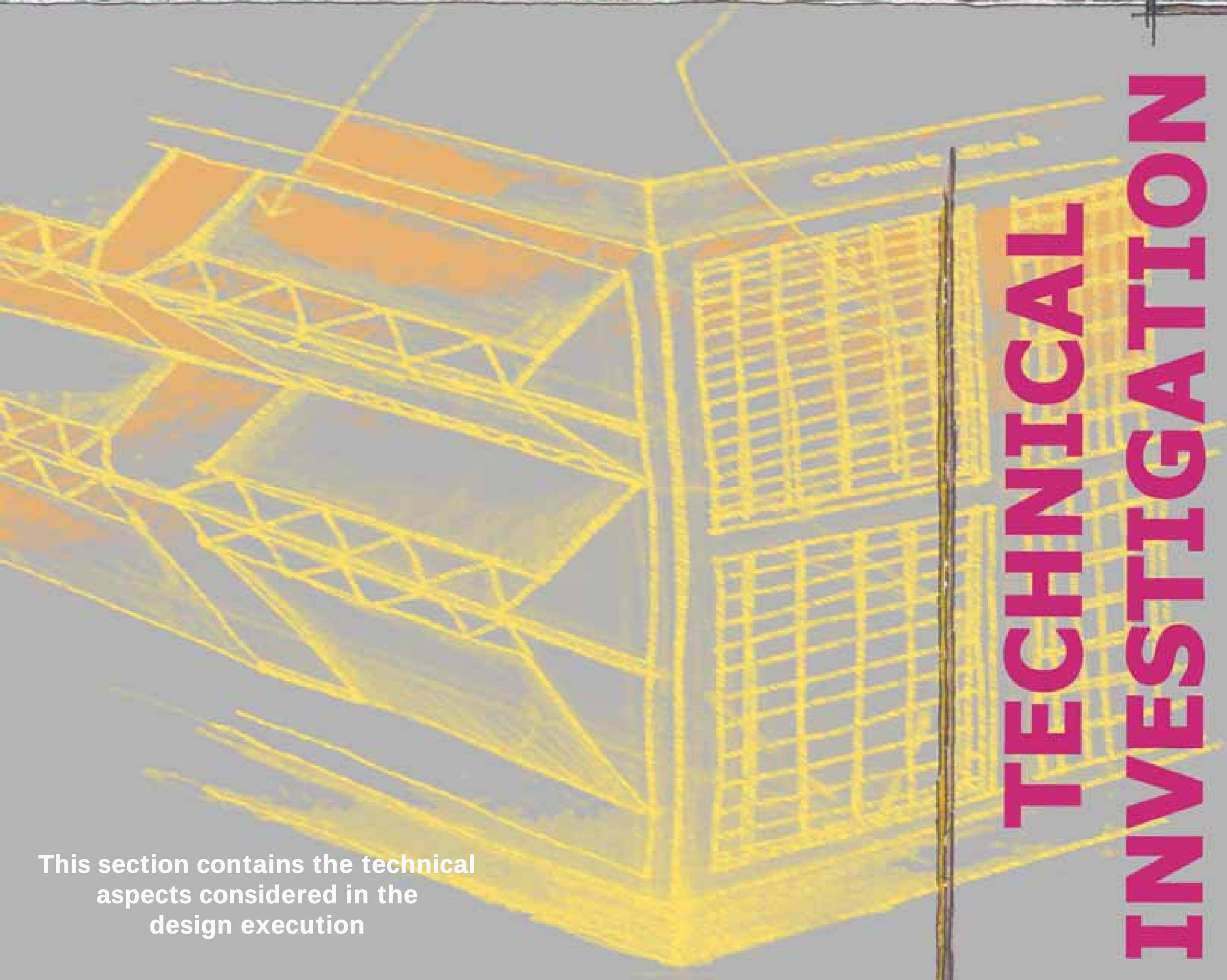


TECHNICAL INVESTIGATION

This section contains the technical aspects considered in the design execution

JOURNAL 7

Technical Progression Report

Site: Erf 33/866 and Portion R/1340.

The site is located between the Breytenbach Theatre and Nelson Mandela Drive. The following issues were dealt with:

1. Structure

Vehicular access is allowed from Gerard Moerdyk Street, due to traffic legislation preventing it from Nelson Mandela Drive and Jacob Mare Street. The parking basement is situated underground. Access to the basement is by means of a ramp (1:8 gradient) with a 6.4 radius semi-turn circle placed on the northern border of the site, at the back of the MOTH Club. Due to the ramp having a head clearance of 2980 mm, it is the only space capable of housing the ramp due to the western border having been designated for mass development and the eastern border functioning as a public space.

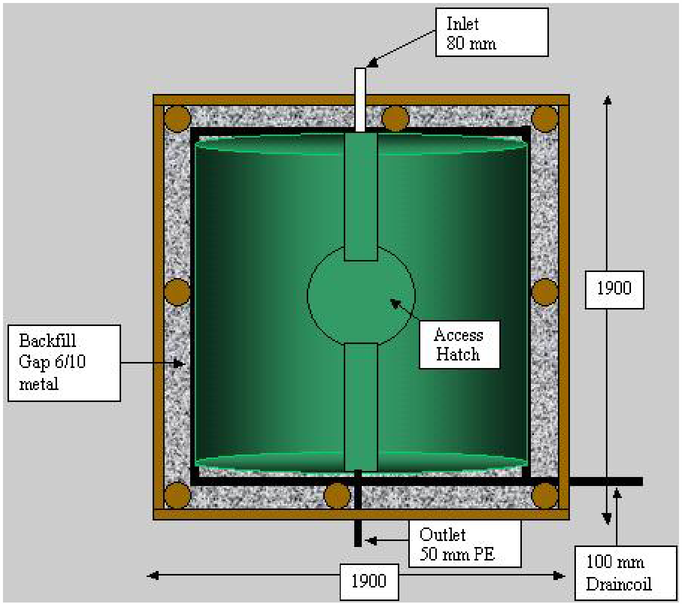
1: Column structure: exposed concrete

The basement grid of 5600 mm centres as chosen to ensure adequate parking space, with 7500mm circulation routes. Reinforced concrete columns (330x330) are placed on the grid. The structure of the building consists of 3 storeys of extruded columns with 170mm reinforced concrete slabs every 2890mm. Thus the basement structure partially determines the design of the upper levels. Two fire staircases are provided in the basement with one fireman's lift (2400 x 2200). Parking for the disabled is located close to lift, and ablutions are available for workers. The sewage from the basement level is pumped to connect with the plumbing grid under the slab. A 150 mm sewage pipe runs at 1:60 fall connecting to the municipal connection at the MOTH Club boundary. Mechanical ventilation is used along the southern border of the basement, where air is released via a duct. Natural ventilation is used along the northern border. Honeycomb brick bond is used on walls at levels 97 0450 up to 99 830.

Movement joints are provided on the following grids: C,F,L,O, 3 and 5. Flax rope made from waste linen fibres can be used instead of polyutherane in the joints of the building. Cavity walls, concrete columns, slabs and beams provide thermal mass. Non-load bearing brick is used for 270 cavity walls. The walls and concrete heat up slowly and retain heat releasing it overnight. During the evening, windows and vents are kept open to cool the mass of the building.

2. Water

Rainwater is collected in a segmented water tank, supported by a strengthened slab on 3rd floor roof level. Planters are irrigated by a pressured drip system. Grey water will be available from the silkscreen workshop and wash hand basins. The water needs to be filtered and treated to avoid plumbing blockages. It can be used in conjunction with municipal water to flush the toilets. A mechanical in-door filtration system is installed in the basement, pumping water back up to



2: Indoor gray water filter

the ablution facilities.

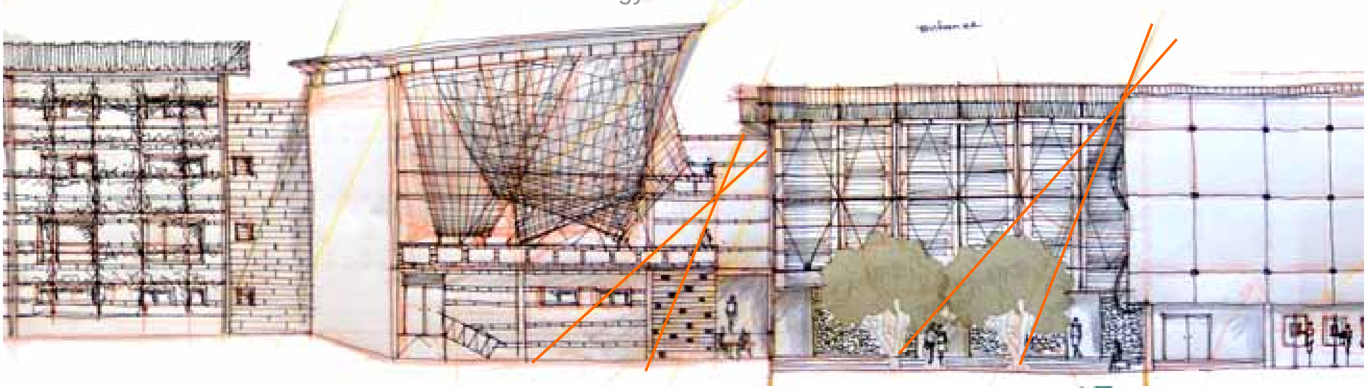
3. Orientation

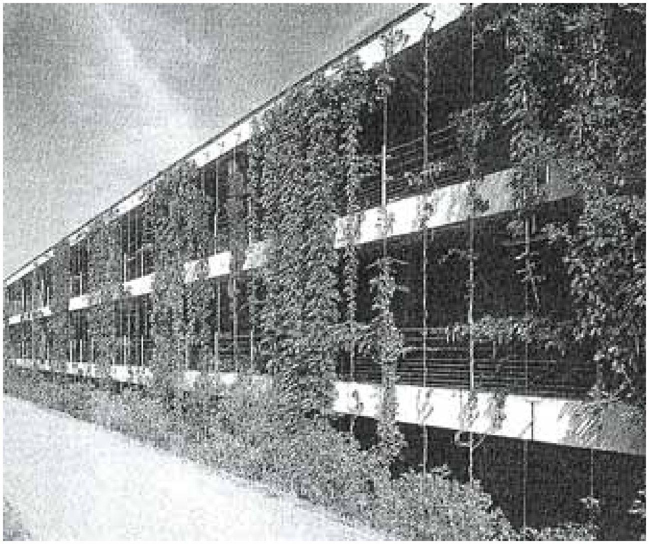
The bulk of the building faces west. This is determined by the Nelson Mandela Urban Design Framework to promote mass along the street façade. This however allows little consideration in climatic control and energy efficiency of buildings placed facing this direction. Freedom of design was limited and placement of functions were categorised according to the needs of the different facilities. The coffee shop, lecture hall, research and weaving facility face north. A spill space for warm winter sun allows a comfortable place for students to gather. The western built mass is designed with facing windows to facilitate cross ventilation, directing eastern summer winds through the building.

Cooling is promoted by the reduction of direct solar gain by the building. The western facades make use of deep overhangs, brises-soleil and covered walkways. Architectural stainless steel mesh, Alnet aluminium polypropylene cloth, and white-plastered wall finishes reduce the amount of heated absorbed. A heart space for the community provides a cooling aid for cross-ventilation between the buildings. Trees along the eastern border and in the heart space also promote cool shadows on the buildings and paving. Deciduous trees will allow winter sun to filter through for a comfortable public environment in front of the coffee shop.

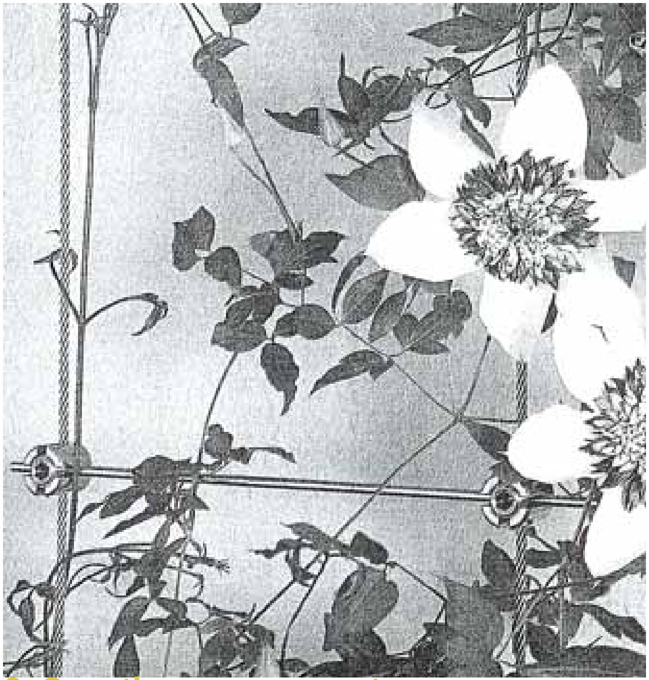
A stainless steel grid structure provides a growth screen for the eastern façade. A concrete ledge of 700mm allows pruning of plants and passive design control for direct solar gain.

3: Eastern elevation





1: Growth screen facade proposal



2: Growth screen connectors

4. Materials

According to Elizabeth Wilhide (WILHIDE.E.2002: 126-149), the following qualities of the different material applications in the building will have a great impact on the environment due to aspects of it's embodied energy, recycling and re-use.

Insulation:
Cellulose insulation made of recycled newspapers and magazines and mixed with additives such as borax for fire resistance, has a U-value similar to mineral wool. Cellulose panels are fixed to the roof structure.

Wood:
This is a renewable resource, has low embodied energy and is recyclable. It is used for the timber walkways. Large plywood panels used as wall cladding in offices provide a smooth warm interior surface.

Non-structural straw ceiling panels and particleboards can be used for interior applications. Straw is compressed between heavy paper sheets at high temperatures.

Woven paper flooring can be used in areas of low circulation. It offers a variety of different weaves for a textured look.

A cork floor in the lecture facility supplies high sound absorption and insulation.

Linoleum flooring used in the design studio and research lab, is a completely natural product that is ideal for hygienic applications and for low maintenance. It repels dust and is durable. It strengthens with age. It is available in a wide variety of colours, patterns and textures.

Recycled rubber is strong, highly slip and weather resistant and ideal for application in the silkscreen workshop, weaving and clothing manufacture facilities. It is inexpensive, tough and available in a wide variety of patterns and colours.

3: Linoleum flooring

4: Rubber flooring

Salvaged rock:

Salvaged rock from site excavations can be applied as textured cladding. It is very durable and reuse is a sustainable solution. Rocks can be grinded to achieve a smooth surface .

Brick:

Brick applications are essential for the Pretoria vernacular. It provides high thermal mass and enables a variety of applications. The western façade consists of plastered stock brick with a protruding brick coarse every 510mm. The proposed brick pattern on the southern and northern façades brings warmth and movement to the building.

5: Brick

6: Concrete

Concrete:

Provides high thermal mass to the building. 25 percent of Portland cement is to be replaced with fly ash for floors and foundations according to engineer's specifications.

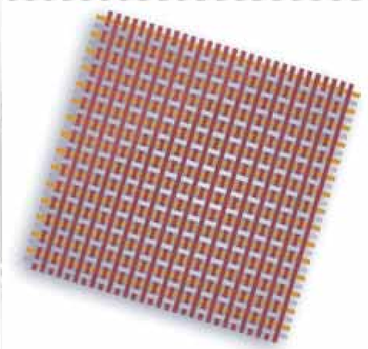
Steel:
Structurally light sections are used, bolted to facilitate re-use. Metal reflects the heat of the sun and the roof covering promote maximum run-off for water harvesting. Steel can be recycled up to 90% and is locally available. A rigid steel structure is used for the walkway on the western shop front façade and a woven shading device is used in front of the design and silkscreen workshops. Klip-lock roof sheeting is used on the west-facing buildings. A flat concrete roof is used for the north facing building block. The angled-steel frame roof structure is more durable than common wood applications.

1: Steel: dismountable

5. Solar energy

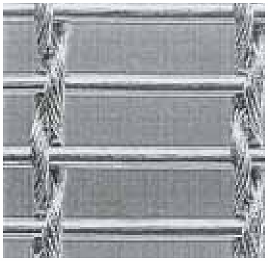
Due to the vast extent of the building exposed to the western façade, the utilization of solar energy will be an effective way to save costs. Photovoltaics produce direct-current electricity that needs to be converted into alternating-current electricity. By installing an inverter this change can take place. The system can be connected to the national grid and used as storage. Due to the 10-year life span of shading cloth in the detailed application of the western facade, its future replacement can consist of flexible thin photovoltaic film (fig 2) which is laminated to a woven polyester cloth coated with pvc and can be wrapped around the steel structure to form a loom effect. Research in this field is still advancing but no projects are commercially available yet for application.

2: Konarka solar fabric

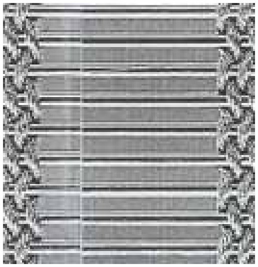


6. Climate control

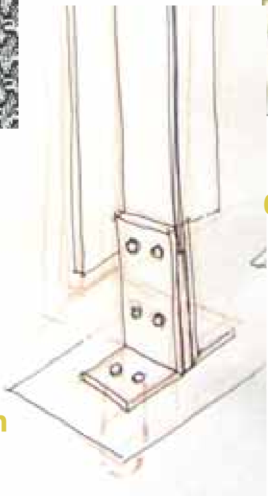
Cross ventilation is promoted by facing windows in all building sections. Overhangs of 500mm on northern sections and 1200 on western sections provide passive climatic sun control for the buildings. Direct solar gain is limited. Double-glazing and textile sunscreens on the western and eastern facades prevent direct solar radiation in summer. If necessary console air-conditioning units can be installed on the eastern office façade. A wall offset of 1m from the eastern boundary line is provided and units will go unnoticed, hidden by the growth screen.



3: Futura mesh



4: Zambezi mesh



5: Steel column footing

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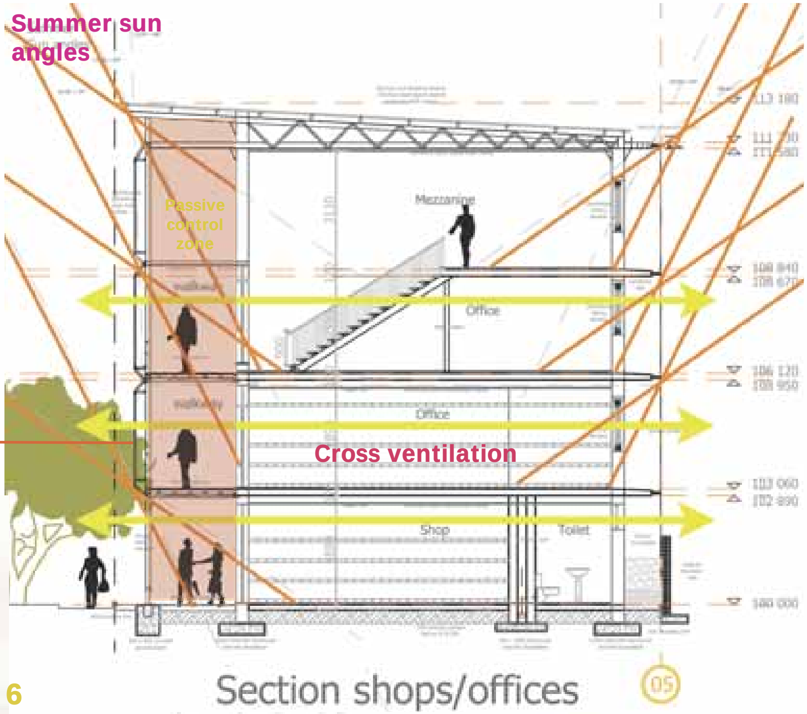
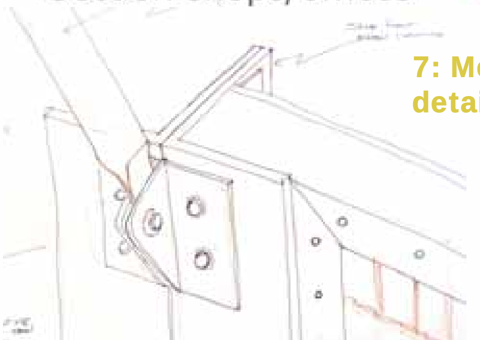
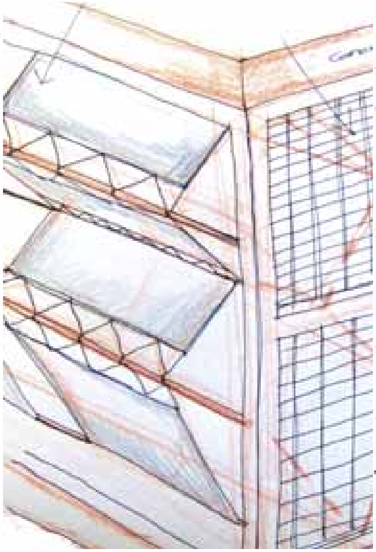


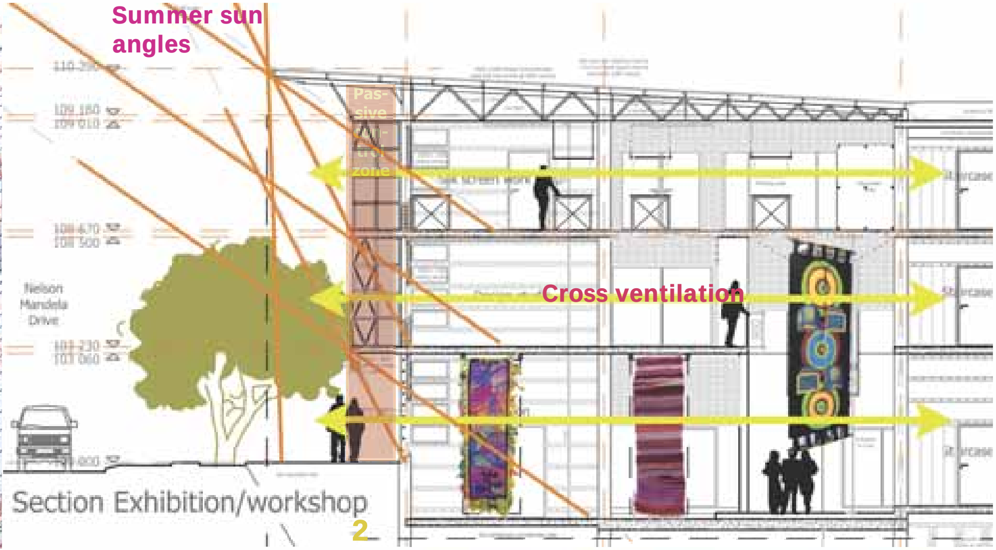


7: Mesh frame detail

Architectural mesh detail:

Stainless steel mesh is a highly durable and resistant material. Stainless steel becomes resistant to corrosion and weathering by the reaction between its chrome content and oxygen. It is low-maintenance and has good acoustic values. The mesh diffuses and reflects solar rays. Due to its permeability, cross-ventilation is still possible when applying it as a sunscreen in front of the office block (fig 6). The Futura (fig 3) and Zambezi (fig 4) types mesh are used due to their high transparency levels. Their textures are also more prominent, thus the varying rotated applications in a steel frame (fig 7) of the two types provides a patterned façade.





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1: Loom detail

Alnet shading loom detail:

Cooltone UV Ultra Block Shade Cloth is available in a wide range of options (fig 4), which provides fashionable and durable protection against the sun and elements. The cloth allows heat to escape while blocking harmful UV rays. The cloth is silkscreen printed to present the pedestrian and vehicular routes with an interesting interactive façade (fig 1&2). It can be dismounted and replaced by new more fashionable options. It is mounted to the loom structure (fig 3).

A wide variety of polypropylene ropes (fig 5) are available and can provide an insightful platform for the weaving facility. The weavers can make colourful textile sunscreens that can be used for the building itself and be sold for financial gain.

3: Loom effect

4: Shading cloths

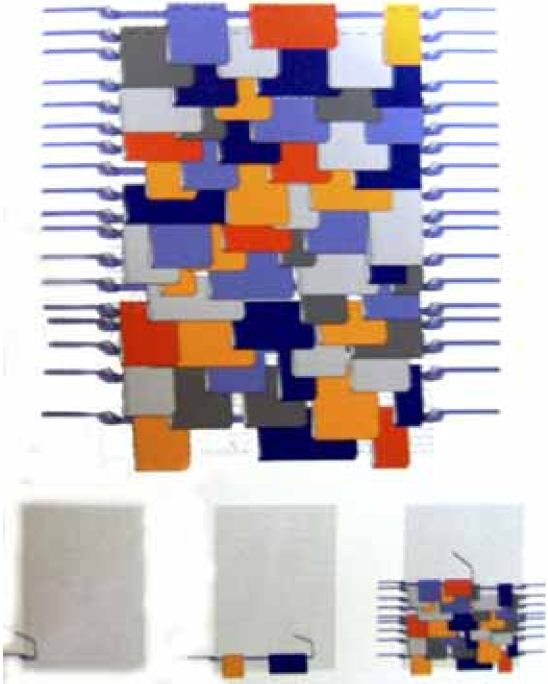
5: Synthetic ropes

7. Recycling:

*" Japanese born architect Toshiko Mori has challenged the barriers that divide art from architecture from the real world. Her **WOVEN INHABITATION**, presented at the Artists' Space in New York in 1999, seeks to offer a simple, elegant solution to the vast problem of providing temporary housing to the refugees or victims of natural disasters. Her concept is to make use of 'the woven remnants of revolutionary industrial fabrics already utilized by aerospace, medical and fashion industries but never developed as an architectural building product.' Mori proposes an elegant, inexpensive solution to a vast problem." (JODIDIO.P. 2001: 394).*

6: Woven scrap material

Woven scraps and silkscreen cut offs can be used by the workshops for a woven inhabitation project (fig 6). The panels are inserted into the sliding doors of the exhibition gallery. Panels (fig 8) can be used for home partitions and as insulating cladding for squatter camps in cold environments . All waste products that cannot be salvaged for this purpose can be woven into floor rugs. Waste from the coffee shop will be separated in the refuse quarters into the following categories; glass, metal, organic and paper. A composter for organic waste will be located in the basement and can provide fertilizer for the gardens on the premises.



7: Construction of panel: strips stitched to rope woven to chicken wire

8

1 Fire stratergy: 1:600

8. Fire strategy: according to SABS 0400-1990 Part T: 157-221

NBR TT16.2 Provision of escape routes where the travel distance is less than 45m in any building three storeys in height, and emergency route shall not be required. Any door opening in the path of travel along a feeder route shall be a double swing door constructed of non-combustible material (TT18.1-2). See (fig 1).

TT21.2 states that the width of any escape route shall be determined according to the population of the room. A maximum of 120 people will have a minimum width of 1100mm.

TT23.8 The distance between any change in floor level and the centre line of a doorway in an emergency route shall not be less than 1.5m.

TT31.3 A manually activated audible fire detection and alarm system shall be installed throughout the building.
TT35.1 Hydrants in position subject to direction by the local authority shall be provided, with 30m length fire hose.

TT36.1 An approved sprinkler system shall be installed in any storey that exceeds 500m² of total floor area.

Occupancy type (A20)	Structural stability (TT7)	Portable Fire Extinguishers (TT37.4)
A3: Places of instruction	90 min	1 per 200m²
C1: Exhibition hall	120 min	1 per 200m²
B3: Low risk commercial service	90 min	1 per 400m²
D3: Low risk industrial	60 min	1 per 200m²
F3: Small shop	120 min	1 per 200m²
G1: Offices	60 min	1 per 200m²
J2: Moderate risk storage	90 min	1 per 100m²
J4: Parking garage	60 min	1 per 400m²

Exposed structural steel elements (interior and exterior) are painted with a thin film of intumescent mastic coating. A topcoat of non-combustible acrylic paint for a matt silver finish matching natural anodized aluminium must be applied. For connection points of steel and concrete, the steel will be cast in-situ.

9. Inclusive environments: according to SABS O400-1990 Part S

The building mass of the Textile Art centre frames the pedestrian public route to Oeverzicht village, therefore it is essential that the space it contains is accessible to all people. Stramps (1:12 gradient) descend into the heart space of the building complex, allowing easy pedestrian access for walkers and disabled people. Textile stainless steel mesh light columns will provide diffused light in the evenings on all movement routes. A ramp descends into the exhibition space, and level changes into the shops on ground level are a maximum of 30mm. A lift is provided for the disabled access from basement up to second floor level. A toilet for the disabled is provided on every level. One parking space close to the lift on basement level is allocated for the disabled.