DESIGN DISCOURSE & TECHNICAL DEVELOPMENT 5

5.1 SITE DESIGN

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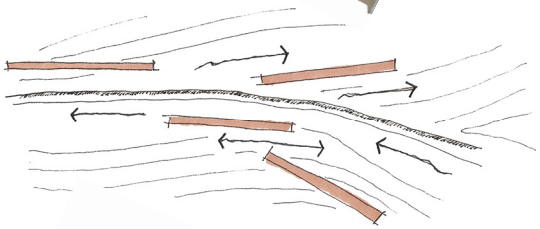

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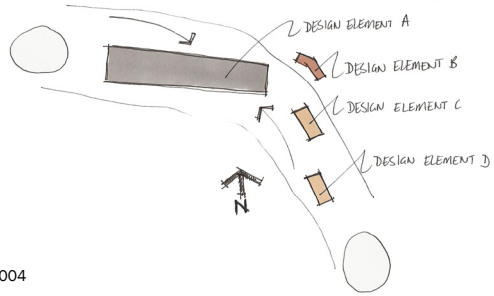

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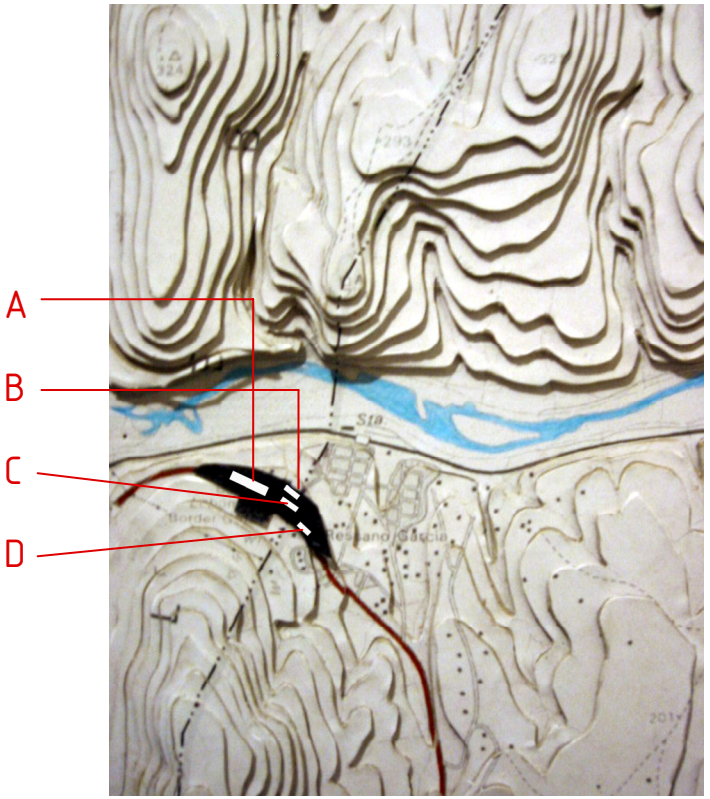


5_005

DESIGN ELEMENT A
Main Customs and Immigration Administration Building

DESIGN ELEMENT B
Satellite Administration building for pedestrians

DESIGN ELEMENT C
Truck Terminal for traffic to Mozambique

DESIGN ELEMENT D
Truck Terminal for traffic to South Africa

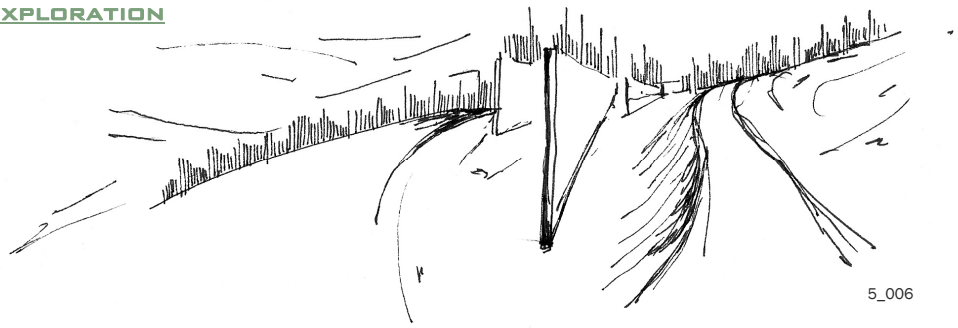
5.2 Approach & conceptual exploration

Architecture is an art form that is bound up with utilitarian, technical, and economical considerations, and with the ' sense of place' and physical conditions of a site. Architecture must therefore be balancing. It is the coordination of aesthetics, functions and technological considerations.

Road architecture is a distinctive expression, as aesthetics are often dictated by the surroundings themselves. A simple design, or a minimalist approach intensifies the concepts, making it clear to the observer. Since the road interacts to a high degree with the surroundings, it is important for the building to be easily grasped, clear and understandable.

The Design Guidelines set out in Chapter 3 give an overview of the major design considerations of this scheme.

The design is generated from 3 major conceptual ideas:



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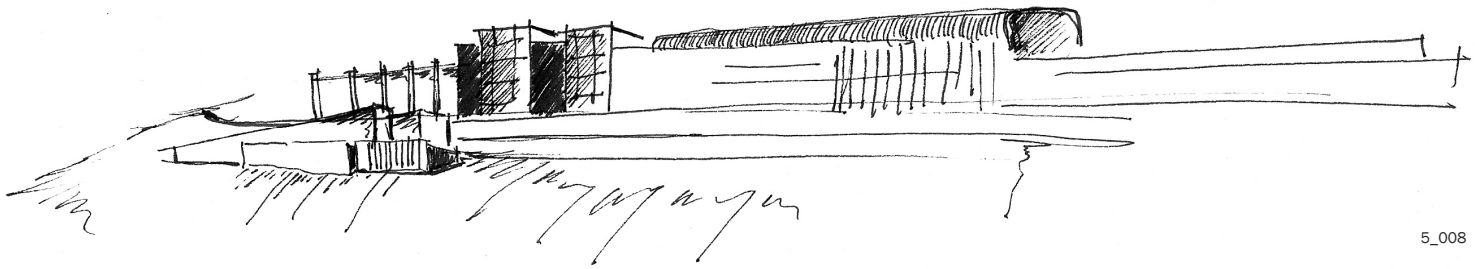
5_007

Movement & Transition

Function & Control

Landscape & Surrounds



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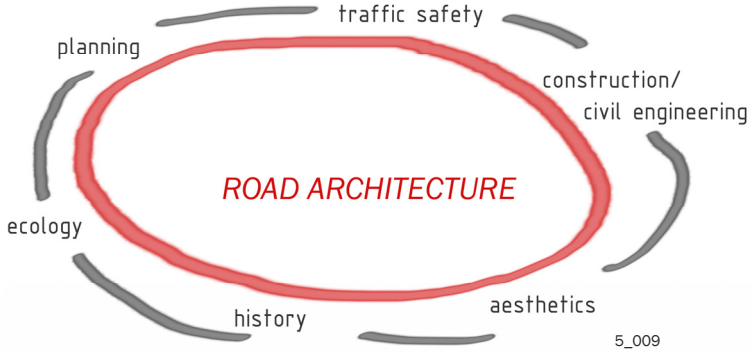
Design thinking evolved from the idea of separating movement across the site into two bands. The operation of a 'one– stop' border forces the separation of traffic in two directions, from South Africa to Mozambique, and from Mozambique to South Africa. This results in an island type design whereby the building needs to be accessed from all sides. The building therefore needs to welcome visitors from both sides of approach.

The two sides of approach to the building allow for contrasts in the architectural style. This can emphasise the diversity of the two countries. On approach from South Africa the experience will be different than if you were to approach the building from Mozambique. The architectural language is carried out throughout the entire complex. This is achieved by using the same detailing and materials. Building form and proportion are used to differentiate between the two sides. Bold contrasting elements are used to intrigue, and angular offsets of walls also draw a visitor into the building. The richness of the two countries is portrayed in the design, and the diversity of the cultural context is highlighted.

The relation of building to road is an important interface. The way in which the building extends into the landscape also needs to display the relationships between the two countries, and how they merge together on one site. Moulding the building along the contours, and using linear elements around the ridge ensure that the building does not dominate over the landscape, but rather acts as a gateway, enhancing the natural surrounds by drawing attention on approach, and again welcoming any visitor.

Linear elements, that run parallel to the direction of travel, draw and entice people through the site and allow for no obstructions in the flow of movement. Building length, parallel to movement, also allows for a maximum view window over the surroundings. By keeping the east and west facades to a minimum dimension, both solar control and the effect of having to cut through the building is controlled.

The building needs to be legible. Everyone needs to engage with the building, and movement through the building needs to be clear. The orientation of walls, openings in the roof, openings in the walls and floor levels, all need to all contribute to making the building easy to access and understandable.



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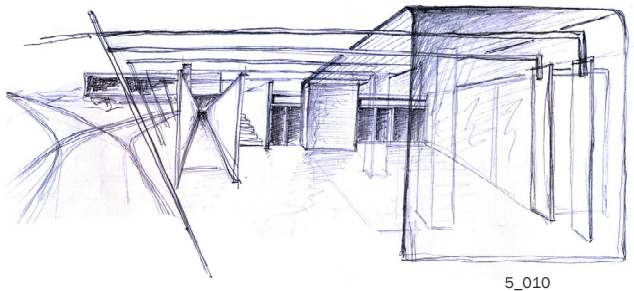
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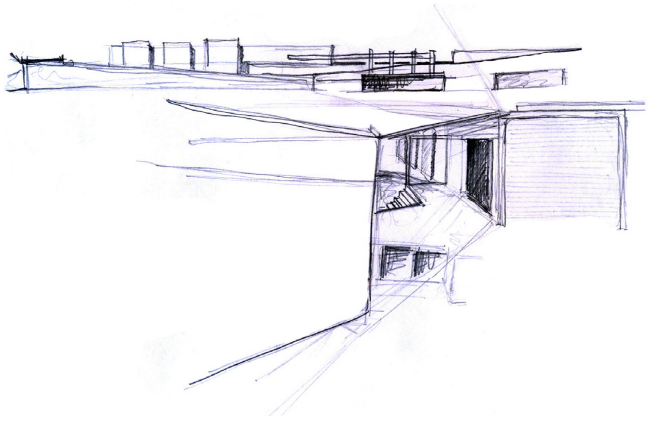
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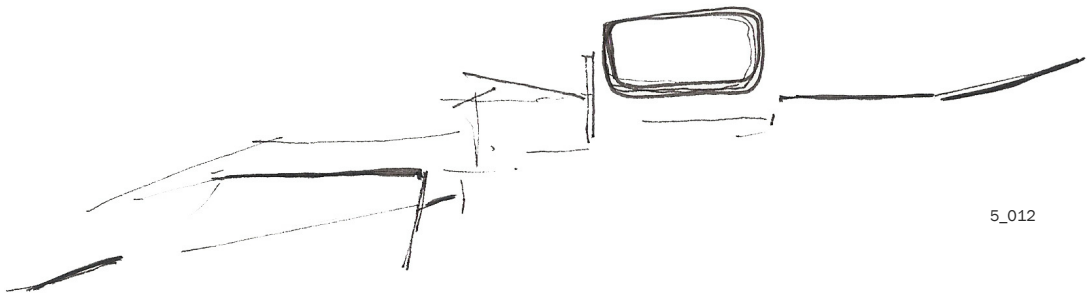

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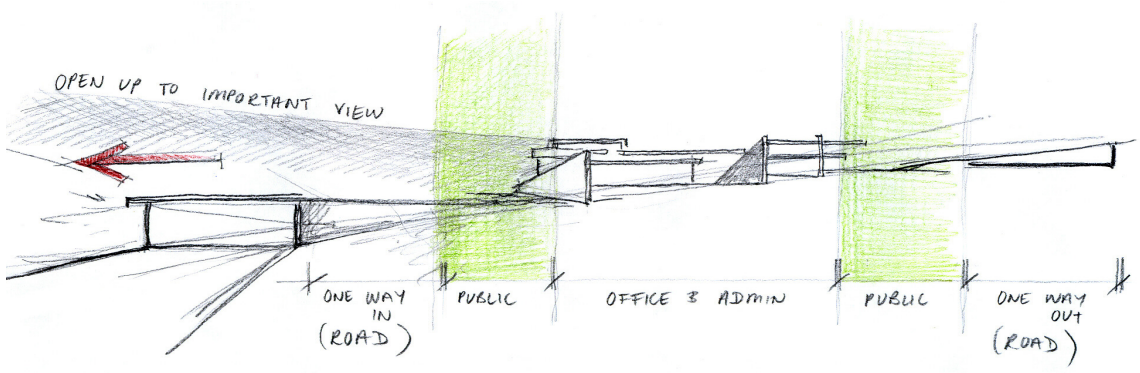

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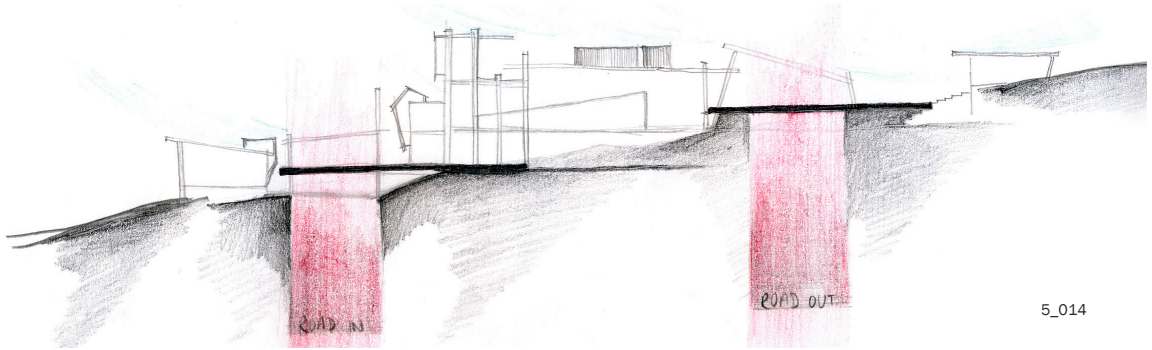

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CONTOURS

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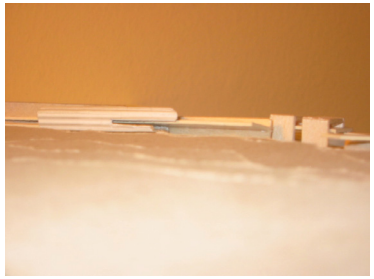

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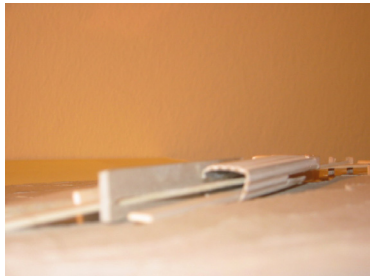

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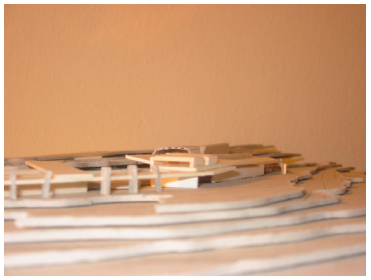

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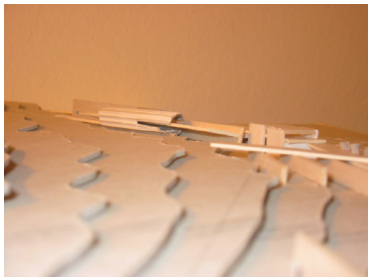

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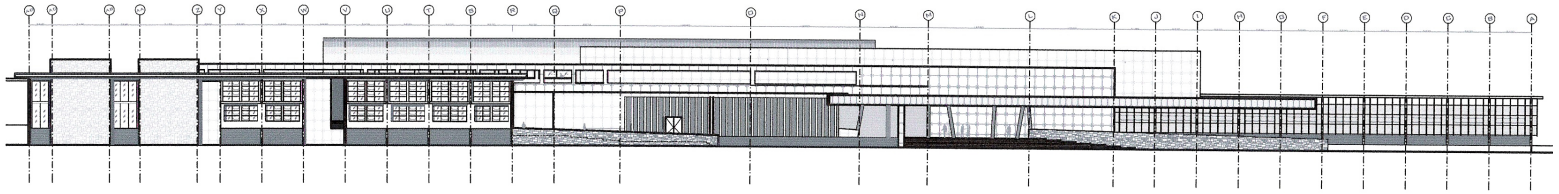

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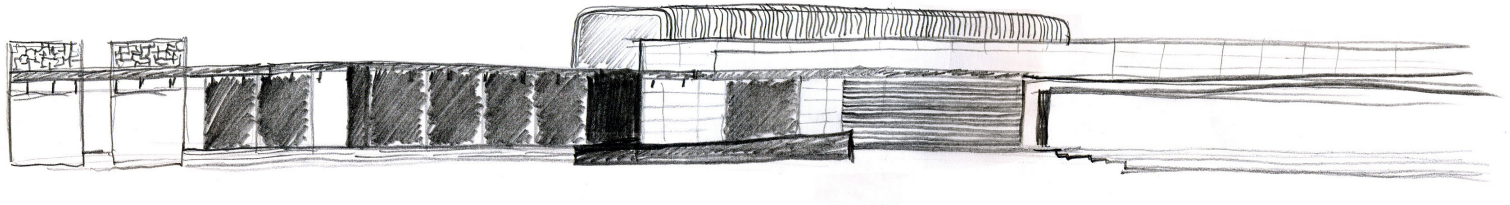

LINEARITY

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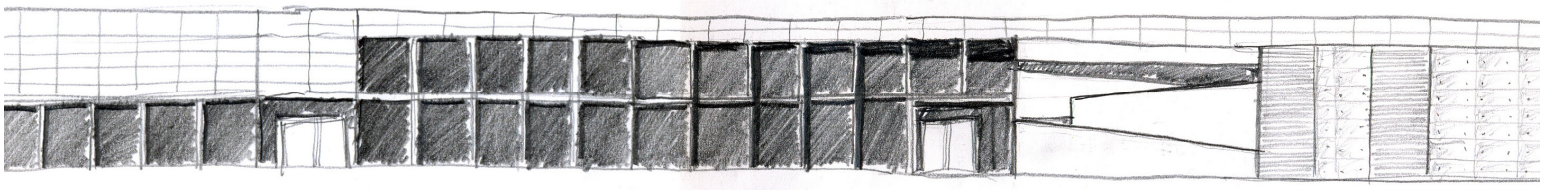

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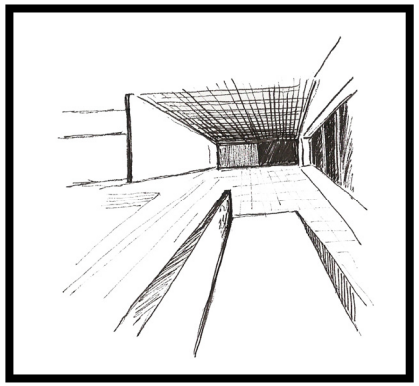

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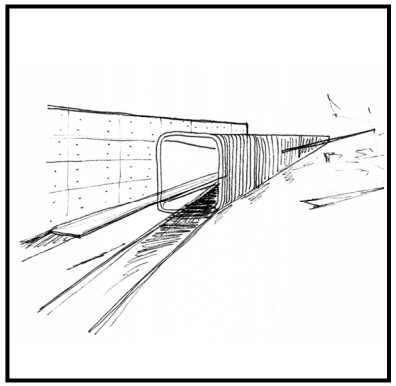

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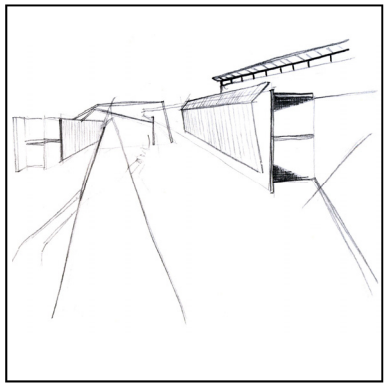

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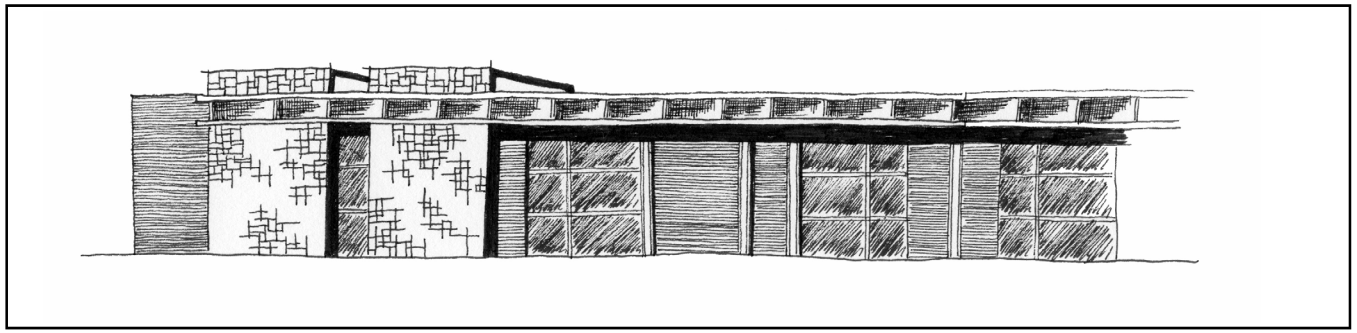

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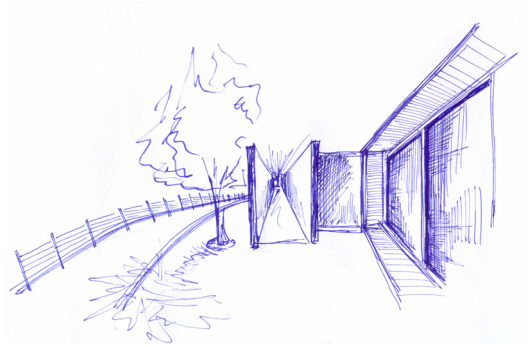

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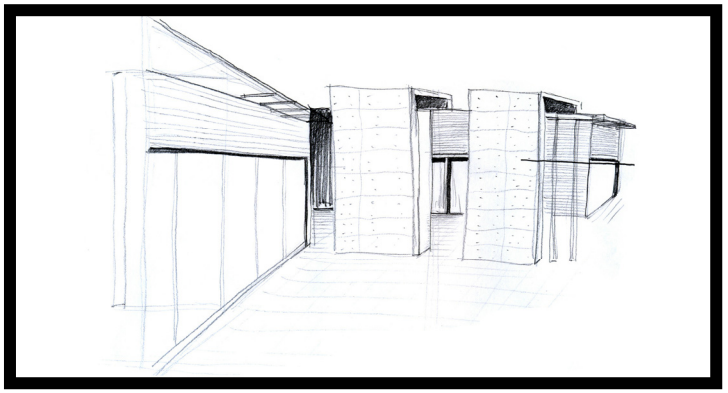
PROPORTION



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Scale

Is both perceivable and relative. The building needs to be understood in terms of the scale of the human body. Sizes can however be altered from familiar dimensions to enhance symbolism and enhance contrast to act as welcoming elements.

Structure

Refers to the way in which the landscape and building complex is built. Patterns of rhythm can be created with regard to geometry, sizes, dis tances, building forms, and road widths etc. There needs to be a relationship between structure and the natural surrounds.

Space

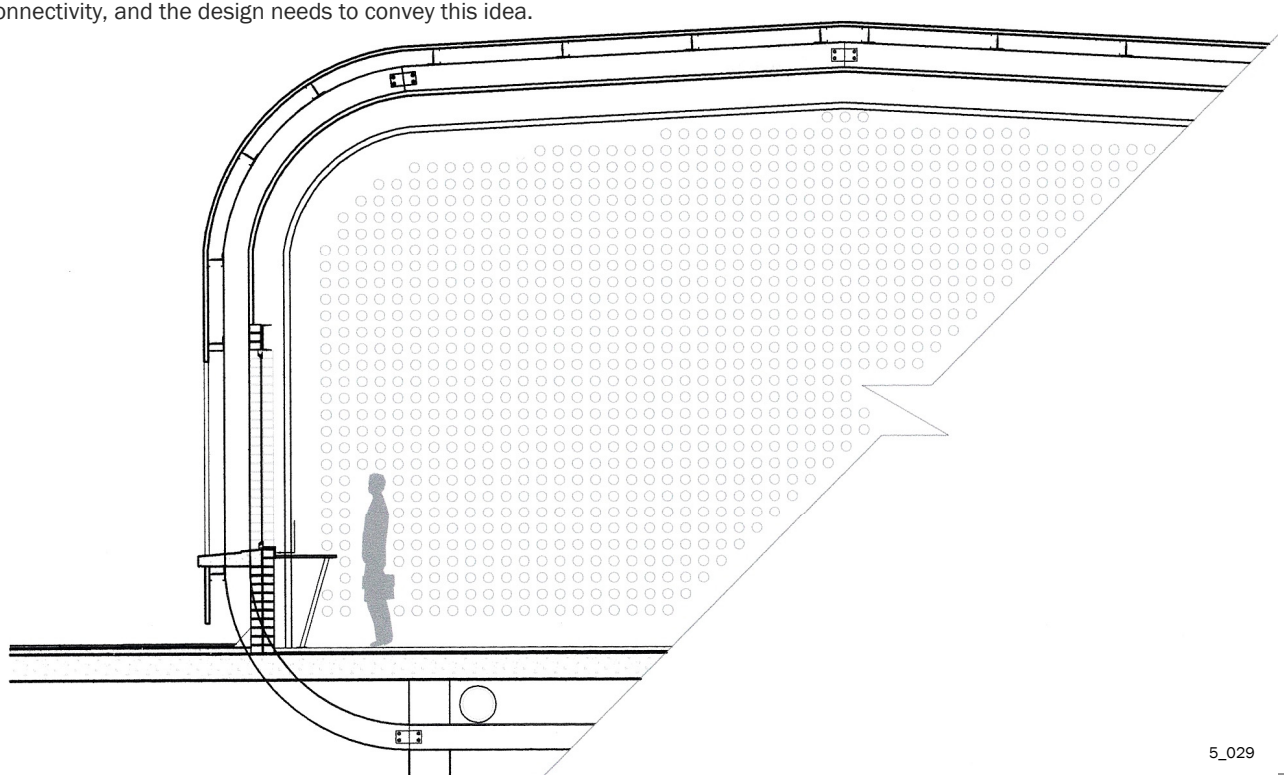
The sky is the ceiling, the earth is the floor and landscape/ building elements are the walls. Often small changes in the alignment or design can provide greater spatial variation, for example a view, and consequently give a richer visual experience.

Identity

Describes the character of a space, and enhances the relations between building or landscape and user. Familiarity or understanding make the experience a comfortable one.

Unity

Needs to exist between landscape and building/ road and building edge and roof and sky. Two countries, unified in one built complex promote international connectivity, and the design needs to convey this idea.



5.3 ORIENTATION

North/ south facades

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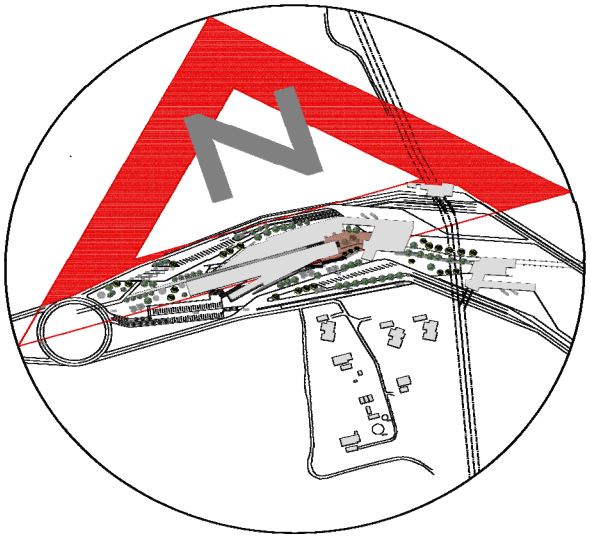
The building is orientated to optimise the northern and southern exposure. The linearity of its form allows the long facades to open up to the views, and allow for an open design. Large roof overhangs on the northern and southern facades provide shading for the offices.

West/ east facades

5_031

The eastern and western facades of the building are designed to be short elevations, reducing the climatic strains which would be experienced in this harsh climate if they provided too much exposure. The eastern and western elevations of the building are designed to incorporate minimal openings, and all exposed glazing on these facades are provided with sun screening mechanisms to shade from the harsh sun.



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5.4 SUN/ WIND/ RAIN

5_033

5.4.1 SOLAR ANGLES

Komatipoort coordinates 25° 50'S
31° 55' E

Sun angles are investigated to ensure overhangs and shading devices provide the necessary shading to all facades.

Shading is obviously most crucial during the summer months, The sun angles taken into account are therefore those between the equinoxes, and devices are designed for the period between 21 September and 21 March.

Solar Times	06:00	08:00	10:00	12:00	14:00	16:00	18:00
Azimuth 21/09 21/03	90E	75E	49E	0	49W	75W	90W
Altitude 21/09 21/03	0°	25°	49°	60°	49°	25°	0°
Azimuth 21/12	111E	98E	83E	0	83W	98E	111E
Altitude 21/12	12°	36°	62°	83°	62°	36°	12°

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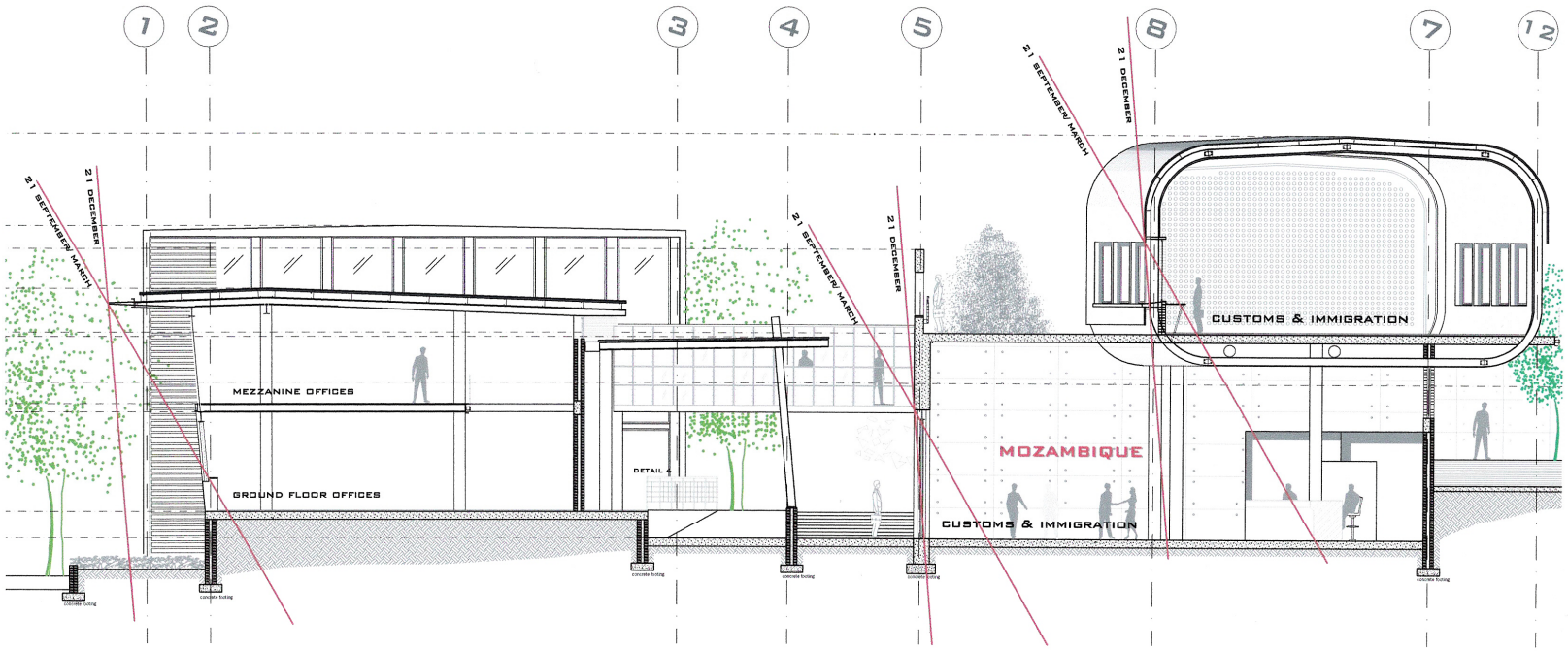

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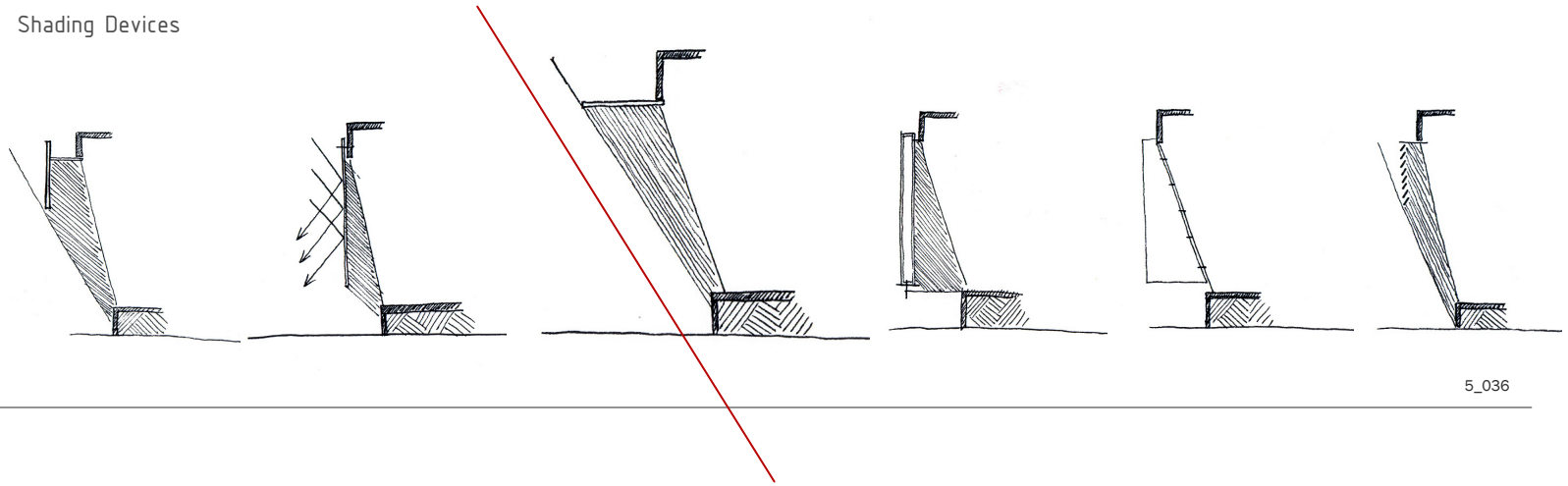
Shading Devices



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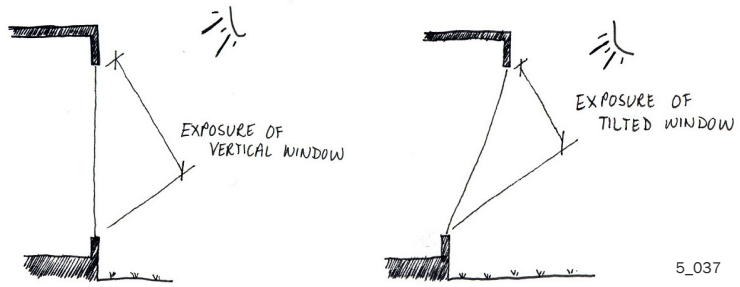
5.4.2 VENTILATION & WINDOW DESIGN



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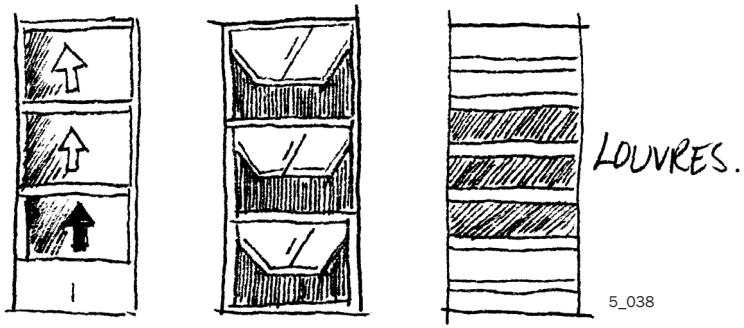

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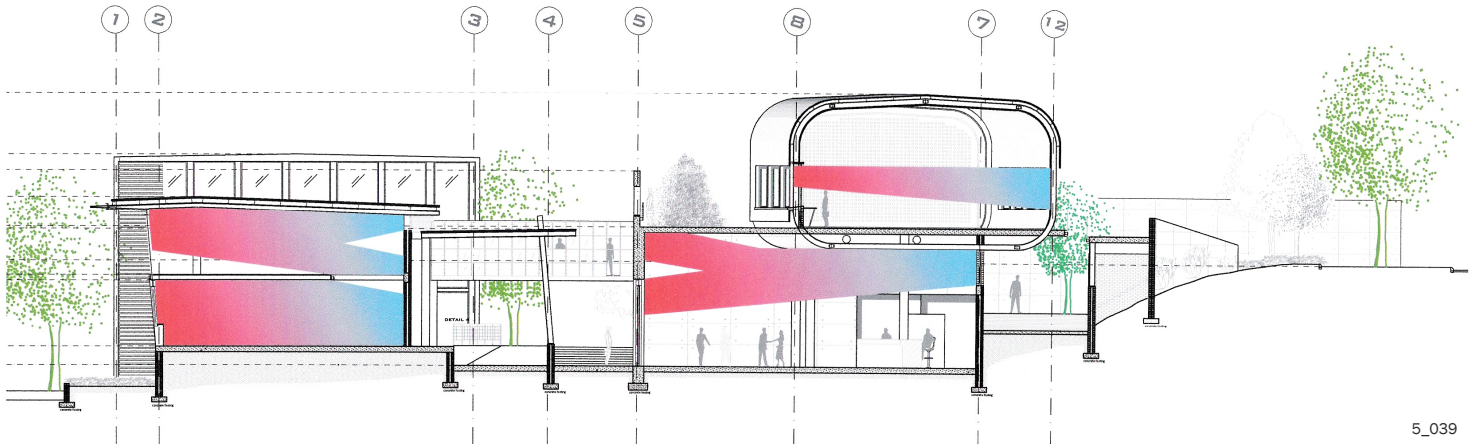
The hot humid climate of the Lowveld calls for an open, naturally ventilated building, to provide as much relief as possible for the extreme heat discomfort experienced during the summer months. The building is oriented in order to allow movement of air to flow through the building. Valley winds are drawn through, and air movement is encouraged by offsetting walls at angles to create wind tunnels. Window and door openings are large, and by angling exposed walls the angle of incidence is kept to an angle smaller than 30°. This reduces solar exposure dramatically.

Various window opening types were investigated. Horizontal pivot windows will aid with enhancing ventilation and are easy to control by the user.

Cross ventilation is encouraged by keeping the depths of the building to a maximum of 15m, where possible the depth has been kept to 12m. Certain public areas, i.e. the main Customs & Immigration administration areas, cannot keep to this depth due to functional requirements and require a larger area. In these areas however, mechanical ventilation can be employed during peak summer months to provide optimum user comfort. The building needs to be user controlled, natural cross ventilation needs to dominate, however the option does need to be in place whereby mechanical cooling systems can provide relief in summer. Ceiling voids are large enough to facilitate the air conditioning ducts, they are either to be hidden in ceilings, in office areas, or exposed or recessed in floor voids in the public areas. Diffuser placement will be determined by internal space planning.



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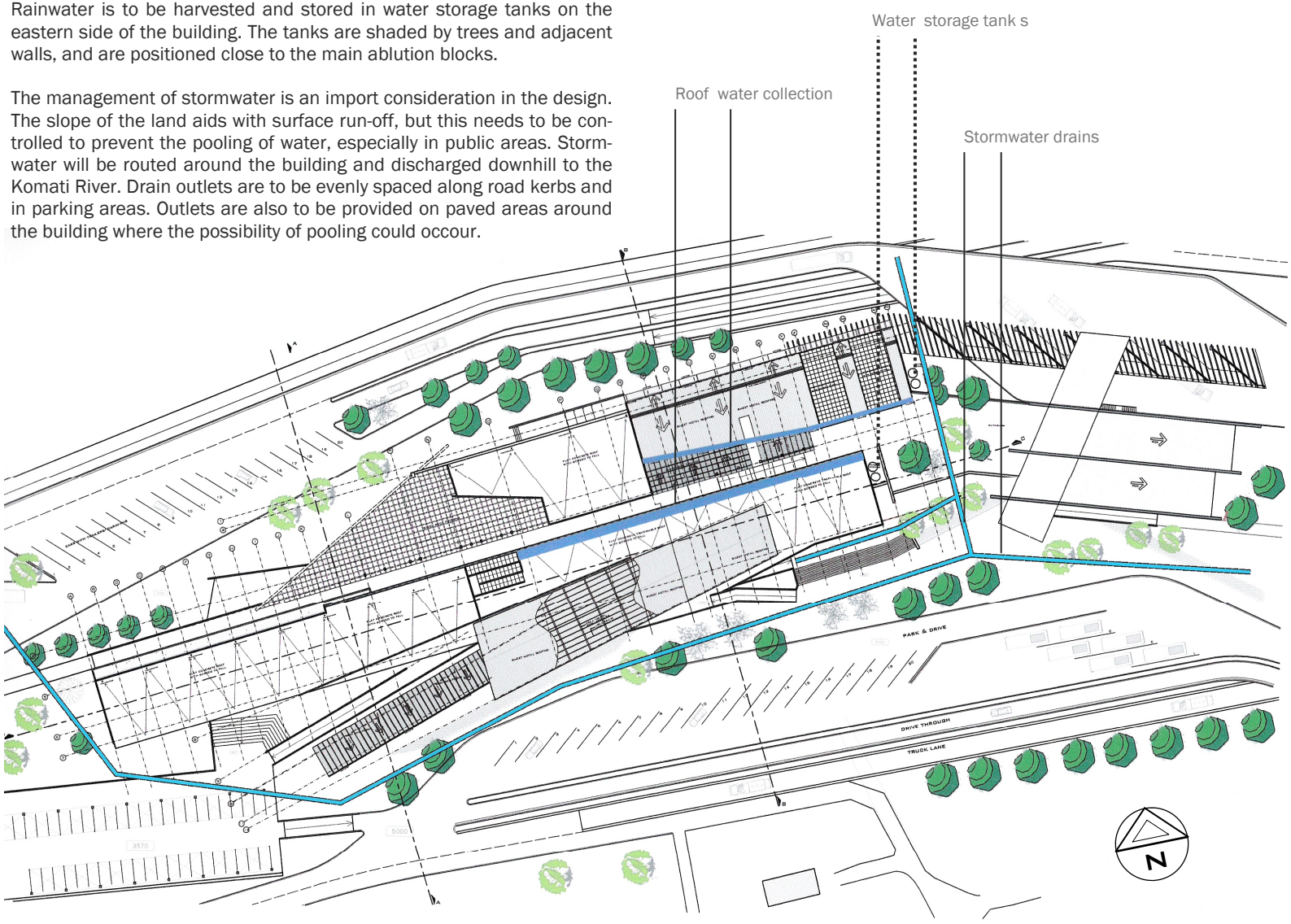
5.4.3 RAIN AND STORMWATER CONTROL

Rainwater is to be harvested and stored in water storage tanks on the eastern side of the building. The tanks are shaded by trees and adjacent walls, and are positioned close to the main ablution blocks.

The management of stormwater is an import consideration in the design. The slope of the land aids with surface run-off, but this needs to be controlled to prevent the pooling of water, especially in public areas. Stormwater will be routed around the building and discharged downhill to the Komati River. Drain outlets are to be evenly spaced along road kerbs and in parking areas. Outlets are also to be provided on paved areas around the building where the possibility of pooling could occour.



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5.5 EXTERNAL WORKS

5.5.1 PARKING & ROAD CONSTRUCTION

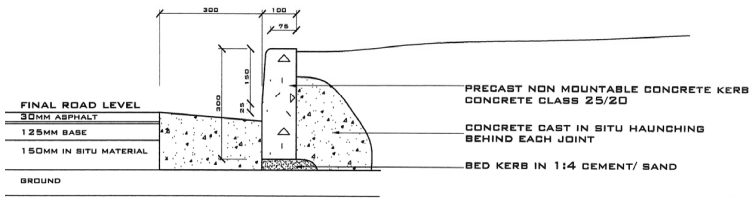
The nature of the built complex has direct reference to the flow of traffic and to the provision of parking. Parking becomes an integrated aspect of the design product and becomes the point of reference for the driver and passengers.

Various parking configurations were explored, efficiency and movement are addressed as key principles. There must be no doubt to driver as to which lane he must be in, where he must park etc. Signage too becomes an integrated feature of the design, for pedestrian, passenger vehicle and cargo vehicle. Roads should be designed in a clear and simple way to facilitate orientation for all users. It should be easy for motorists to navigate their way across the site, confusion as to where to go should be eliminated, and lanes and parking need to be clearly marked and sign posted. The roads should also be designed to ensure that motorists comply with the legal speed limit.

Road architecture needs to sometimes be predictable to eliminate any element of danger, or element of insecurity. Structures, planting and terrain need to relate to the scale of the road so as not to surprise the motorist or interfere with his/ her vision or overview.

Safety also depends on providing enough room for traffic. The movement of vehicles and trucks, and pedestrians crossing roads need to be carefully coordinated to ensure overall safety. A major consideration is to minimise the walking distance of the passengers and to make movement through the complex as legible as possible.

The road construction is to be specified by an engineer. The large loads on the road surface necessitate an asphalt surface to take the wear from heavy trucks.



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5.5.2 WALKWAYS AND PAVING

Pattern and flooring material choice can help clarify the street space and make it a comprehensive environment that the visitor can identify with.

Paving can also emphasise separations, or a difference in level. A calm, smooth surface provides a good background. Often too many types of flooring details, and changes from one type to another, attract attention and can make the street space or outdoor landscape areas seem confusing or chaotic. The same paving finish is therefore to be used for the majority of the built complex. The only differences will be where the differentiation is needed between public and private spaces.

Paving choice should also allow for disabled access and should not be a safety concern. Porous walkways would be ideal on the lie of the land to allow the penetration of rain water into the ground. Because the building is a public entity however, solid paving bricks will be a more suitable walking surface.

5.5.3 LIGHTING

Lighting has an important architectural function. Dimensions of lighting features need to be harmonised with the surrounding scale. Safety and security at the border needs to be enhanced using suitable lighting. Mast lights need to be incorporated to ensure enough illumination during the night. Outdoor lighting needs to be sturdy in design, and solid materials should be used to ensure the best quality and guarantee. Good materials also stand up to weather and wear and prove more economical over the long term.

5_042

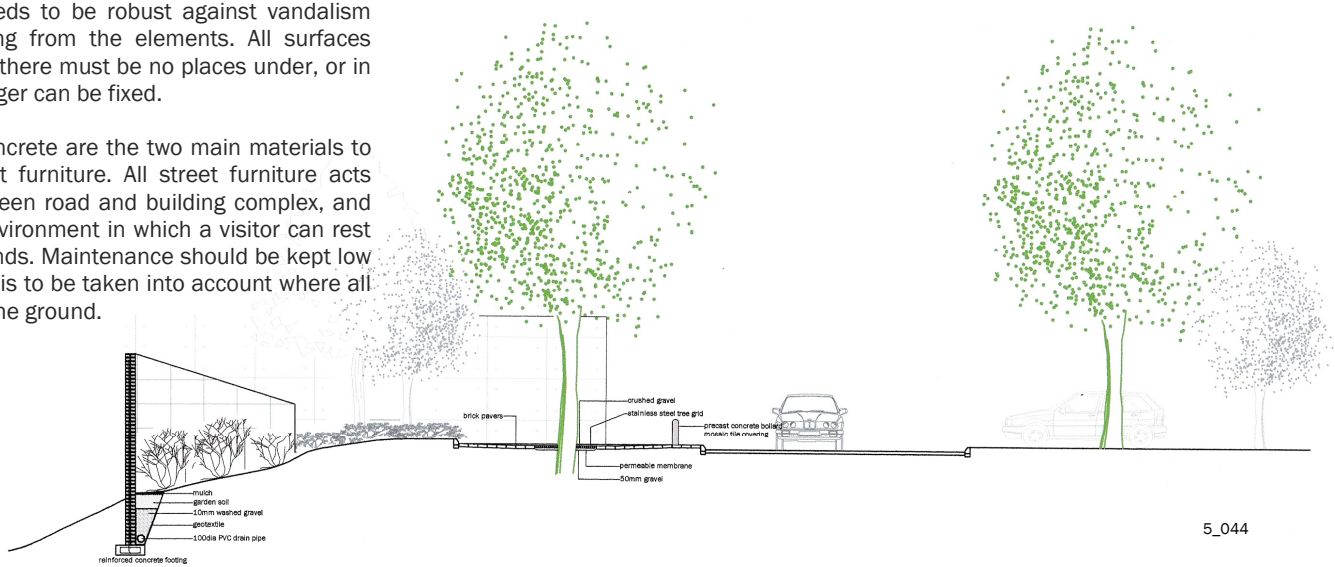
5_043

5.5.4 STREET FURNITURE

Bollards Seating Dustbins Drinking fountains Tree grids

All street furniture needs to be robust against vandalism and against weathering from the elements. All surfaces need to be visible and there must be no places under, or in which elements of danger can be fixed.

Stainless steel and concrete are the two main materials to be used for the street furniture. All street furniture acts both as a barrier between road and building complex, and to create a relaxing environment in which a visitor can rest and take in the surrounds. Maintenance should be kept low and drainage detailing is to be taken into account where all elements are fixed to the ground.



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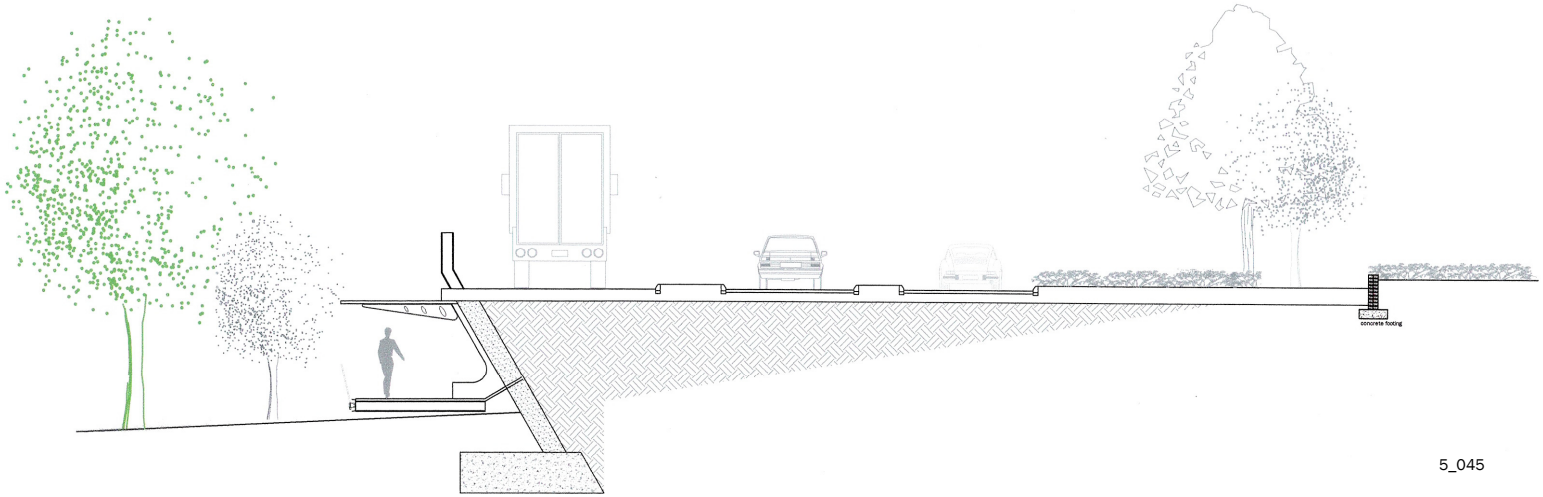

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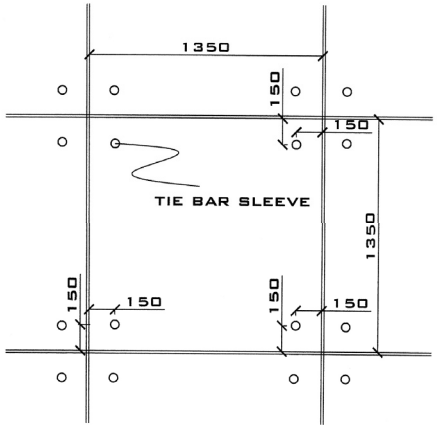
Concrete

Concrete work needs to be done with care. The quality of the off shutter work needs to be done by trained specialists so as to ensure good detail. All edges need to be chamfered, both to ensure a neat edge and because they are easier to cast. The runoff of rainwater needs to be carefully dealt with in order to ensure that surfaces are not stained. Each horizontal surface needs to be drained individually, and although darker colours and heavier textures can hide stains, light coloured concrete is to be used due to its thermal performance. Shuttering needs to be designed accordingly so as to provide the detail as indicated below. Steel or glass fibre reinforced polyester shuttering is proposed to ensure the smoothest finish possible. The placement of the sleeve holes to be used for the tie bars, is an important detail.

The safes need to be constructed of reinforced concrete. The shell must be of 30MOA concrete, and no openings must be provided.



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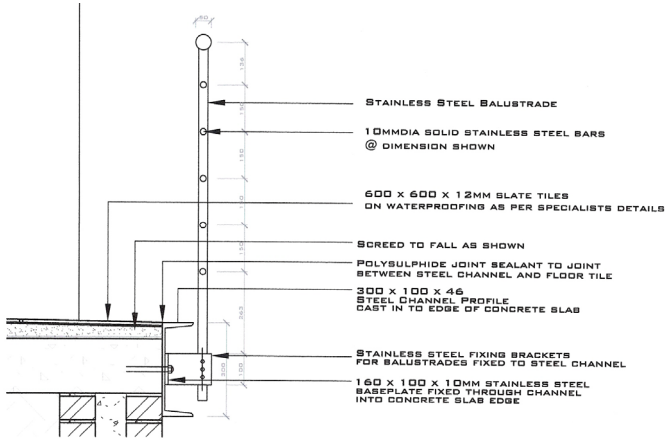
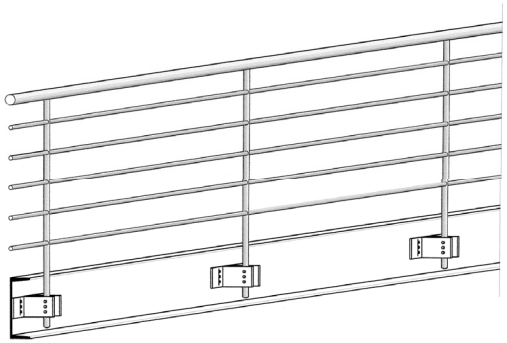
Masonry

All masonry work is to be internally plastered and painted, but the external skin is to be face brick. A light colour is to be used for thermal performance, to ensure that heat absorption is minimised

Steel

Mild steel I- profiles, and channel profiles are used structurally throughout the building. Steel members also form edging detailing, and I- beams are used to frame all window and door openings. All stair and balustrade details are uniform throughout the complex, both externally and internally. Stainless steel is used for its robust qualities and its resistance to weathering.





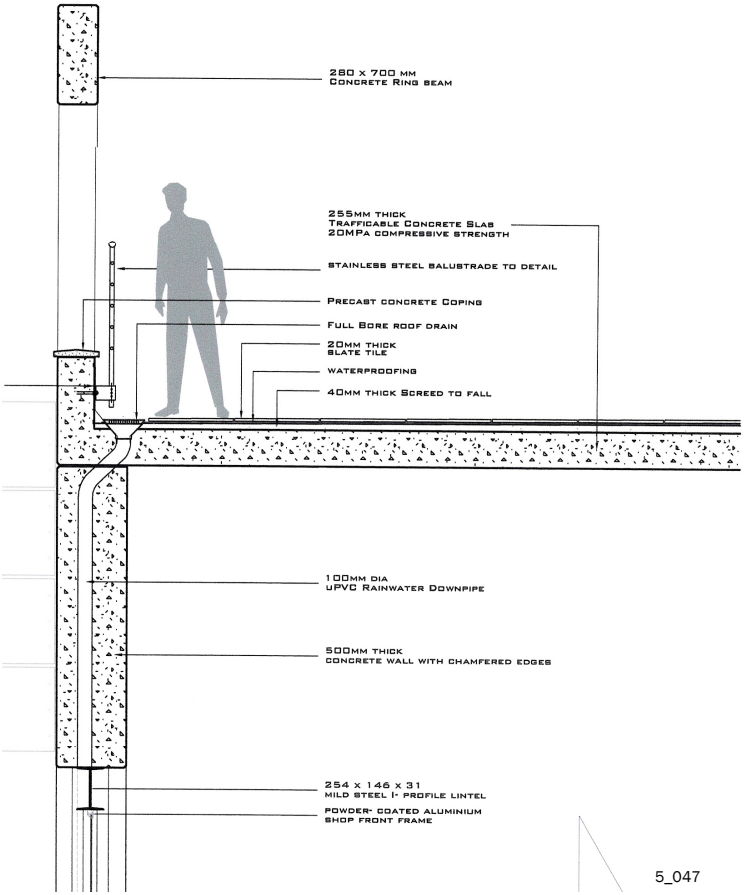
Roofing

Roofs become important elements of the design. Choice of material type, height differences and overhangs merge to enclose the buildings functions. The building is kept to one storey. Mezzanine levels are allowed for in certain areas, this allows for the interplay of different levels to draw in different amounts of sunlight.

Roofs other than flat concrete slabs, are a monopitch type with a 0.6mm thick sheet metal covering, laid on purlins using hook bolts. Sheet metal is also used as a cladding material. An ideal situation, in this specific climate, would be to have a pure white building, to allow maximum reflection of solar energy. Roof sheeting not exposed to the visitors will be painted white, all other surfaces will be reflective or light coloured. All sheeting is to be well insulated. Insulation needs to be provided for the entire built structure. A foil type will ensure that heat is kept out of the building and allow for maximum user comfort.

Trafficable roofs need to be of 20– 30 MPa concrete, and cast and cured correctly. The screed needs to be a minimum of 40mm thick, and have a minimum gradient of 1: 50. Full-bores need to be placed accordingly, to allow for the efficient drainage of rainwater and it needs to be ensured that water is discharged to a suitable area.

Waterproofing needs to be detailed with care on the flat concrete roofs. It needs to be laid by a specialist, and taken up at least 200mm against the parapet walls. Protection of the waterproofing is achieved by laying tiles on top, inspection and maintenance the roof could however be problematic.



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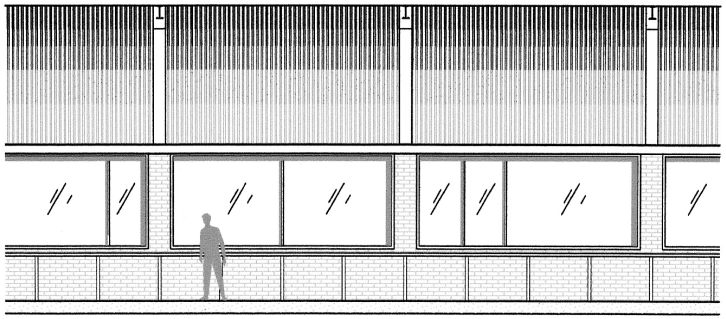
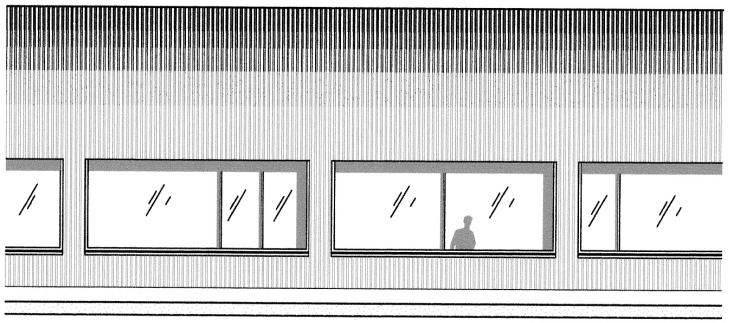


Internal Section of tubular structure



External Elevation of tubular structure

5_048

5.7 CONSTRUCTION DRAWINGS

site plan

lower floor plan

upper floor plan

roof plan

north elevation

south elevation

west elevation

section aa

section bb

section cc

details