position myself at a window so that I can see whether there is someone outside.
- Functions which are held during the evening often do not have adequate lighting and makes it difficult to lip read.

Despite the difficulties, I am more privileged than most other deaf people because I am able to communicate normally. I will always appreciate the care my parents took, the trouble, sacrifices and perseverance, in order to teach me to speak verbally.

Karin Koen

List of figures:

FATHER GOD... FOR CARRYING ME THROUGH EVERYTHING THAT COMES MY WAY...
MOM... FOR ALWAYS BELIEVING IN ME, SUPPORTING ME, AND YOUR UNCONDITIONAL LOVE...
DAD... FOR TELLING ME NOT TO DO THIS, FOR INSPIRING ME, YOUR WORDS OF WISDOM ...
LAURA...THE BEST SISTER IN THE WORLD, FOR ALL YOUR SUPPORT...
FAMILY...FOR ALL YOUR PRAYERS AND LOVE...
JACQUELINE, CHRISTINE, ANNELINE, TANIA, DIANE, KATE, MICHELLE & JACKIE...FOR YOUR HELP, FOR LISTENING TO ME THROUGH ALL THE SWEAT AND TEARS...THE BEST FRIENDS A GIRL CAN ASK FOR.

KAMIKAZE...FOR YOUR LATE NIGHT PHONECALLS AND MY COFFEE BREAKS...MWAH

Fig 12..2 Cats