MORTALITIES IMMORTALITY

BASELINE DESIGN REPORT
FOR
STONE BRIDGE MEMORIAL PARK

BOOK 2

AMANDIO CASTANHEIRA 22354680

CONTENTS

Figure 001 : Life Cycle & Energy

Figure 000 : Finger Print of Amandio Castanheira

LIST OF FIGURES

LIST OF FIGURES

LIST OF TABLES

WATER

Pure water is essential for all life on Earth. The Earth is 70% water, as are our bodies. We can last for about 2-3 weeks without food, but we would be dead within 3 days without water. What we do to our water, we do to ourselves.

Humans are increasingly putting this essential resource in serious danger. We poison our ground and surface water. We burn fossil fuels that cause acid rain and global warming. We dam our rivers, interrupting water flow and destroying delicate ecosystems downstream. We clear vegetation and pave massive land areas, decreasing the groundwater level and increasing flooding and soil erosion. On top of all this, those with access to the most water are wasting vast amounts of it. (Earthday: 2003)

Water Usage - Evaluation

It is assumed that every staff member working in the offices will drink about 2 litres of water a day, flush three times per day an average of 10 litres of water in a conventional toilet, and wash their hands with 5 litres of water per day. Showers are provided for the general staff to utilise and an average of 50 litres of water is consumed per shower.

An estimate of nine fulltime staff members are expected to consume in the region of 783 litres of water per day; therefore over a typical working year of 260 days a total of 203, 580 litres of water would have been used.

Figure 005: Tap

It is expected that the number of funerals attended on the premises per month would be in the region of 100, the average number of people attending each funeral service would be about 30. Should one third of these visitors at each funeral utilise the public toilets, 100 litres of water would be flushed per WC, 16 litres of water used for washing their hands and 12 litres of water used for making tea. The expected total for water consumed by visitors comes to 153, 600 litres annually. The gross amount of water needed for human consumption on this development on an annual basis would be 357, 180 litres.

No municipal pipeline currently exists to the proposed development and the cost of establishing a pipeline from Pinedene Station must be calculated into the initial development cost. Once the pipeline is connected, water could be supplied to the development by the municipality at a rate of R5, 94 per kilolitre [1].

Water Usage – Performance Criteria

Water is a critical commodity for sustainable living of all humans and thus must score a ‘5’ in the performance prioritisation index. Maximize the use of wet service fittings with a low water consumption, and reuse water through recycling.

Water Usage – Target Setting & Assessment

The following design elements must be incorporated into the design scheme of Stone Bridge Memorial Park. Installation of dual flushing WC mechanism with an efficiency level of between 4-6 litres per flush· Installation of low water consumption taps within all kitchens and toilets and change rooms

The total amount of water saved on a monthly basis, by implementing these basic water saving mechanism is 21%, a total of approximately 282, 172 litres of water for human consumption resulting in an annual financial saving of R445.55 [2].

This saving is not large in monetary terms but rather represents a commitment to sustainability and environmental awareness.

Footnote : [1] Ekurhuleni Water & Light Account May 2003, Personal Communication
[2] Cobra Watertech, SABS 0252-1, 1994

GREY WATER

Grey Water – Evaluation

Generally wastewater from hand washbasins, sinks and baths or showers are disposed of directly into the sewer system and the potential for recycling this water is lost. It is commonly accepted that half of all water utilised is wasted. The amount of water that could be reused is in the region of 178, 590 litres.

Grey Water - Performance Criteria

Water is a critical commodity for sustainable living and thus must score a '5' in the performance prioritisation index. Maximize the reuse of this precious commodity is vital.

Grey Water - Target Setting & Assessment

Grey water from hand washbasins, kitchen sinks and showers can be treated and recycled back to WC's toilets or used for irrigation. However, the treatment of such grey water needs a biological purification system, which requires a sedimentation tank or coarse filter, and a purification pool containing a substratum of gravel, sand and lime with aquatic plants so micro organisms can break down the dirt. This system will only be implemented if it is economically sustainable.

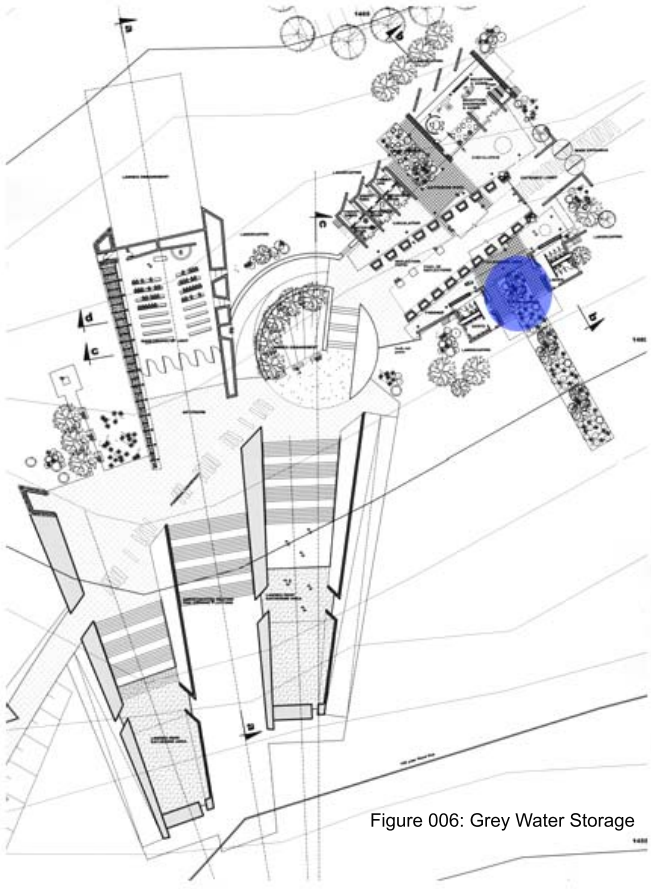


Figure 006: Grey Water Storage

Grey Water - Design Breakdown

The grey water is stored and treated in an underground tank as indicated in the adjacent sketch. The water is reused for the WC's and urinals and excess water is diverted into the irrigation system.

ENVIRONMENT - RAINWATER

The average rainfall within the Olifantsfontein and Irene areas is in the region of 700mm annually. If not harvested, all this rainwater would be lost and absorbed into the landscape of Stone Bridge Memorial Park.

Rainwater - Evaluation

Rainwater can be gathered cheaply and easily. Rainwater harvesting systems work when rainwater falls on sloped or flat roofs and is collected into gutters, through down pipes and into a filtering devise, and finally into a storage system. Water is treated then distributed to hand washbasins in the toilets, taps in the kitchen and baths or showers.

The total roof area of the building is multiplied by the annual precipitation of rainfall and the volume of water is the result of what could be expected from harvesting.

The following are averages per month for the Pretoria region:
January : 136mm
February : 75mm
March : 82mm
April : 51mm
May : 13mm
June : 7mm
July : 3mm
August : 6mm
September : 22mm
October : 71mm
November : 98mm
December : 110mm

Figure 002: Rainwater

The monthly average rainwater is 56.17mm [3].

Rainwater – Performance Criteria

Water is a critical commodity for sustainable living of all humans and thus must score a ‘5’ in the SBAT performance prioritisation index. Rainwater harvesting must be maximised and its potential of reuse for human and irrigation consumption must be fulfiled.

Rainwater – Target Setting & Assessment

The current roof area is in the region of +-2500m2; the potential amount of water harvesting is 1, 750, 000 litres of water. This is more than what the development needs for human consumption and the balance may be utilised for irrigation. A storage tank must be constructed to hold a minimum of 1 million litres of harvested water.

Footnote : [3] Holm (1996:20)

ENVIRONMENT - RAINWATER

Figure 003: Layout Plan of the Welcoming Centre & Chapels

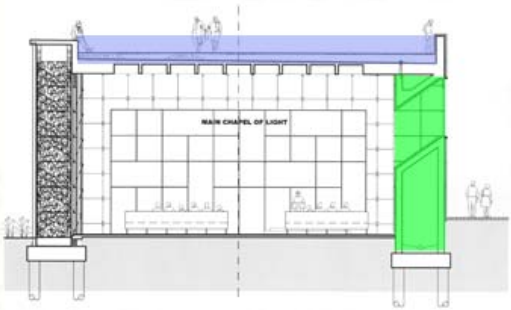


Figure 004: Typical Section Through Chapels

Rainwater – Design Breakdown

The rainwater harvesting is achieved by large flat roofs indicated above in blue and stored within the east walls of the chapels as indicated in green.

WATER RUNOFF

Water Runoff - Evaluation

Hard surfaces within developments such as vehicle parking lots and pedestrian walkways contribute to the vast displacement of storm water from the site. This water is either discharged into municipal storm water systems or dispersed into the landscape.

The expected amount of hard surfaces for this development is about 10, 000m2. If this water is not harvested a total of 7 million litres of water could be lost.

Water Runoff - Performance Criteria

Water is a critical commodity for sustainable living of all humans and thus must score a ‘5’ in the performance prioritisation index. Maximize the reuse of this precious commodity is vital.

Water Runoff - Target Setting & Assessment

To disperse water within parking areas and exterior walkways, surfaces should be covered with pervious block paving or soft landscape to allow rainwater and runoff to ground water level. Ground water is replenished when the rainwater is not collected but drained into the ground. Excess water will be caught in channels built to follow the contours of the site. This water will be stored in underground tanks for irrigation purposes.

Figure 007: Grass Blocks

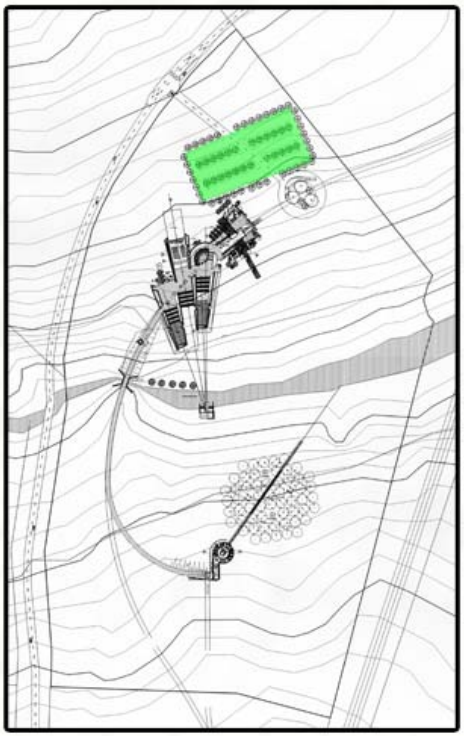


Figure 008: Site Plan indicating Vehicle Parking area utilising grass blocks

PLANTING & LANDSCAPING

Planting - Evaluation

Trees are essential in the landscape. They define space and movement and become part of the experience of a place. The flowering of trees and the falling leaves from deciduous trees all aid in and arousing sensations and strengthening emotions. However plants, like humans need water to survive, some plants absorb more than others.

Planting - Performance Criteria

- Indigenous trees with funerary connotations.
- Indigenous medium sized evergreen plant species.
- Sunlight intensity requirement of each species.

Planting - Target Setting & Assessment

The vegetation is composed of mostly indigenous plant and grass species, such as Acacia caffra, Euclea crispa, and Bankenveld grassland.

- Minimize the use of water for watering gardens by mixing indigenous plant species with different water and sunlight requirements to balance the water availability. A minimum of 25mm of water per m2 of plant growth.
- Arrange evergreen on the southern side to act as barriers to break excessively strong prevailing winds, and deciduous on the northern and western sides to provide shade in summer and sunlight in winter.
- Water the garden when it is cool and the sun is not shining. Therefore, water the garden during the early evening or early morning during the summer, because less water will evaporate. Half the amount of water is needed; it is also better for the plants

Grass

Variegated Acorus Grass - Acorus Gram Variegatus
Yellow to lime Green Fescue - Festuca Ovina Golden Toupe
Green Fescue Grass - Festuca Ovina / Festuca Gaurtieri
Tall Mondo Grass - Ophiopogon Japonicus
Cat's Whiskers - Scirpus Cernuus
Thatching Reed - Chrondro Petalum Tectorum

Lilac Flowers and Scent garden

Mexican Bush Sage - Salvia Leucintha
French Lavendar - Lavandula Steochas
Australian Lavendar - Lavandula P. Sidonie
Hybrid Lark Lavendar - Lavandula Snowball
Honeysuckle - Tecomaria Capenisis
Yesterday, Today and Tomorrow - Brunfelsia Pauciflora
Jasmine - Trachillae Spermum
China Laurel Swelt - Viburnum Odarat Sinesis

Death Association

Golden Privet - Ligustrum Ovalifolirum Aureum
Cypress - Cupress Semp Swanes Gold
Gold Crest Cypress - Cupress Macrocapra

Trees

Silver Birch - Betula Pendula
Paper Bark - Acacia Sieberiana Woodi
Wild Olive - Olea Europaea Afrikana
Fever Tree - Acacia Zanthafl Zanthaphloa

ENVIRONMENT - 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 can make a substantial contribution to sustainability (SBAT: 2002).

Location

The site is located along a primary public transport route between Olifantsfontein / Midrand and Centurion / Pretoria, however its location remains semi-rural for the foreseeable future. Local residential communities are located within a 5km radius and as such, commuting to and from urban areas becomes viable for staff members and visitors alike.

Ventilation Systems

The provision of ventilation within rooms maintain comfortable areas for people to work and live in. Where possible, passive ventilation systems should always be opted for over fully mechanical systems.

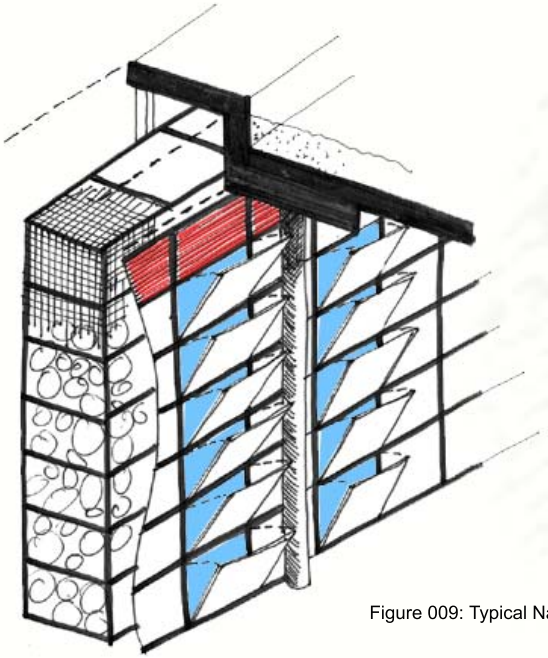
Ventilation Systems - Performance Criteria

Temperature and the rate at which air changes is required in each room according to the Accommodation Schedule-2 (refer to Book 1) for comfortable ventilation.

Ventilation Systems - Target Setting & Assessment

Natural ventilation is enforced through use of clerestory strips, window openings and wall slots. Glass louvers intercept the force of the wind and rain, so that the windows behind can always open for natural ventilation in summer. Cool air flows from window to window as cross ventilation for cooling. Hot air rises from each room and escapes through the top rows of glass louvers and clerestory.

Mechanical ceiling mounted low volume fans are used only when the natural ventilation fails.



Typical west facing wall to the chapels, the cool air is drawn in through the bottom hung window openings (indictacted in blue and hot har rises and through convection is drawn out through the permanently opened louvres indicated in red. The gabion wall filters string winds and rain.

Figure 009: Typical Natural Ventilation System

HEATING & COOLING SYSTEMS

Heating & Cooling Systems - Evaluation

The higher the conductivity, the quicker the temperature changes on the surface of the material. For example, stone has a high thermal conductivity value, so the surface becomes hot very quickly when sun shines on it; and when sun sets, the surface becomes cool and even cold during the night. Therefore, it needs insulation with materials with low conductivity values to reduce the temperature fluctuations.

Heating & Cooling systems - Performance Criteria

The Heating mechanism should be achieved through passive desig. The use of mechanically aided systems should be avoided and natural systems employed.

Heating & Cooling Systems - Target Setting & Assessment

Materials and thermal conductivity; U value:
Concrete blocks: 0.19 W/m.K; 0.97 W/m2 °C
Glass: 1.05 W/m.K; 6.6 W/m2 °C (Skylight), 4.3 W/m2 °C (window single glazing with wood frame)
Stone: 1.53 W/m.K;
Timber (plywood): 0.141 W/m.K; 1.7 W/m2 °C (floor tile)

Building materials used for passive heating and cooling mechanism are natural stones, concrete blocks and timber floor tiles. Concrete slabs and stonewalls as thermal mass absorbs heat during the day and releases it during the night. Glass louvers allow sunlight penetration. During winter, the glass traps heat behind it when the louvers are closed, and it also acts as another layer of insulation.

Artificial watercourses and lots of plants are used to effectively assist with natural and passive cooling as both water and plants absorb excess heat during the day and water releases heat in the evenings.

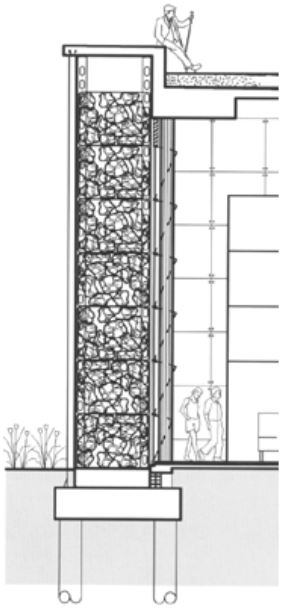


Figure 010: Gabgion Wall Cooling Device

Heating & Cooling Systems - Design Breakdown

The western walls to the chapels are clad in 1,2m wide gabion walls allowing ventilation and light through loosly stacked gabions apart from providing thermal protection to the building it also filters the light entering the chapel.

RENEWABLE ENERGY

Solar cremation operates through lenses, focusing the sunlight intensity in the cremator for incineration. Solar panels collect renewable sunlight for electricity generation.

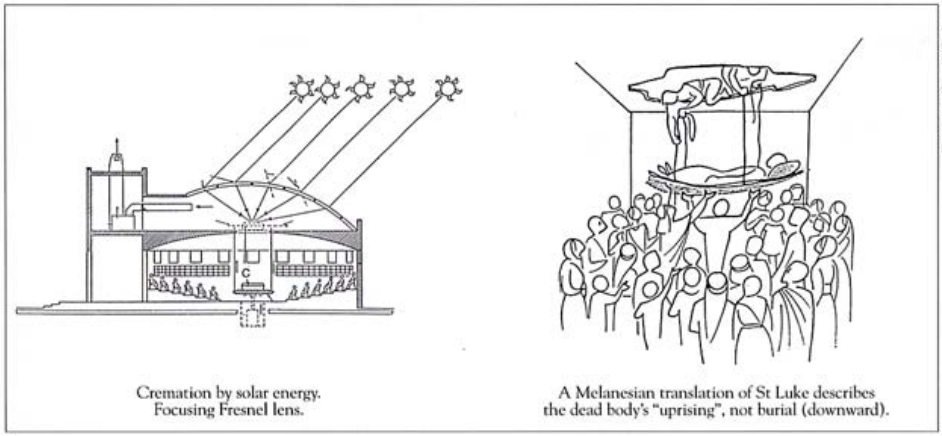


Figure 012: Solar Crematorium

RENEWABLE ENERGY - DESIGN BREAKDOWN

Unfortunatly the concept of utilising solar lenses as a means of cremation is currently unviable as the demands required are greater than what the focusing lenses or solar collectors can generate. Gap Engineers report illustrates this, (refer to apendecies) The main criteria is that differences or variations in the intensity of the solar radiation make the viability of this option difficult and expensive to construct thus the feasibility of this concept unattainable.

ENVIRONMENT - RECYCLING & REUSE

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 that reduces the energy and resource consumption (SBAT:2002).

Figure 011: Recycling Team

CONSTRUCTION WASTE

Construction Waste

It is inevitable, but on any construction site a minimum of 10% of all building materials delivered to the site are wasted.

Construction Waste - Performance Criteria

Construction waste should be kept to a minimum and where possible, building waste should be processed and reused on site.

Construction Waste - Target Setting & Assessment

The use of recycled construction materials, such as modular concrete blocks, timber door & window frames, glass and stone blocks, which may also help to integrate and blend the building with its natural surrounding.

Careful control and management of all material and design will ensure that building waste is maintained to an absolute minimum.

ENVIRONMENT - SEWERAGE & ORGANIC WASTE

Sewerage & organic Waste - Evaluation

In a built urban environment the disposal of sewerage into a municipal sewer line would be the most practical and economic for any development. Our proposed site is located within a rural environment and no municipal sewer lines currently exist.

Existing vegetation grows wild and natural decay of old plants occurs naturally on the site.

Sewerage & organic Waste - Performance Criteria

Minimize contribution of organic waste to sewerage system from toilets, and recycle inorganic waste.

Recycle organic waste on site; arrange sorting, storage and picking up of recyclable inorganic waste; safe disposal of toxic substances and waste.

Sewerage & organic Waste - Target Setting & Assessment

Human waste in waterless toilets rots down to compost when mixed with kitchen waste and garden matters. Obnoxious odours from decomposition escape through an exhaust air vent. Such systems are only emptied every couple of years. However, the waterless toilet is a big system that may be uneconomically sustainable due to the low number of uses for this type of system. The most suitable waste disposal system is the wet land system which could be incorporated into the landscape successfully.

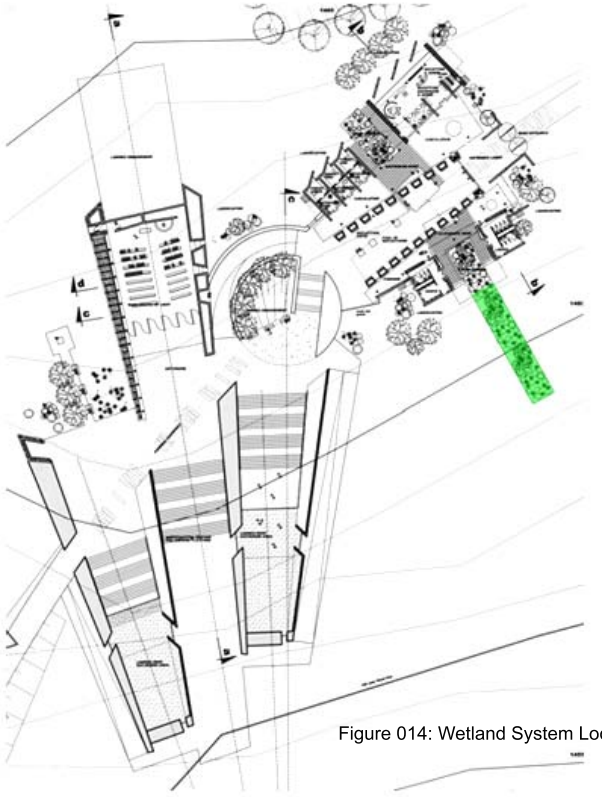


Figure 014: Wetland System Location

Sewerage & organic Waste - Design Breakdown

A wet land system breaks down all the organic waste for the development along a terraced system befor the treated water is used for irrigation of the landscaping.

ENVIRONMENT - SITE

Buildings have a footprint and a size that takes up space. Such space could be occupied by natural ecosystems, which contribute to sustainability by helping create and maintain an environment that supports life. Buildings can support sustainability by limiting development to sites that have already been disturbed, and working with nature by including aspects of natural ecosystems within the development (SBAT: 2002).

Brownfield Site - Evaluation

The site where the proposed development is to take place is located on an old quarry site and is scarred from years of mining and exploitation. The geological conditions of the site do not allow for large-scale development or agricultural use.

Brownfield Site - Performance Criteria

To rehabilitate the site and its vegetation.

Brownfield Site - Target Setting & Assessment

All existing Trees and other vegetation and species where possible to be conserved and incorporated into patios, parking and landscaping to utilize the shaded areas they create.

VEGETATION

Vegetation - Evaluation

In any new development, either green or brown field vegetation and the natural environment is irreversibly altered. The level to which one changes the landscape is dependent on the designer.

Vegetation - Performance Criteria

Indigenous medium to large sized trees, evergreen and deciduous plants to be planted within the overall scheme.

Vegetation - Target Setting & Assessment

Incorporate as many existing and indigenous Vegetation species as possible.

Current vegetation species: Acacia caffra and Euclea crispa are the existing medium sized evergreen trees, and Bankenveld is the existing indigenous grass species.

The existing trees and other vegetation species are conserved and incorporated into patios, parking and landscaping to utilize the shaded areas they create.

ENVIRONMENT - MATERIALS & 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 process that are harmful to the environment and consume non-renewable resources (SBAT: 2002).

EMBODIED ENERGY

Embodied Energy – Evaluation

80% of a buildings materials and components are made from materials and components with low embodied energy, materials sourced within a 50km radius are important in maintaining a low embodied energy level for the building.

Embodied Energy – Performance Criteria

80% building materials and components with low Embodied energy.

Embodied Energy – Target Setting & Assessment

Use of locally produced timber, stones, concrete.
Energy consumed in manufacturing process:
Concrete blocks: 4 MJ/kg
Glass: 8 MJ/kg
Stones: 0.1 MJ/kg
Timber: 3 MJ/kg

MATERIAL & COMPONENT SOURCE

Material & Component Source – Evaluation

The provision of materials and components that are sourced locally and that have a recycled component to them are of importance in maintaining a low embodied energy level and sustainability status to the building. The selections of materials that can be recycled are important.

Material & Component Source – Performance Criteria

90% from renewable Sources, 10% from reused or recycled sources

Material & Component Source – Target Setting & Assessment

Concrete: hard wearing, low maintenance, low environmental damage during manufacturing process and low embodied energy; recyclable and reusable from demolished buildings; locally available; acoustic and thermal comfort and insulation; prefabricated, modular and consistent.
Ingredients are local, renewable, recyclable and reusable sources with low embodied energy.

Glass: recyclable and reusable from demolished buildings; locally available.

Stones: hard wearing, low maintenance, natural material and low embodied energy; recyclable and reusable from demolished buildings; locally available.
Timber floor tiles, window and doorframes: low environmental damage during manufacturing process and low embodied energy; recyclable and reusable from demolished buildings; locally available.

Cement screed for flooring, natural paints help to facilitate cleaning.

MANUFACTURING PROCESS

Manufacturing Processes – Evaluation

The selection of building materials must take into account the manufacturing process, as some processes are more harm full to the environment than others and some incorporate recycled materials in with raw materials.

Manufacturing Processes – Performance Criteria

Building materials that produce little pollution during the manufacturing process and development, with low to medium embodied energy.

Natural materials produce lower pollution and require less energy in manufacturing than synthetic materials.

Manufacturing Processes – Target Setting & Assessment

Environmental poisons and ozone-reducing substances: effects to health; environmental waste.

Concrete
Concrete Health Impact
- Chrome and chrome compounds: allergenic, bio-accumulative, carcinogenic, oxidizing; can cause liver and kidney damage.
- Dust: irritates inhalation routes, forms pat of photochemical oxidants.

Concrete Waste from production process: 58 g/kg
Concrete Building and demolition waste category: landfill.

Concrete Environmental Waste
- Chrome and chrome compounds.
- Dust.
- Thallium: extremely poisonous.

Concrete Low embodied energy.

Glass
Glass Health Impact
- Quartz dust: carcinogenic.

Glass Environmental Waste
- Calcium chloride: irritant, acidifying.
- Quartz dust.

Glass Building and demolition waste category
- landfill.

Glass Medium embodied energy.

Stone
Stone Health Impact
- Dust.
- Quartz dust.
- Radon gas (gas that contains radioactive isotopes of polonium, lead and bismuth): carcinogenic.

Stone Building and demolition waste category
- landfill
- Low embodied energy

Timber
Timber Health Impact
- Dust.

Timber Waste from production process
- 25 g/kg.

Timber Building and demolition waste category
- Burning without purification, it needs local authority tip.
- Low embodied energy.

CONSTRUCTION PROCESS

Construction Processes – Evaluation
Evaluation of the site conditions and natural features will result in a quicker design process and building programme.

Construction Processes – Performance Criteria
Construction with minimum environmental impact, clearing of vegetation and earthworks.

Construction Processes – Target Setting & Assessment
The entire building complex is to be constructed on the natural ground level, no basement or any rooms constructed below the earth. The elevation of the building is to be stepped to accommodate the natural fall of the site.

Stairs and ramps are included to adapt the fall.

SOCIAL ISSUES

SOCIAL - OCCUPANT COMFORT

The quality of environments in and around buildings has shown to have a direct impact on human comfort. Being healthier, happier and more effective contributes to sustainability by being more efficient and productive, therefore, reducing resource consumption and waste. However, the quality of this environment needs to be achieved with minimal cost to the environment (SBAT: 2002).

LIGHTING

Lighting – Evaluation

Natural lighting over artificial is always beneficial for a comfortable working environment.

Lighting – Performance Criteria

A minimum lighting requirement for the offices and reception area should be 500 lux, corridors 200 lux, the balance 350 lux (according to Accommodation Schedule-2). Current sources are natural sunlight, which is between 9000 and 15000 lux outside, and the supply of electricity from the City Council. Large openings to be provided on the eastern and southern façades, small or no openings on the northern and western sides.

Lighting – Target Setting & Assessment

Maximize natural day Light transmittance and use of light fittings with low electricity consumption and low energy production to minimize lighting control, heat production and electricity consumption.

Offices and reception Area:
- Window size at least 0.5 x 1 m2 for natural ambient lighting, at least 30% of the floor area;
- 0.5 x 0.5 m2 glass panels for roof lighting;
- Blinds and shading devices outside office windows prevent glare;
- Adjustable louvers with a reflective finish for solar control;
- Compact fluorescent lamps mounted on ceilings or walls provide artificial light;
- Low volt tungsten halogen miniature reflector lamps mounted on walls provide direct, artificial light.

Storerooms, toilets and kitchens:
- Window size at least 30% of the floor area for natural daylight;
- Circular fluorescent lamps, which last 6000 hours and emit less heat, for artificial light.

Enclosed corridors:
- Vertical slots in external walls or ceiling slab for natural light source;
- Compact fluorescent lamps mounted on ceilings or walls provide artificial light.

Waiting room, funerary halls and family chapels:
- Thin, small window slots on northern side for thermal comfort and ambience;
- Clerestory strips and entrance door are natural light sources;
- Adjustable louvers with a reflective finish for solar control;
- Maximum room depth is 7 meters;
- Compact fluorescent lamps mounted on ceilings or walls provide indirect, artificial light;
- Low volt tungsten halogen miniature reflector lamps provide artificial light.

LIGHTING continued

Crematorium:
- Use of skylights and clerestory openings for maximum natural light reception;
- Compact fluorescent lamps mounted on ceilings to provide artificial light.

Patio and indoor gardens:
- Open-air patio and indoor gardens receive indirect sunlight;
- Polished concrete walls for maximum light reflection;
- Lit at night with metal halide lamps;

Exterior walkways, ramps, stairs, parking are well lit at night with warm orange high-pressure sodium lamps.

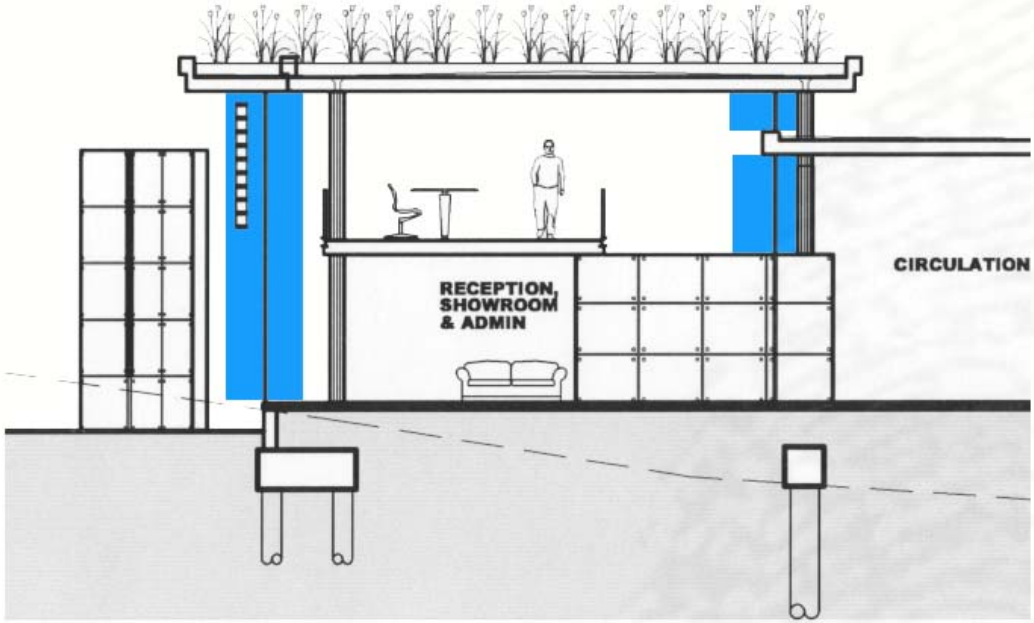


Figure 015: Section through office block

Lighting - Design Breakdown
Double storey shopfronts on either side of the offices provide natural light into the office environment, shallow depth of the office building allows for a cross section of light from either side of the building, shading devices are installed to the northern side of the office building to shade the glassing.

VENTILATION

Ventilation – Evaluation

The provision of ventilation within rooms maintain comfortable areas for people to work and live in. where possible, passive ventilation systems should always be opted over fully mechanical systems.

Ventilation – Performance Criteria

See temperature and speed at which air flows in a room in Accommodation Schedule-2 for ventilation comfort in each room.

The current natural sources are winds from northeasterly in summer and northwesterly in winter, and desktop fans as artificial source. Winds generally blow at 5 m/sec, which forms gentle breeze.

Ventilation – Target Setting & Assessment

Maximize Ventilation by natural means, even in toilets and kitchen.

Rooms such as office, reception, storeroom, toilets, kitchen, waiting rooms, funerary halls and family chapels are naturally ventilated by windows which are either 0.2 m2 or 30% of the floor area; glass opening doors provide cross ventilation.

Enclosed corridors with vertical slots in external walls provide natural airflow movement.

Crematorium is naturally ventilated by the clerestory windows that provide cross ventilation; low volume ceiling mounted fans provide artificial ventilation when natural means fails.

NOISE

Noise – Evaluation

Comfort within a working environment is linked to the amount of ambient nose is generated by electrical devises, people moving through spaces and external noise transfer.

Noise – Performance Criteria

Maximum noise level should be between 30 and 50 dB for normal communication.
About 20 dB of noise level is expected on the site, which is exceptionally quiet for human's hearing; noise from the medium intensity of traffic (approximately 60 dB) on Glen Avenue.

Noise – Target Setting & Assessment

Keep constantly low Noise level in all zones.

Use of material differs in rooms or zones for their specific needs:
- For ceiling, walls and floor in Wall of Remembrance, office, reception, waiting rooms, materials have high sound absorption (carpets reduce 5 dB).
- In funerary halls and family chapels, materials have properties of high sound reflection (acoustic timber panels and concrete slabs).
- Crematorium has materials that possess properties of high sound absorption.
- Materials for exterior corridors, patios and finishes have high sound insulation (prefabricated concrete blocks).

Separate zones for social interaction from rooms that need low noise level:
- Office and reception are separated from the rest of the building in which funeral service or sermon takes place.
- Outdoor green spaces or gardens are for higher social interaction and noise level.
- In-between patios, indoor gardens and enclosed corridors are venues for medium social interaction ("medium" means less people and lower noise level than in outdoor green spaces and gardens).
- Patios keep waiting rooms and funerary halls apart; family chapels, crematorium are grouped in different zones of the building complex for minimal noise level.

Figure 016: Green Roof

Noise – Design Breakdown

The provision of landscaped roof gardens to all buildings within the public areas reduces the overall ambient noise levels by about 20db.

ACCESS TO GREEN OUTSIDE

Access to Green Outside – Evaluation

Rooms should have close links to green spaces either as internal green spaces or directly to external garden area.

Access to Green Outside – Performance Criteria

Two large adjacent rooms (floor area more than 50 m2) must share at least one patio or indoor/covered garden, the size of which must be at least between 1/5 and 1/4 of the room. Outside Green space for every room must be easily accessible.

Access to Green Outside – Target Setting & Assessment

Office, reception, storeroom, toilets and kitchen are less than 7meters away from exit doors.

Enclosed corridors are directly linked to gardens.

One patio is shared by every two family chapels and is located between one waiting room and one funerary hall.

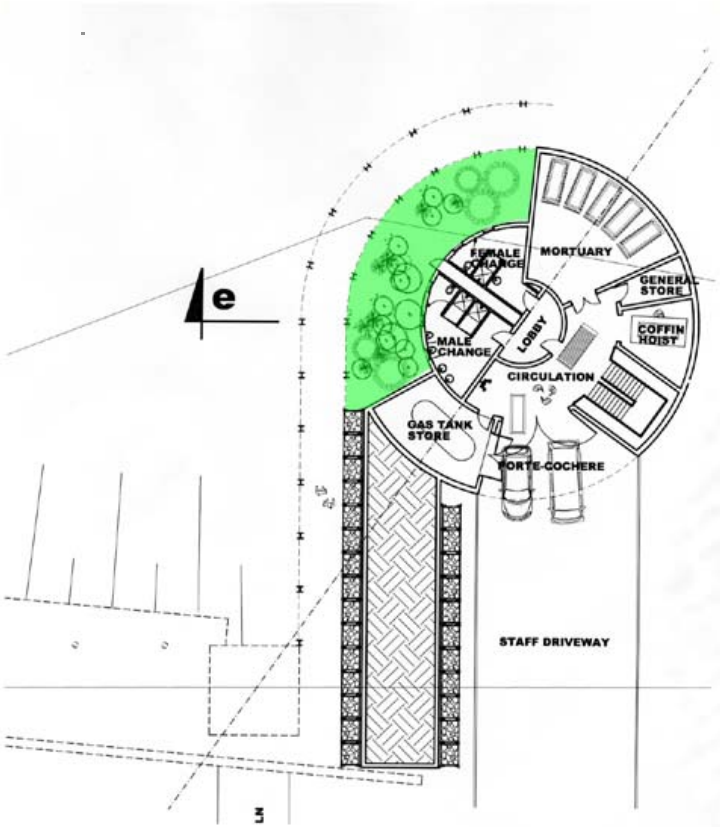


Figure 017: Green Outside

SOCIAL - INCLUSIVE ENVIRONMENTS

ROUTES & CIRCULATION

Routes & Circulation – Evaluation

Legible circulation is vital to any development and the provision of limited signage aids in the overall aesthetics of a building.

Routes & Circulation - Performance Criteria

Surfaces are to be smooth and even, but slightly rough for slip resistance. The entire exterior and interior route Surfaces must be easily navigable for wheelchair circulation.

Routes & Circulation - Target Setting & Assessment

Crematorium, storeroom, kitchen, toilets and enclosed corridors: polished concrete floor.

Offices, reception areas, waiting rooms, funerary halls and family chapels: carpeted timber floor tiles on concrete slabs.

Parking, landscape surfaces and exterior walkways: pervious surfaces for water absorption, such as concrete block paving, flagstones, boulders or cobbles, indigenous grass species.

Ramps and stairs: unpolished concrete slabs.

Figure 018: Routes & Circulation

Routes & Circulation - Design Breakdown

Circulation through out the development is through the funery causeway linking all zones together.

CHANGE IN LEVELS

Changes in Levels – Evaluation

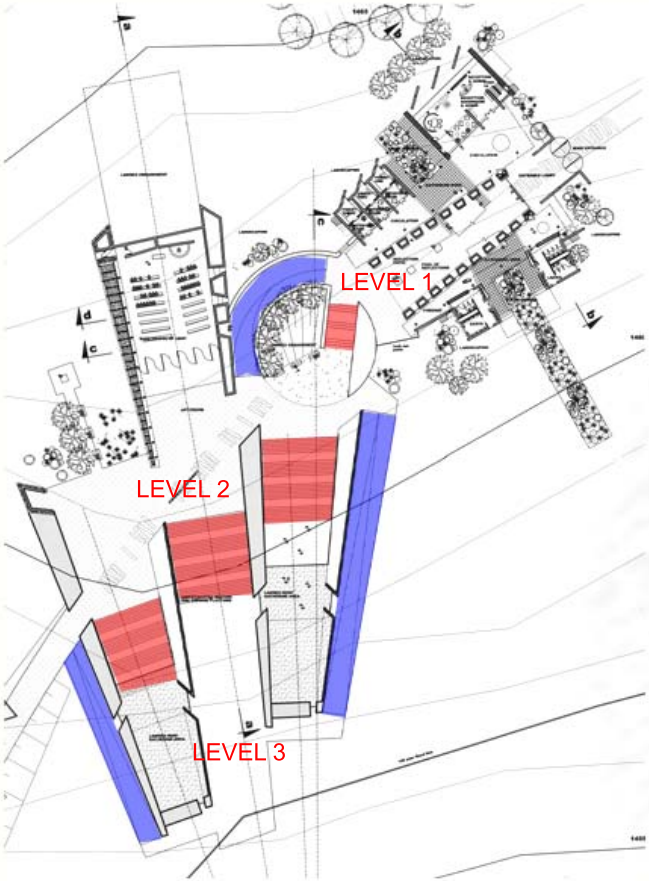
The site has a natural fall of about 1:15 towards the Olifantspruit River along the south and a gradient of about 1:8 to the north of the Olifantspruit River. Circulation within the building structures must take care of all these level differences and accommodate for the disabled visitors and staff members.

Changes in Levels - Performance Criteria

Maximize comfort in Level change with minimal earthwork. Ramps and stairs must be at comfortable gradient for level change.

Changes in Level - Target Setting & Assessment

The ramp and stairs outside the building should be a minimum of 1.2 meters wide. The gradient of all ramps should be at 1:12 so as to accommodate for wheelchair circulation.



Changes in Level - Design Breakdown

The welcoming centre and chapels are broken up into 3 distinct levels, all levels are accesable via a ramp and stairs all within a 5m radii.

Figure 019: Level Changes

AMENITIES

Amenity - Performance Criteria

Access to Amenities, such as kitchens and ablutions, must be visible and legible in the building. One kitchen and at least one WC for each gender and the disabled must be provided for.

Amenity - Target Setting & Assessment

Kitchens and ablutions should be located near to the main entrance and office block components of the proposed development.

COMMUNITY INVOLVEMENT

Community Involvement

Maintenance of the property such as grass mowing and cutting, tree shaping and trimming, irrigation, waste removal and litter picking, reparation and management is controlled by the management of the development, however sub-contract agreements may be arranged to provide entrepreneurs with the possibilities of providing services for this development by nearby rural communities.

Figure 020: Bees for Development

Community Involvement - Design Breakdown

The local community consists of rural people working on agricultural land in and around Irene / Olifantsfontein. By providing access to land and training in the keeping of bees, income can be generated for the community from bee products such as honey and wax. The bees inturn provide a service to the surounding farmers polinating crops.

SOCIAL - PARTICIPATION & CONTROL

Ensuring that users participate in decisions about their environment helps ensure that they care for and manage properly. Control over aspects of their local environment enables personal satisfaction and comfort. Both of these support sustainability by promoting proper management of buildings and increasing productivity (SBAT: 2002).

ENVIRONMENTAL CONTROL & ADAPTION

Environmental Control & Adaptation - Performance Criteria

Maximize the use of movable and adjustable building components and furniture to encourage the users to Control over their environmental conditions, and to allow rearrangement.

Windows, skylights, blinds, louvers, furniture, artificial light sources, shutters and shading devices must be adjustable for better lighting, comfort and air movement; screens, walls, artificial light sources, furniture, fittings and plants for desired arrangement

Environmental Control & Adaptation - Target Setting & Assessment

Switches, revolving and extensible joints, arms, rollers, joists and bases must be part of or temporarily installable to the above-mentioned components and fittings for manual control and personalized space.

SOCIAL SPACES

Social Spaces - Performance Criteria

Informal social Interaction should take place for higher extent of comfort and emotional relief. Access to amenities or venues must be visible; the place for interaction must include comfortable seating.

Social Spaces - Target Setting & Assessment

Outdoor gardens are an ideal destination for outdoor casual talking and other forms of social interactions.

Every room has direct and indirect access to outdoor space.

Kitchen is located on regularly used route.

Waiting rooms and funerary halls are especially designed for purposes of indoor formal or informal gatherings and meetings before and after deposing of the ash urn either into the Olifanspruit River or into the Mausoleum.

SOCIAL - EDUCATION, HEALTH & SAFETY

Buildings need to cater for the health and safety of the people that use them. Ensuring that people remain healthy and economically active reduces the costs (to society, the environment and the economy) of unemployment and ill health (SBAT: 2002).

EDUCATION

Education

As this building does not conform to the standards of a regular development, no educational facilities are provided, however the opening up of the chapels to the local communities to have church services provides the community with spiritual education.

Health & Safety - Performance Criteria

Safe environments must be provided to the users to limit incidence of accidents. Maximize safety through creation of visual links and overlooking, provision of well lit routes and spaces, and compliance to regulations.

Health & Safety - Target Setting & Assessment

The proposed entrance to vehicles and pedestrians is to be closed at 18:00 during summer months and 17:00 during the winter period.

- Rooms are to be grouped into blocks or zones, according to their proximity of function.
- Each room can be locked individually, with tight connection between rooms.
- Simplistic building functions increase visual links and visibility.
- All exterior walkways, patios, ramps, stairs, parking, corridors and gardens are to be well lit at night.
- Fire escape routes are easily accessible.
- Route surfaces' are slightly rough for slip resistance.
- Width of corridors, ramps and stairs are 1.2 meters wide for walking and emergency.
- Water access to kitchens and toilets for drinking or washing to be maintained
- All electrical cables are properly taped or fixed against walls and skirting, and are connected to the main distribution board for safety control.
- Level of security and safety is enhanced through participation and awareness.

SMOKING

Smoking

The entire complex has been zoned as a non smoking area and smoking rooms are to incorporated into the development. Exterior areas have also been zoned as smoke free zones.

ECONOMIC - LOCAL ECONOMY

The construction and management of buildings can have a major impact on the local economy. The economy of an area can be stimulated and sustained by buildings that make use and develop local skills and resources (SBAT 2002).

LOCAL CONTRACTORS & MATERIAL SUPPLY

Local Contractors & Material Supply - Evaluation

Providing work to local contractors and local sub-contractors within the immediate area portrays the development as wanting to be part of the community it will ultimately serve.

Local Contractors & Material Supply – Performance Criteria

80% of the construction is to be carried out by Contractors based within 40km of the building.

Labour intensive techniques together with possible skills training programmes to be implemented during the course of the construction program.

Local Contractors & Material Supply – Target Setting & Assessment

Maintenance and building contracts to be established with small to medium emerging contractors identified within the community.

REPAIRS, MAINTENANCE & OUTSOURCING

Repairs, Maintenance & Outsourcing – Evaluation

Providing work to local contractors and local sub-contractors within the immediate area portrays the development as wanting to be part of the community it will ultimately serve.

Repairs, Maintenance & Outsourcing – Performance Criteria

80% of the Supplies for the main building materials components and future repairs to be locally available and manufactured within 50 km radius of the site.

Concrete, timber floor tiles, natural stones and glass as building materials, and building components, such as furniture, windows and doorframes, are prefabricated, in modular units and produced in replication.

Repairs, Maintenance & Outsourcing – Target Setting & Assessment

Specify materials that can be, and some of the building components that are readily available and produced locally.

ECONOMIC - EFFICIENCY OF USE

Buildings cost money and make use of resources whether they are used or not. Effective and efficient use of buildings supports sustainability by reducing waste and the need for additional buildings (SBAT: 2002).

USABLE & SPACE USE

Usable & Space Use – Evaluation

Interchangeable use of spaces is vital for sustainable usage of a building. A crematorium complex however has a very specific function and the areas that could conform to multiple usages are the offices and chapel halls.

Usable & Space Use – Performance Criteria

For Efficiency of use of space, building and all working spaces are to be occupied for an average equivalent minimum of 30 hours per week. Non-useable spaces, such as plant room, WC's and circulation should not make up more than 20% of total area.

Offices should be occupied for at least 6 hours per day in order to achieve an average of 30 hours of occupancy per week. Other functions of the building complex will not be able to comply with such request.

Usable & Space Use – Target Setting & Assessment

Laws that govern their efficiency of use, space and opportunities hinder the cemetery and crematorium developments in some ways. For example, the administration offices are only open on official working days from 7:30 in the morning to 15:45 in the afternoon (41 hours and 15 minutes per week), except funerals arranged on Saturdays or Sundays. No other types of occupancy are allowed. This evidently reduces opportunity of being multifunctional and effectively sharing facilities.

Usable & Space Use – Design Breakdown

The structures have been designed in such a way that they may be used for other purposes in the future for example the office buildings may be converted into showrooms, the chapels into school class rooms. Generouse vertical space has been provided to allow for mezanine levels in future if so required in the chapels.

ECONOMIC - ADAPTABILITY & FLEXABILITY

Most buildings can have a life span of at least 50 years. It is likely that within this time, the use of the building will change, or that the feasibility of this will be investigated. Buildings, which can adapt change easily, support sustainability by reducing the requirement for change (energy, costs etc.) and the need for new buildings (SBAT: 2002).

VERTICAL DIMENSIONS

Vertical Dimensions - Performance Criteria

Vertical dimension from floor to ceiling must be at least 3.5 meters for adaptability and flexibility.

2.7 meters floor to ceiling is the minimum dimension for living and working space. Different rooms may need different heights for ambience and effects.

Vertical Dimensions - Target Setting & Assessment

The minimum vertical dimension from floor to ceiling is 3.7 meters in the building complex, including roof beam. Ceilings for offices, reception areas are to be about 4 meters high for the sense of welcoming and beginning of journey. Storerooms, kitchens and toilets have the minimal 2.7 meters ceiling height for economic and practical reasons. Ceilings for waiting rooms, funerary halls and corridor spaces to be 5 meters high to create a sense of enclosure, which is associated with death.

Ceiling for family chapels is 3.7 meters high for privacy and sense of solitary.

The crematorium must higher ceilings, between 7 and 8 meter, for the sense of openness, diffusion and grandness, as the final step in accepting death and dissolving in natural surrounding.

INTERNAL PARTITIONS

Internal Partitions – Performance Criteria

Internal partitions between spaces should be non-load bearing and easily ‘knocked-out’ for future renovations and additions. (SBAT: 2002)

Internal Partitions – Target Setting & Assessment

All internal walls to be constructed in panels, sizes to be not more than 3m in length and be easily identifiable for removal or extension.

SERVICES

Services - Performance Criteria

All services to be easily accessible and to be provided within a centrally located area. These services must have the option of being modification in future. (SBAT: 2002)

All the wet Services are grouped together for single service shaft, easy access and modification.

SPACE MANAGEMENT

Space Management – Evaluation

The success of scheduling time, goods and services is like most things determined by the person who actually runs the scheduling. The sharing of space during the course of the day or week can be achieved by establishing guidelines of peak demands for various facilities and the frequency that these demands are put on them.

Space Management - Performance Criteria

Intensify Space usage through management and design.

Space Management - Target Setting & Assessment

Sharing of workspaces such as the administrative office with that of the visiting Medical Referee may be exchanged.

USE OF TECHNOLOGY

Use of Technology – Performance Criteria

Use of higher Technology increases efficiency and saves time and human energy, and reduces space required for equipment with low technology.

One computer saves spaces required for storing records on shelves, telephones and fax machine.

Use of Technology – Target Setting & Assessment

Higher technology, such as Internet access and paper work done by computer, encourages effective and efficient communication and information access.

SPACE MANAGEMENT

Space Management – Evaluation

The success of scheduling time, goods and services is like most things determined by the person who actually runs the scheduling. The sharing of space during the course of the day or week can be achieved by establishing guidelines of peak demands for various facilities and the frequency that these demands are put on them.

Space Management - Performance Criteria

Intensify Space usage through management and design.

Space Management - Target Setting & Assessment

Sharing of workspaces such as the administrative office with that of the visiting Medical Referee may be exchanged.

USE OF TECHNOLOGY

Use of Technology – Performance Criteria

Use of higher Technology increases efficiency and saves time and human energy, and reduces space required for equipment with low technology.

One computer saves spaces required for storing records on shelves, telephones and fax machine.

Use of Technology – Target Setting & Assessment

Higher technology, such as Internet access and paper work done by computer, encourages effective and efficient communication and information access.

ECONOMIC - ONGOING & CAPITAL COSTS

ONGOING COSTS

Maintenance & Cleaning

The ongoing Costs are low in specifying hardwearing materials and building components requiring low or no maintenance, and with surfaces requiring little but easy cleaning methods. Costs are also low in security due to passive surveillance.

Ongoing Costs

Not all rooms need constant lighting; therefore, policy and management, such as switching off lights or installing time switches for switching on or off machinery or equipment need to be implemented.

Security & “Downtime”

As mentioned in the aspect of safety, the entire building consists of individual blocks or zones.
Each block or zone performs according to function, and is recognized from the outside with corridors as weak and permeable linkage. The function and space arrangement encloses each zone to avoid crossover or disruption.

CAPITAL COSTS

The capital costs for this development is currently expected to be about 10% more than a convensional development. The reasons for this is that the capital outlay for sustainable devises such as the sewer disposal systems will only have a long term financial effect.

The client is also of the opinion that this development should be seen as community development and as such the additional costs for on the job training and labour intensive methods of construction are justifiable.

LIST OF REFERED WORKS

Cobra Watertech. SABS 0252-1. 1994

Holm, D. 1996. The Manual for Energy Conscious Design. Pretoria:
Department of Mineral & Energy Affairs

www. earthday.net
www.beesfordevelopment.org

Eckards Nursery, 2003, personal communication