"Construction is the mother tongue of the architect. The architect is a poet who thinks and speaks in terms of construction." AUGUSTE PERRET

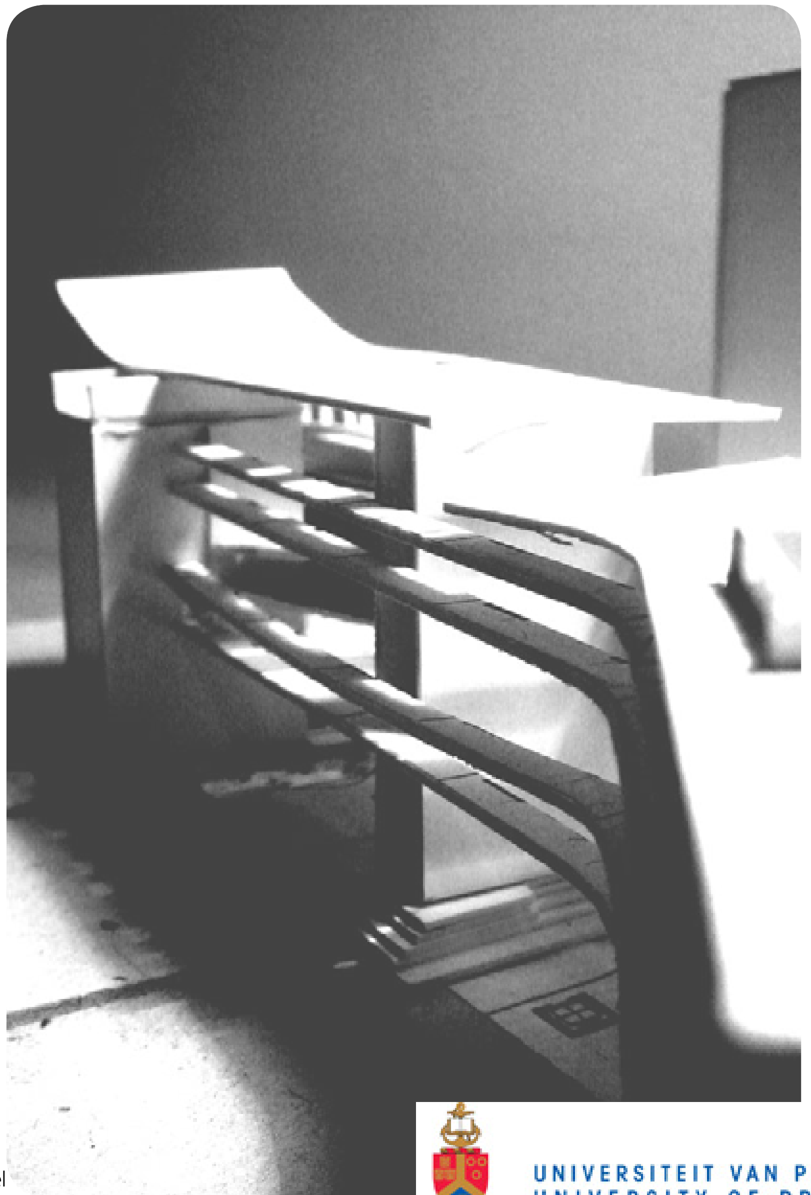


fig. 6.1 photograph of concept model

introduction

Gottfried Semper classified the building crafts as two fundamental procedures: the *stereotomics* of the earthwork, the repetitious piling up of massive elements to compose a volume; and the *tectonics* of the frame, lightweight components composed to define a spatial matrix [Frampton, K. 1996: p. 5]. Vernacular architecture displays varying roles played by these two forms, influenced by climate, custom and available material. The *tectonic* or *frame* component has an affinity to the sky, whereas the *stereotomic* has an affinity to the earth, dissolving therein. [Frampton, K. 1996: p.7]. This relates to man's existential *dwelling* "between heaven and earth". The shape of the sky is described by "the vaulting path of the sun", whereas the earth is related to the human need for shelter. (Norberg-Schulz, C. 1980: p. 24).

The technical discussion comprises these two components, and their relation to the human element, with the primary focus on the *tectonic* as a transient/temporal interface.

the stereotomic

"Pretoria regionalism…reflects a particular response to nature and landscape through the economical use of naturally available and industrially produced materials with an empirical response to climate…" [Fisher, R.C. 1998: p. 123]. Inspired by *Brazil Builds*, many civic and institutional buildings built after the 1940's display elements such as *Brise Soleil,* roof gardens and fluid concrete form work. [Fisher, R.C 1998: p.197-229]. The attempt is to create a building which relates to the local vernacular, while maintaining a culturally non-specific architectural language.

A massive concrete structure was selected as load-bearing component. The material use is regionally respectful as an architectural component, and assists in maintaining a temperate internal environment. The structure creates a skeletal framework, within which internal partitions can be provided as space requirements stipulate. Suspended floors and ceilings accommodate regular change in office space requirements.

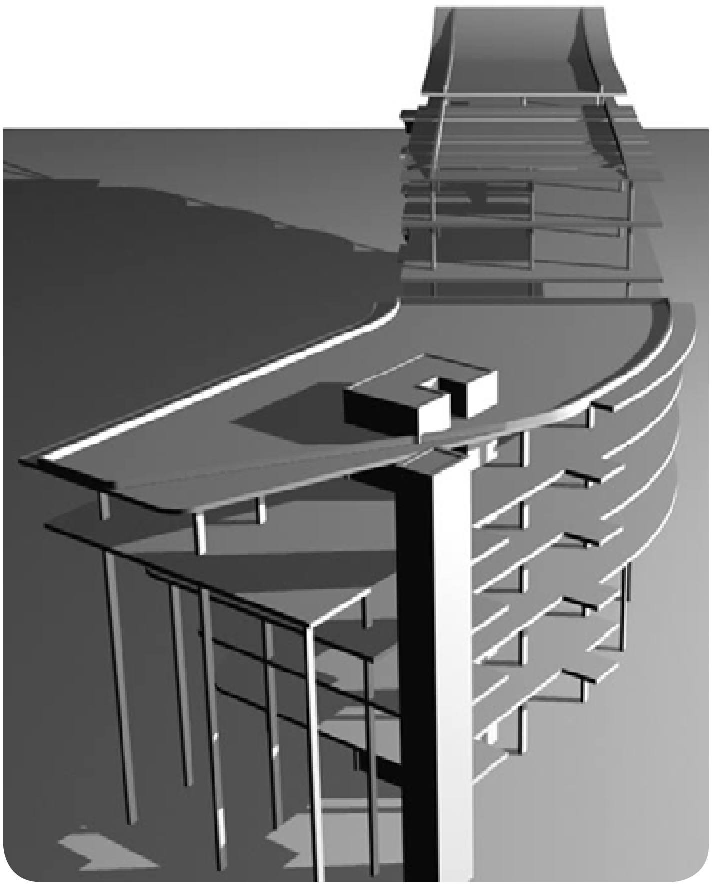
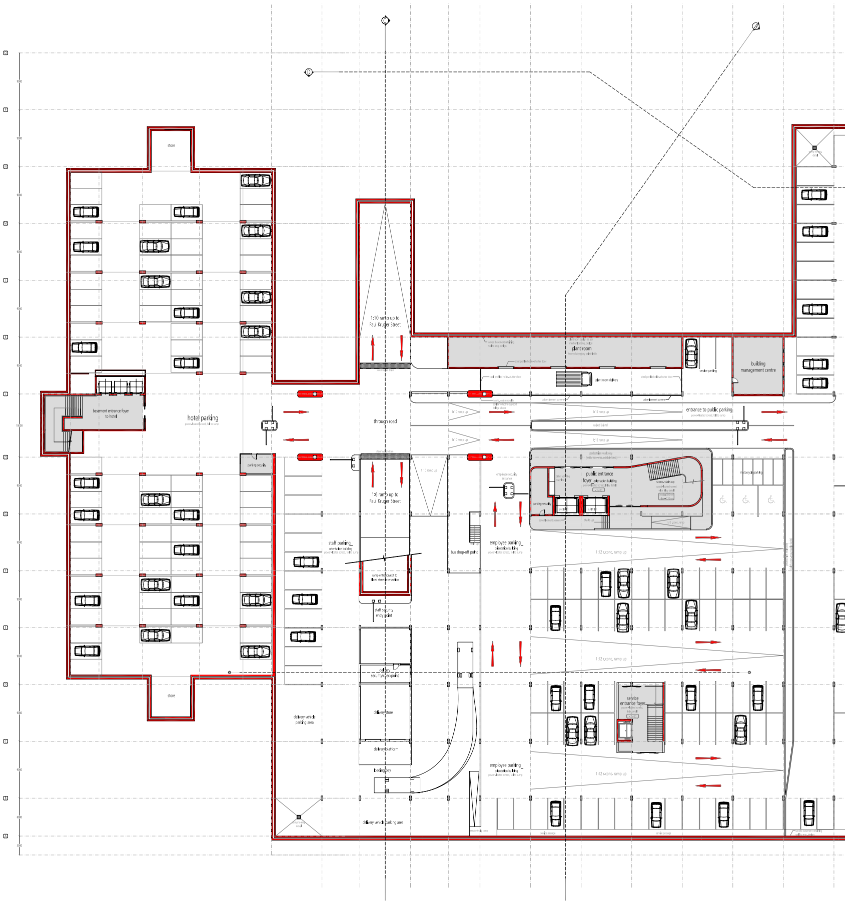


fig. 6

The building's structural system originates from the basement. The proposed building, as departure point when moving into the city, must provide vehicular parking for visitors entering the city. The visitors are intended to leave their vehicles at a safe and accessible point, then proceed into the city on foot or make use of various forms of public transport. Such parking is best provided in a basement level facility. Parking bays, which usually impede pedestrian movement, can thus be eliminated on street level. This also maximizes use of the site at street level. The basement will be used by all the buildings located on the street block. A public parking component will also generate an income, which can contribute to the maintenance of the square.



The basement was co-designed by fellow students Piet du Preez [informal trading centre] and Pieter Maré [hotel]. A tanked system was employed against horizontal and vertical ground water pressure [see typical detail]. Any ingress of water, either through leaking or stormwater penetration, can be drained, as surface drainage, to mechanical sumps at selected points. Extractor fans to ground level remove exhaust air; clean air is introduced through conduits from the plant room. The basement roof [square level] is waterproofed and paved. Tree planter boxes provided are placed strategically above columns to carry the additional loading. Areas adjacent to the entry point were designed with a minimum clearance height of

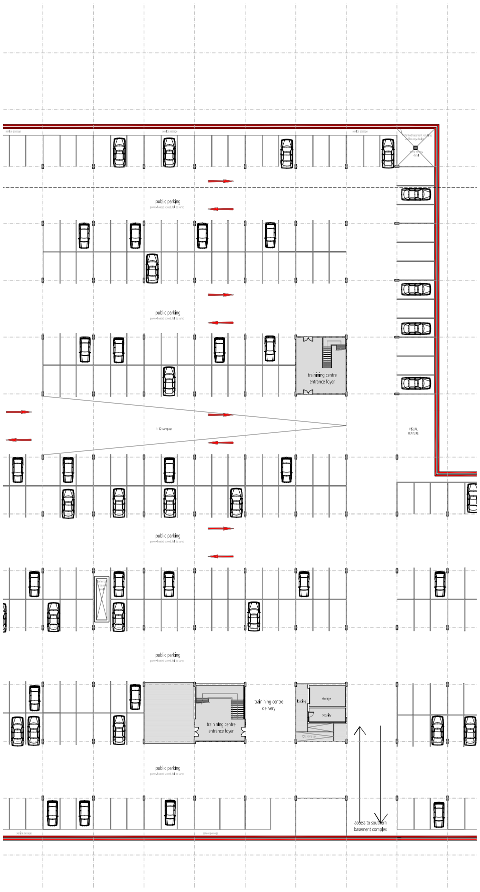


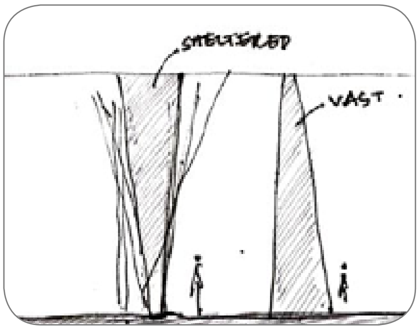
fig. 6.3 basement plan
fig. 6.4 view of pergola

4.5 metres to admit service and emergency vehicles, should it become necessary. The remainder of the basement is ramped in order to reduce the height, with a 2.4 metre clearance height allowed for the public parking area.

The entrance to the basement level is provided by a two-way vehicular ramp in the centre of Paul Kruger Street. Accessible from both a Northern and Southern direction, the location of the parking entrance is clearly legible to unfamiliar visitors approaching the building, enforcing its use as a point of orientation. A series of security booms will be utilised to demarcate visitor and employee parking for the relevant buildings. Access to buildings will be provided by monitored lift and stair shafts, which continue through to the various levels above. The basement also provides facilities for deliveries and waste removal.

The column grid of 9mx8m was influenced by the need for an economical parking layout on the basement level. A 300x700 reinforced concrete column was recommended by the structural engineer [Carl von Geyso, during interview with author]. The size can be reduced proportionally moving upwards through the floors. The reinforced two-way slab was calculated to have a depth of 340mm, a marginally thicker slab favoured in order to reduce the amount of steel reinforcing required. 595mm reinforced concrete beams span in the longer north-south direction.

6.5



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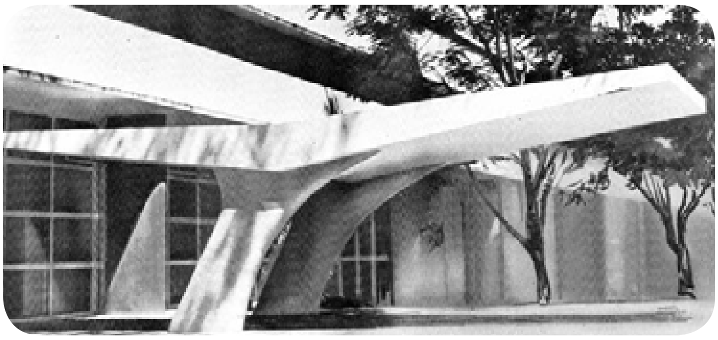
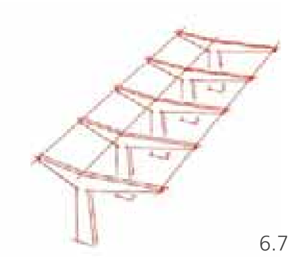


fig. 6.5 column investigation_sketch
6.6 school entrance canopy, Brazil_Oscar Niemeyer
6.7 concept sketch_columns
6.8 t-frame structure
6.9 Perspective view of roof form



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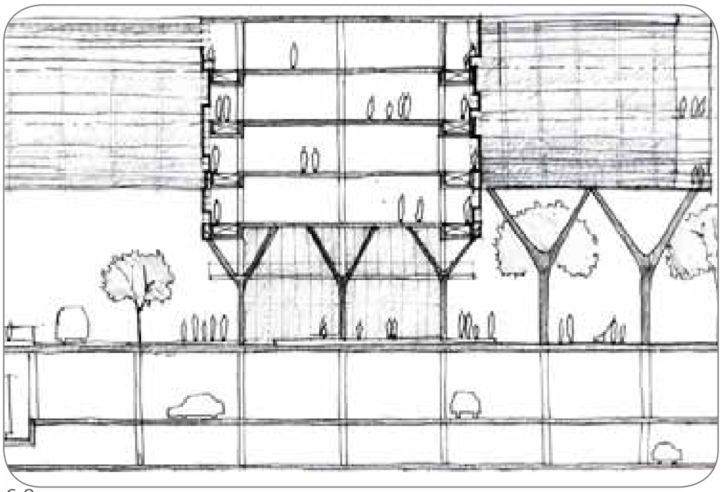
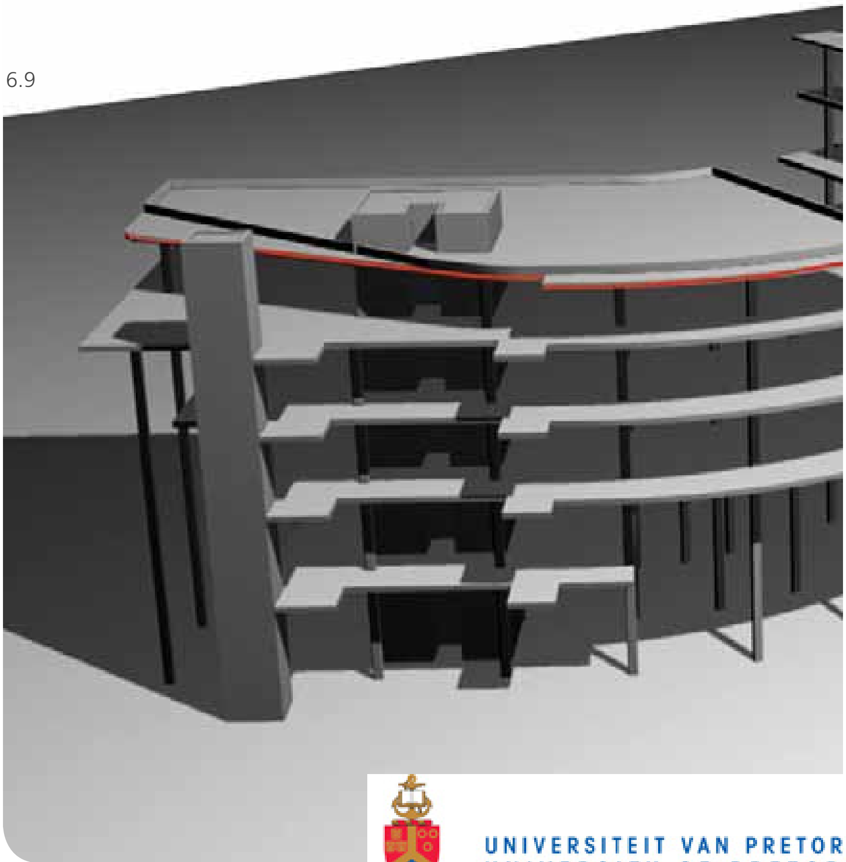


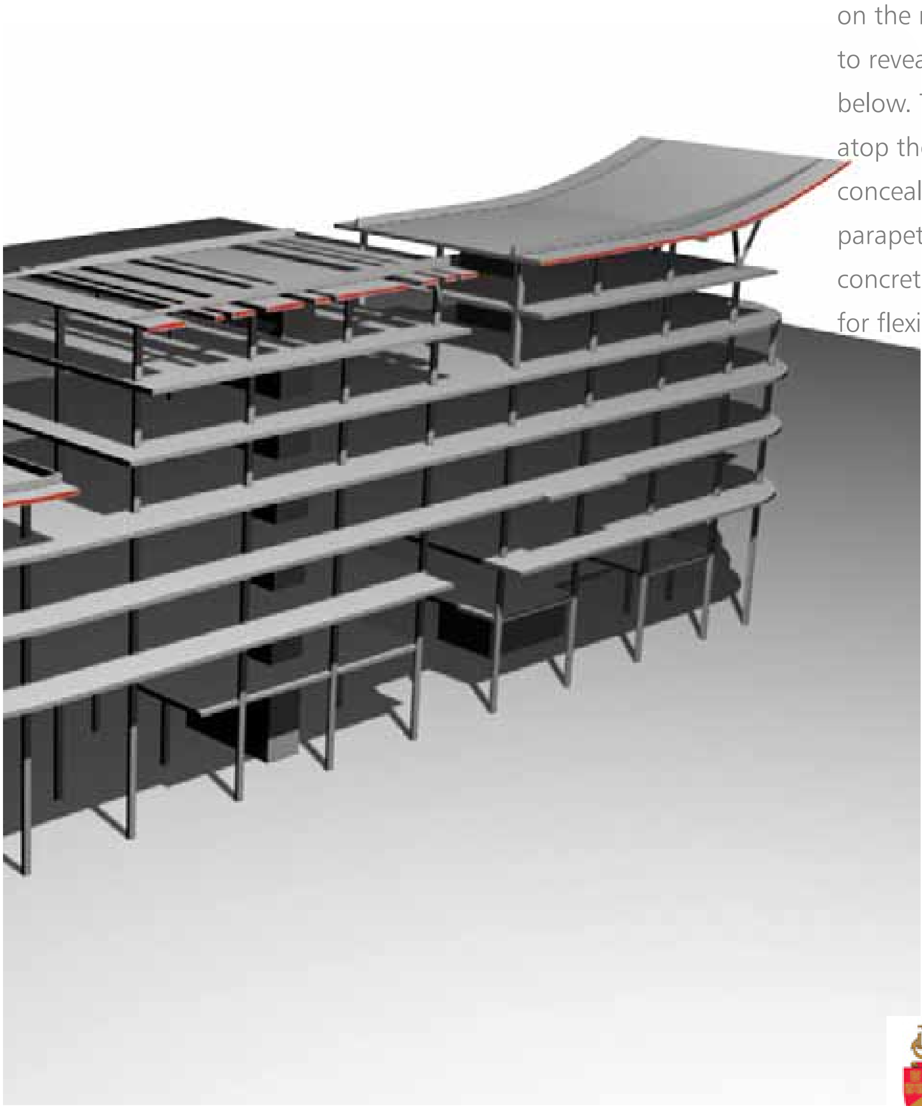
6.8

The building being raised from the ground on street level, led to an investigation of column forms, in an attempt to humanise the space below the structure. However, an intricately formed column was later discarded. Unless a symmetrical column form was utilised, it would denote or favour a direction for movement. The desired freedom of movement through the public space would thus not be articulated in the structure. Complexity was rather provided by enclosing portions beneath the building for commercial use, reducing the overwhelming volume.

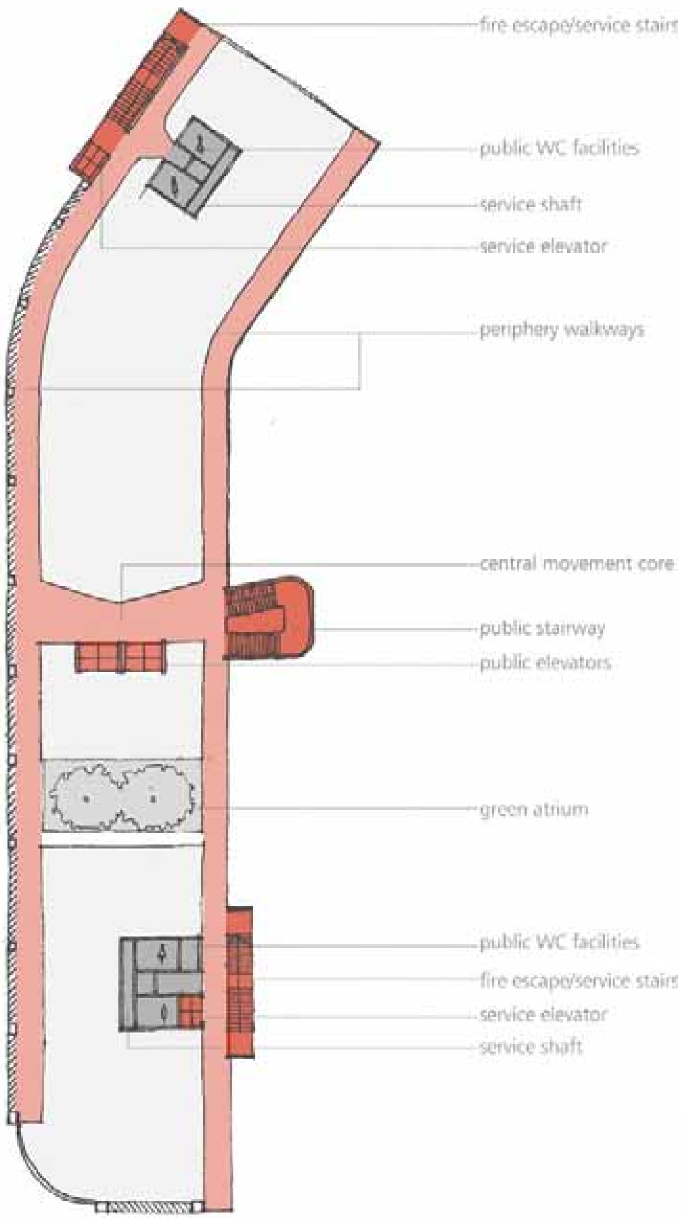
6.9



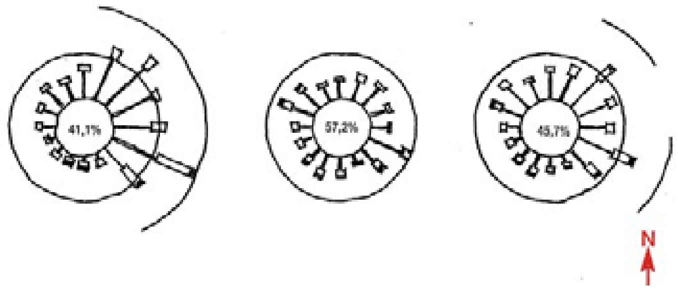
The use of a predominantly flat roof accommodates a roof garden, and allows for future upward expansion. The curved roof and branched columns [south] is an expression of transient freedom and movement. It opens up a welcoming view of the city. The use of concrete formwork to construct these components references to the Pretoria tradition of concrete work. A concrete parapet wall conceals the waterproofing, set back from the roof edge to achieve a slim line on elevation. Shuttering for the curved roof is to be constructed from 150mm wide timber planks, achieving a finely-textured finish. This roof flattens, disintegrating to a concrete pergola above the roof garden. The roof curves horizontally on the northern end of the building to reveal a more intimate roof garden below. This is echoed in a roof garden atop the redesigned heritage building, concealed by the existing stepped parapet wall. The use of precast concrete planter boxes was favoured for flexibility of planting.



Two vertical service cores concentrate utilities, allowing for efficiency and flexibility. These are connected to horizontal service spines, located in the ceiling void above walkways. These service channels allow easy access to conduits for maintenance and modification. Passive ventilation is encouraged in order to reduce energy consumption. The exterior facades are designed to encourage cross ventilation. The secondary leaf of glazing is fitted with operable windows and high level louvers for the escape of hot air. A supplementary mechanical ventilation system, operated by a basement plant room, is provided to create a comfortable working environment. Cool air is transported in ducts, concealed in the eastern service spines, and introduced via inlets in the suspended floors. Hot air is extracted through outlets in the suspended ceiling, and transported back to the plant room, via the western service spines.

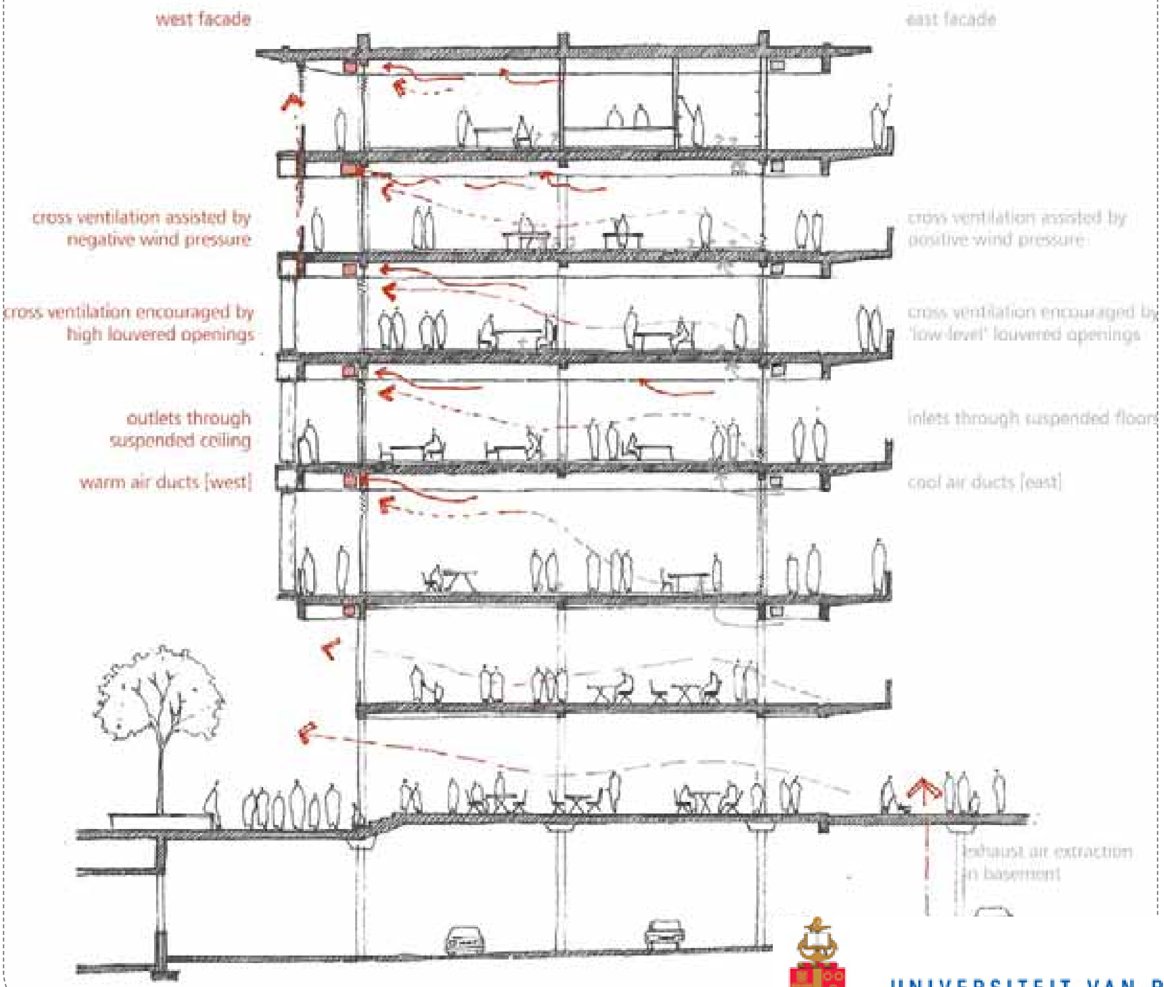


6.10 service and movement cores
6.11 perspective of walkways

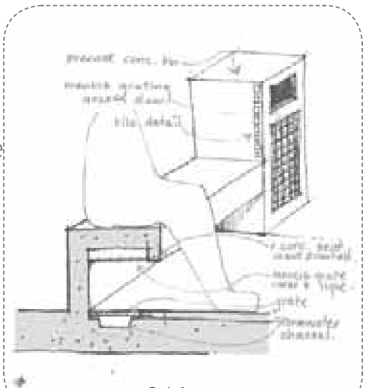


6.12 wind rose for pretoria_indicating predominantly north-east and south-east wind.
wind pressure differrences on the western and eastern facades thus assist in ventilation through the building

6.13 building ventilation diagram



Another component of the investigation was that of creating a unified public space under and around the building. Street furniture and planter boxes were designed, in conjunction with fellow students, to be used throughout the gateway node. An analysis of identified movement patterns through the site developed as a paving design. Where these lines intersect other components, street furniture can be allocated. To achieve organic lines in the paving, cast-in-situ pigmented textured concrete was selected as finish for the main public square areas. Tile and stone inlays emphasize the organic lines of the design. Cast iron grates are installed at points identified, to allow for storm water run-off to drains cast in the floor slab. Cobble paving is to be used on the road surfaces to contribute to an audible experience. Bollards demarcate pedestrian walkways from vehicular zones.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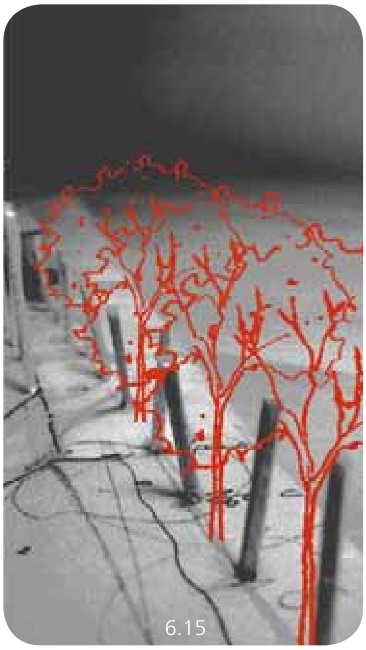
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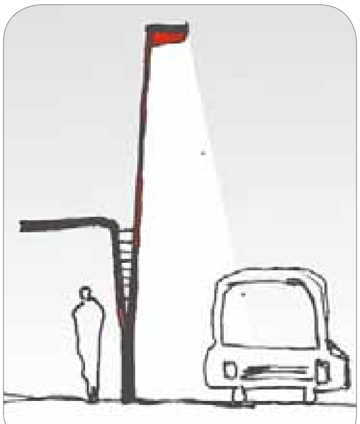
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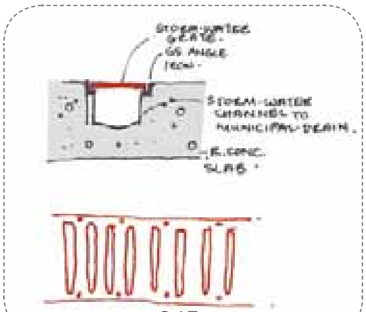
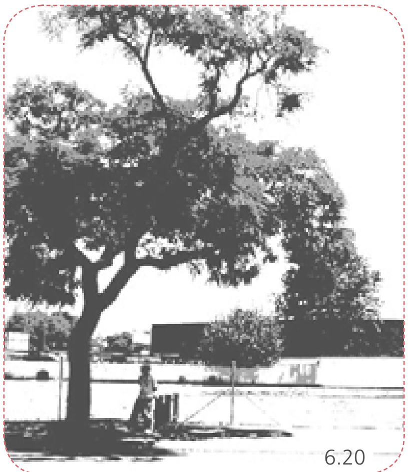

6.17


6.18


6.19

fig. 6.14 seating detail
6.15 trees and lamposts
6.16 lampost sketch
6.17 stormwater channel investigation
6.18 brick floor, placa del general moragues, spain_e. kelly
6.19 paving, chasse terrein, netherlands_west 8
6.20 existing tree on site
6.21 paving detail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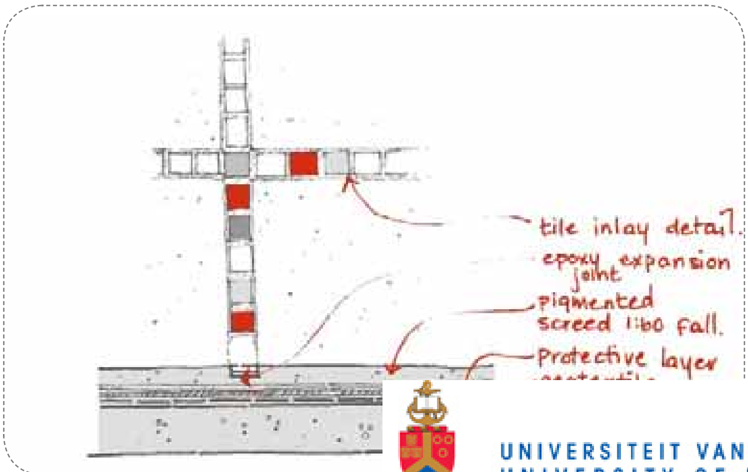


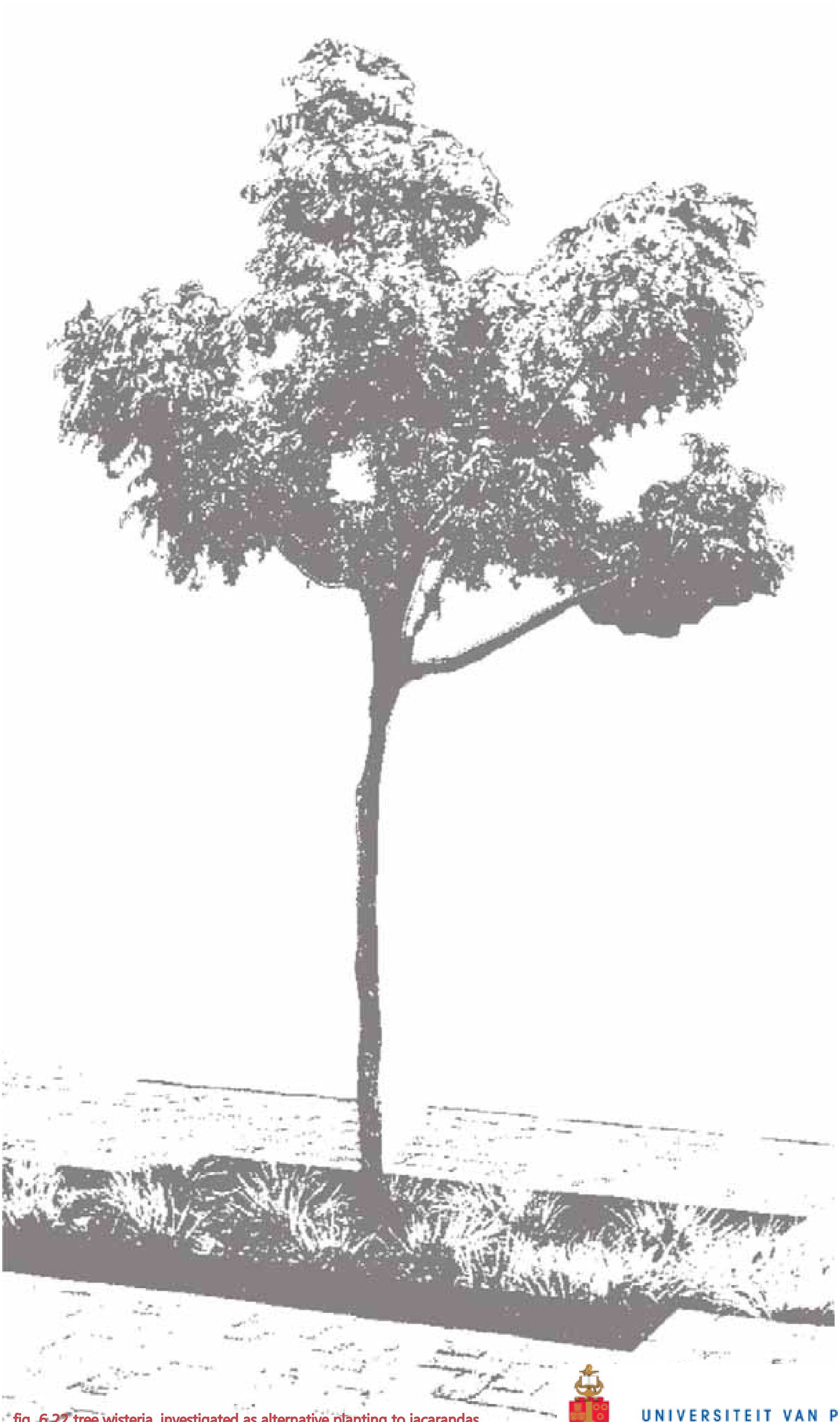


fig. 6.22 tree wisteria_investigated as alternative planting to jacarandas

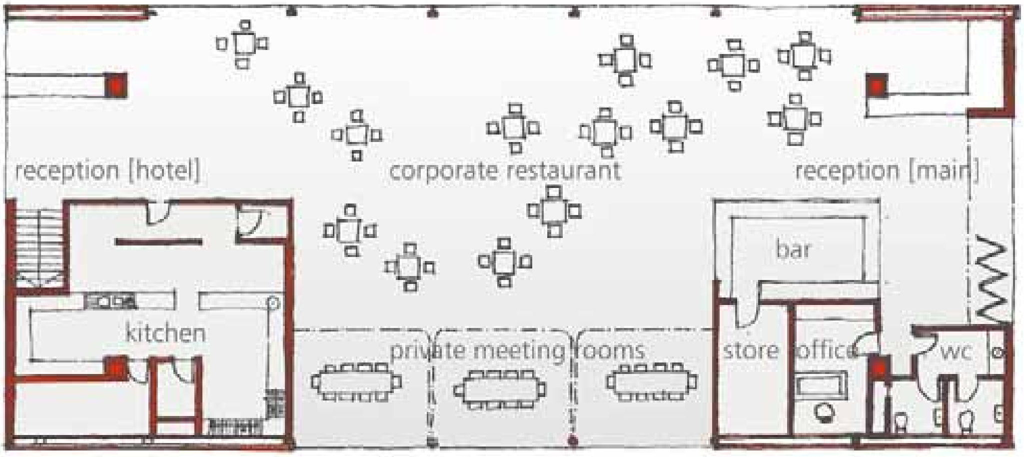


fig. 6.23 lower floor plan [3rd]

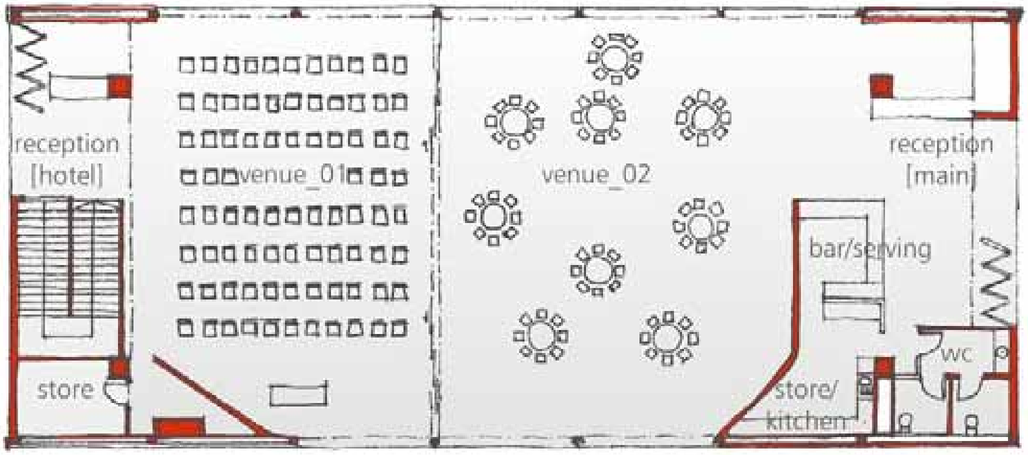
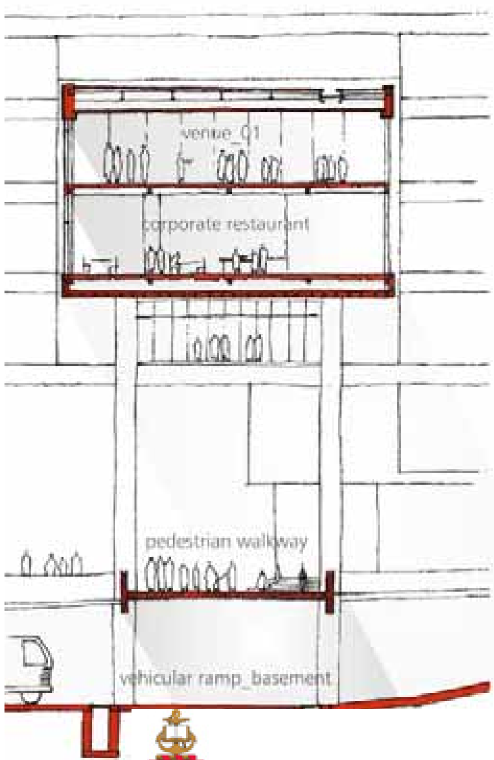


fig. 6.24 upper floor plan [4th]

the bridge

The bridge was designed conceptually as component within the design. It is to be constructed from welded steel trusses, maintaining a light-weight appearance. White aluminium cladding to the roof and base conceal service ducts and structure, while the north and south elevations are enclosed by structural glazing. The interior spaces have a light, neutral appearance. Massive concrete columns provide the necessary vertical support and conceal service and ventilation ducts to the basement.



6.25 section tl

6.26

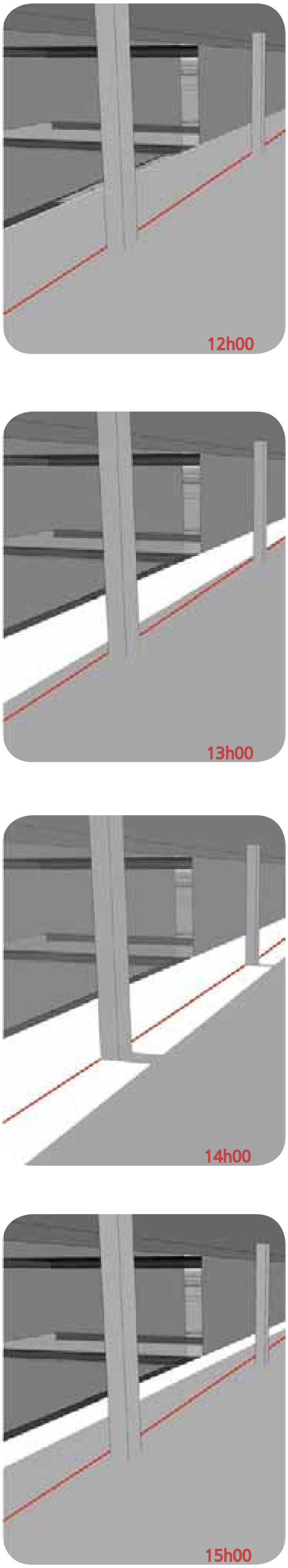
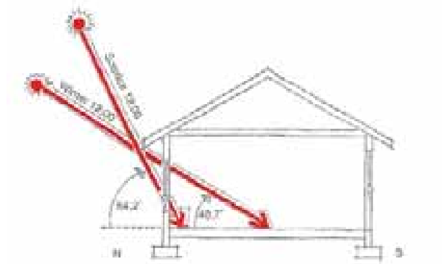


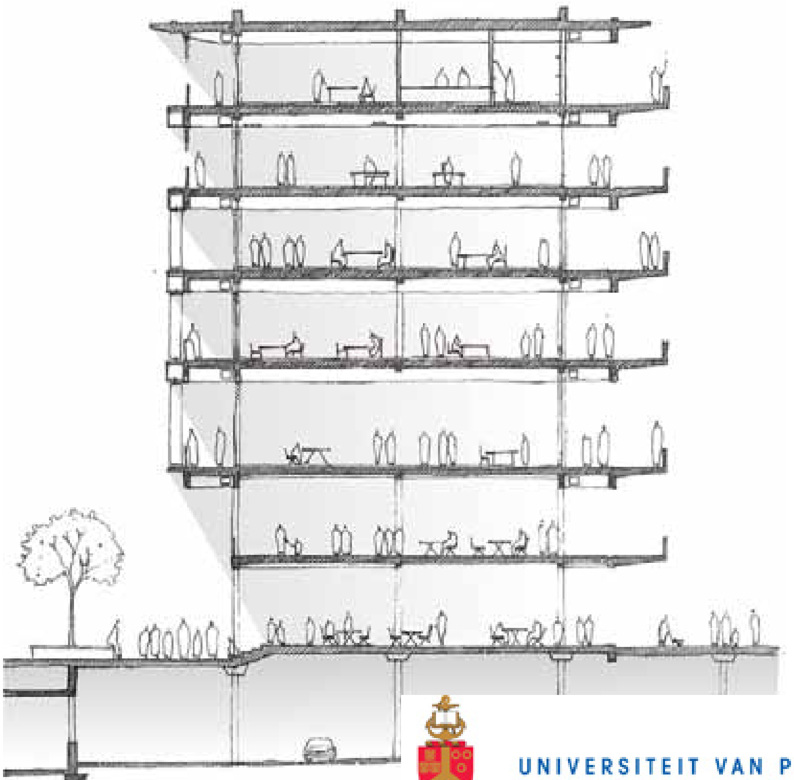
fig. 6.26 study of western sun on walkways
fig. 6.27 solar angles for pretoria
fig. 6.28 solar ingress on western facade

6.27



the tectonic

The primary focus of the *tectonic* investigation was that of the integrated western façade skin. It was intended to be a dynamic component, suggesting layering of interior and exterior spaces. Simultaneously, this façade was to assist in solar regulation to the interior. A study of solar effects on the building revealed that the adjacent tower building obstructs the western sun to the building from approximately 15h30 [during summer solstice]. A study was undertaken to investigate the influence of western sun on the periphery walkways. This study showed almost no sun falls into the core interior spaces, only on the walkways.



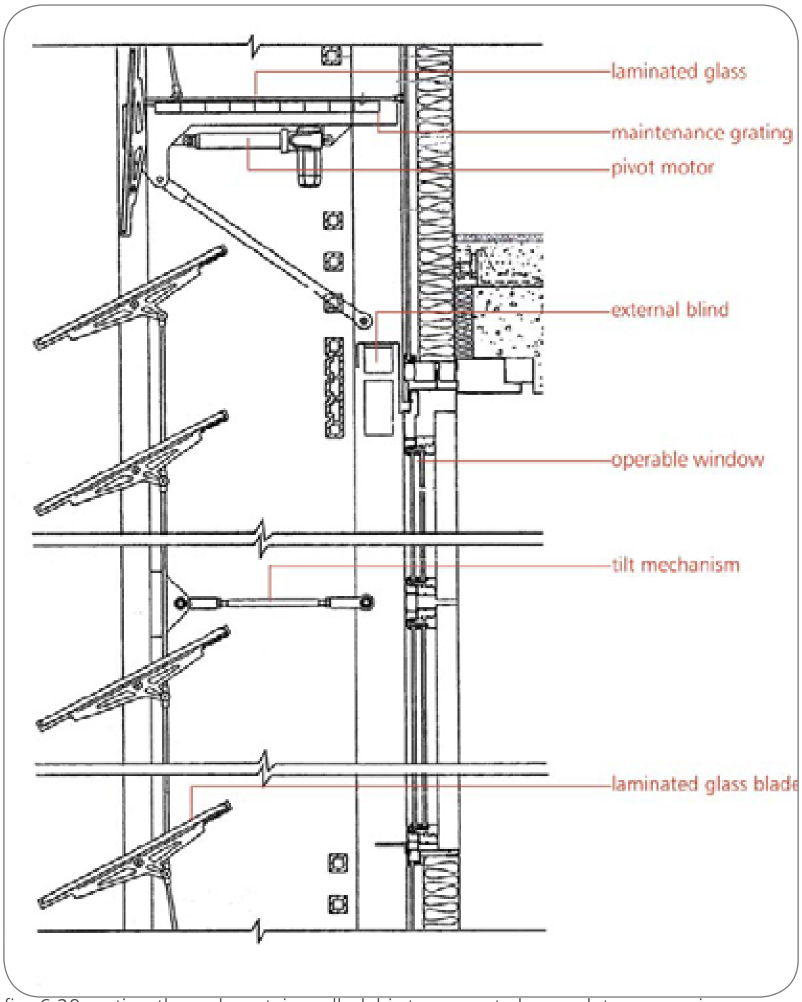


fig. 6.29 section through curtain wall, debis tower, potzdamer platz_renzo piano

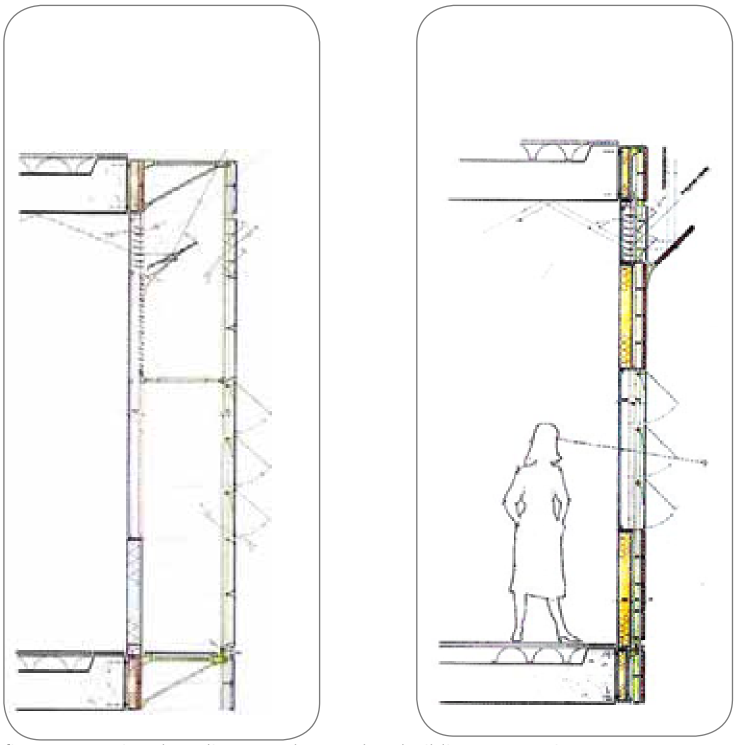
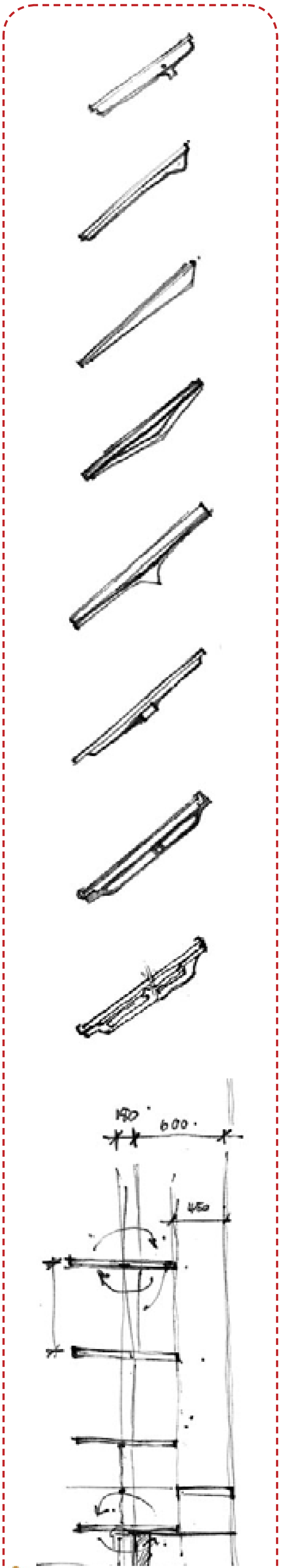


fig. 6.30 sectional studies_potzdamer platz building_renzo piano



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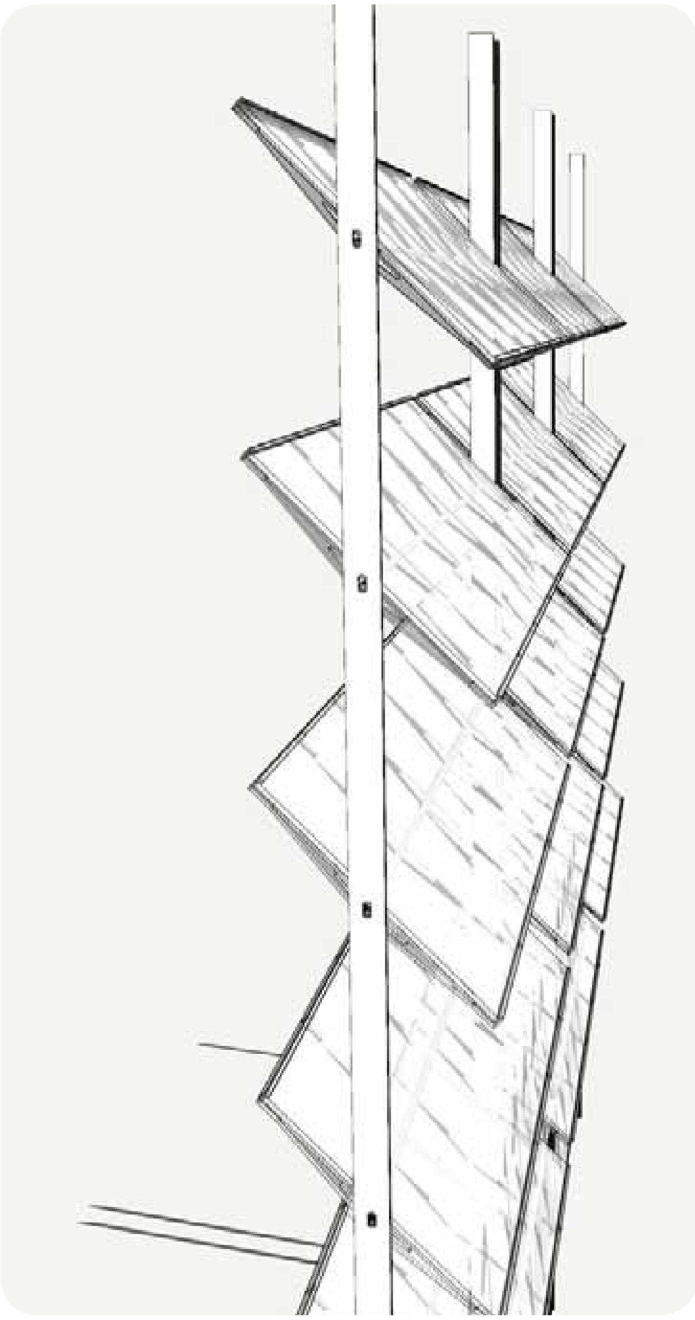


fig. 6.32 side view of horizontal louvers

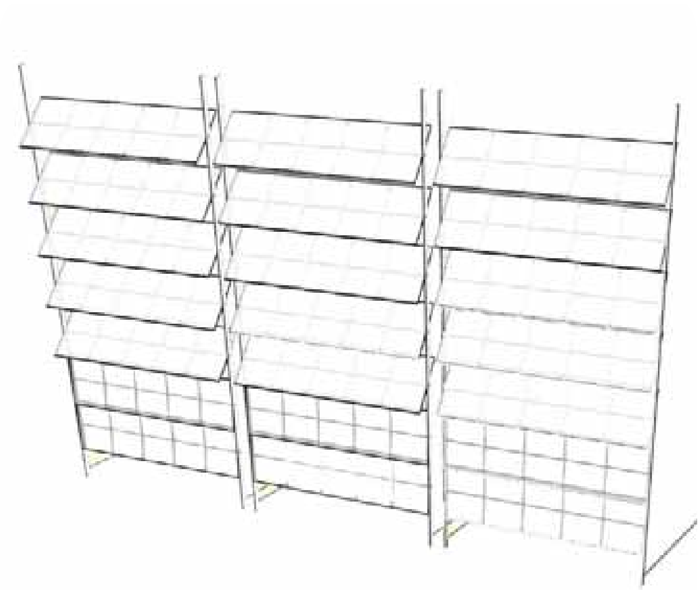


fig. 6.33 front view of horizontal louvers

The building skin was thus designed primarily as an interactive façade, assisting in internal glare control. In addition, as a building skin, it was to assist in regulating climatic factors such as lighting, ventilation, internal thermal environment, safety factors, sound insulation and energy gain [Lang, W. 2006: p. 30]. The initial design was to develop an integrated system using a variety of materials. Several building skin systems were studied. One such a system was that used by Renzo Piano in his Debis Tower, on Potzdamer Platz. The western elevation is clad in an outer layer of sensor-regulated mechanically operated glass panels. These panels can be pivoted to reflect light and assist in ventilation in warm weather.

A skin was developed composed of horizontal glass louvers, fixed in profiled aluminium operable mechanisms, in a vertical steel frame. However, the horizontal orientation limited views from the interior. Release of hot air would be obstructed by the angle of the louvers, thus impeding ventilation. If reflection of low western sun was desired, the panels would have to be almost closed to prevent solar ingress.

fig. 6.34 plan form of screen
6.35 section through screen

6.34

The next design investigated pulling the skin away from the building, creating a cavity for the release of hot air. However this design was soon discarded as it created a barrier between the building and street. This would obstruct views from both the interior and exterior and would detach the building from its context. The curved nature of the designed screen also seemed obscure and out of place with the rest of the design.

[sauerbruch hutton architects]
Several projects by sauerbruch hutton architects were studied, for their use of bold colours in creating integrated glass facades in an ecologically responsive manner.

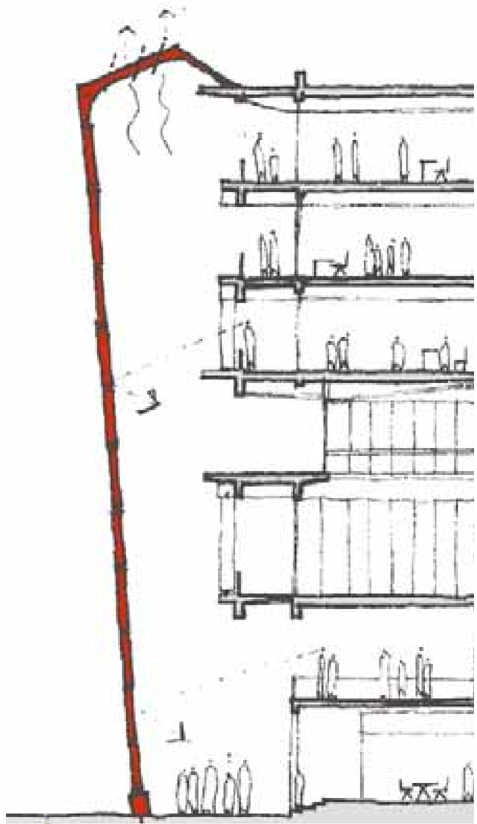


fig. 6.36 facade views, german federal environment ministry_sauerbruch hutton

p

[German Federal Environmental Ministry]

The curved form of the German Federal Environmental Ministry in Dessau, displays a striking, colourful façade. The façade is composed of a palate of 52 colours, screen-printed on a series of glass 'blocks'. The glass panels 'colour code' the building complex for seven different areas. The monolithic nature of the façade is broken by eight alternating horizontal bands of timber and glass. Clear glazed windows are set back from the larch slats which clad the spandrels. In between, glass blocks are screen-printed with enamel to achieve the bold colour. This is offset by the contrasting colours of the louvered reveals [Finch, P. Architectural Review, July 2005, p. 40]. The materials used for the façade were selected above others, as they were ecologically correct [Betsky, A. Architecture, August 2005, p. 38].

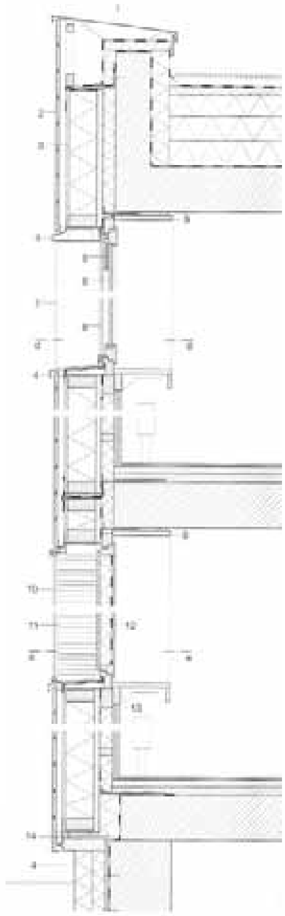
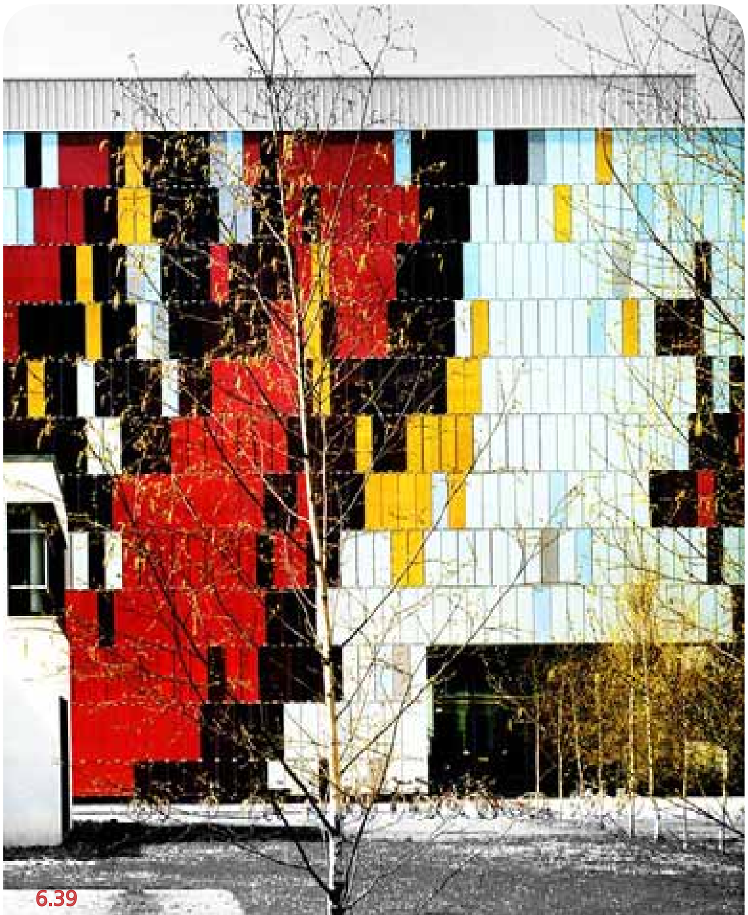


fig. 6.37 section through facade
6.38 facade view

[Pharmacological laboratories, Biberach] p

This building acts as a visual landmark within a dreary industrial research complex. The façade is expressed as a composition of silk-screen fritted glass louvers, acting as a solar and rain screen. A palette of magenta, ochre, pale blue-white and so on create a dynamic pattern, filtering environmental factors on a secondary glazed façade [Jacques, E. Architectural Review, August 2003, p. 52].
The mobile glass panels follow the sun, regulating the effects of temperature, wind and radiation. The material quality of the treated glass creates a bold, opaque façade during the day, which transforms to a luminous element at night. The aim of the architects was to create an environment which stimulates perception [Domus, June, 2003, p. 62-63].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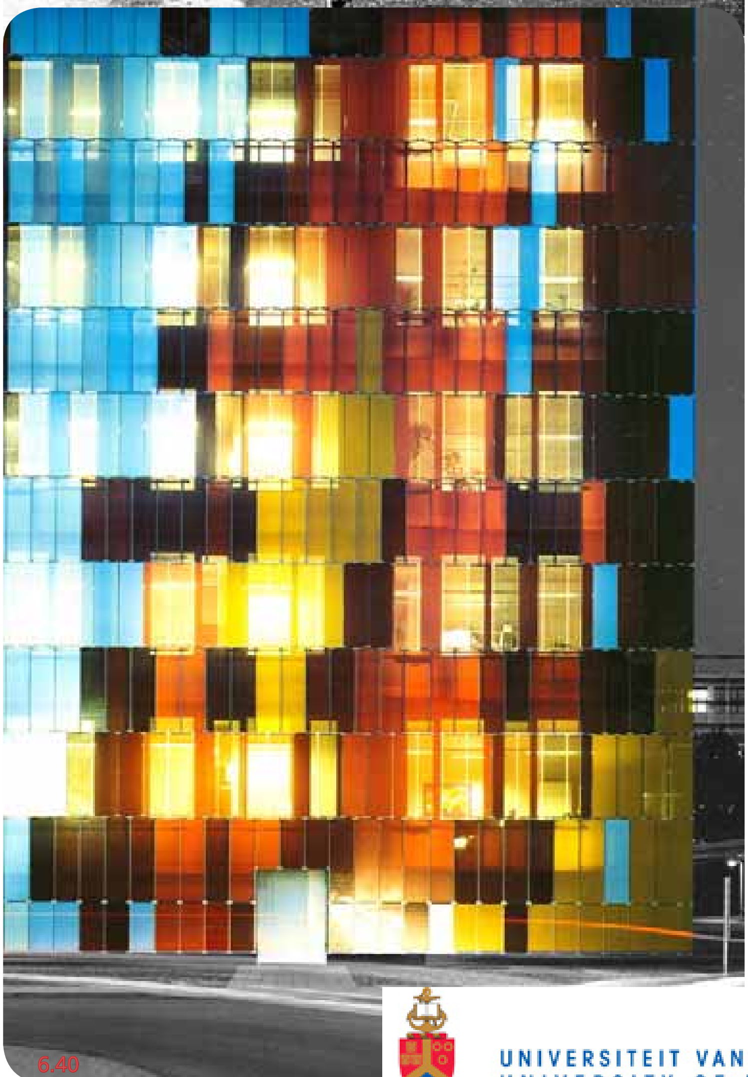
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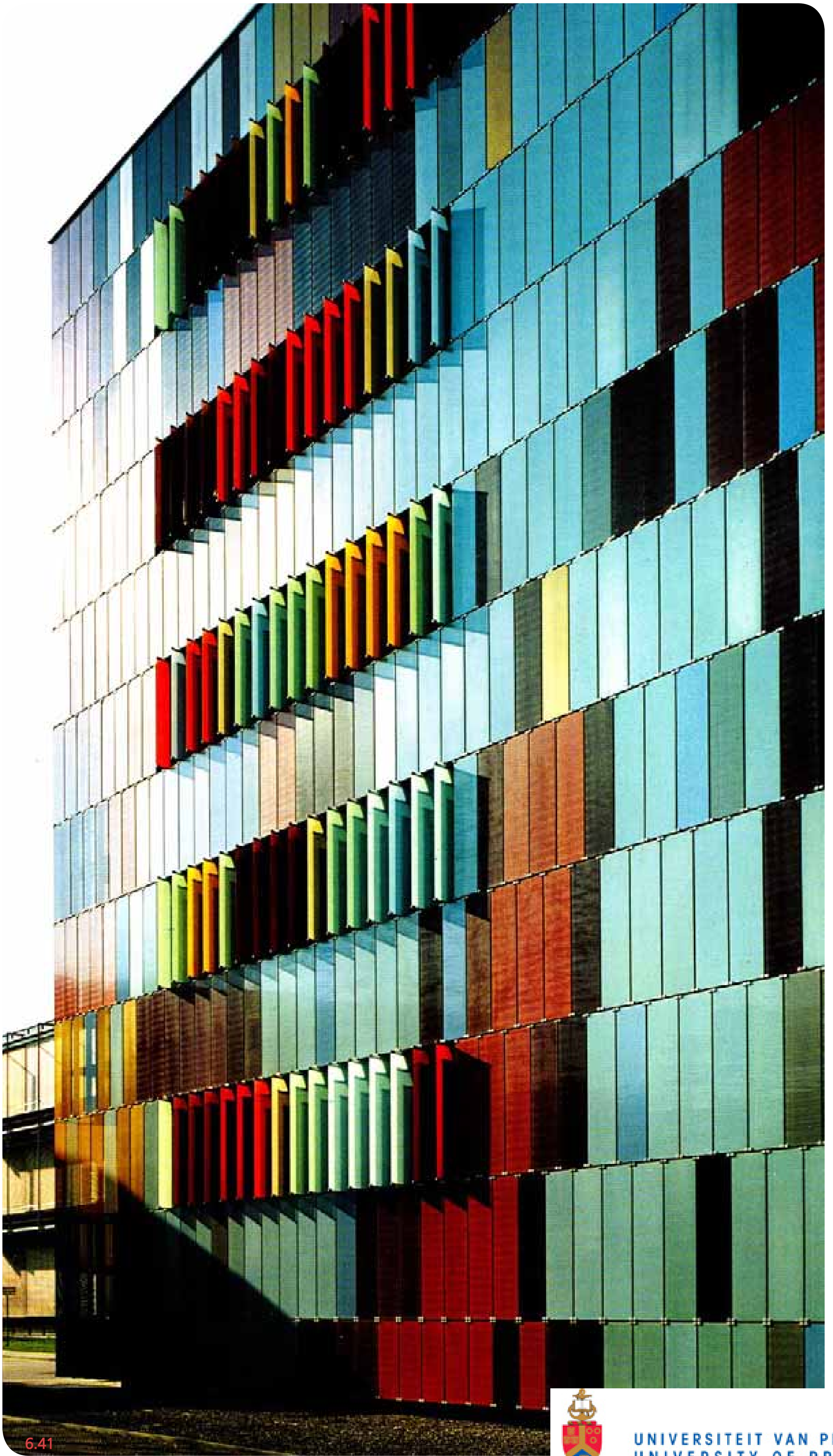
fig. 6.39-6.40 facade views, day + night, pharmacological laboratories_ sauerbruch hutton
fig. 6.41 street facade view, pharmacological laboratories_ sauerbruch hutton



6.41

[Berlin Fire and Police Station] p

This project is an extension of an existing 19th century building, the existing building forming the backbone for the new wing. This new floating luminous body is fixed to the lower part of the existing sheer brick wall and is raised to accommodate the force vehicles. The transition from greens to reds of the glass façade reflects the neighbouring greenery [www.sauerbruchhutton.de]. The glass panels for this building are screen-printed on the back with a grid of dots, achieving almost any desired exterior finish and a fairly neutral light to the interior [Schittich, 2006. P20]. Panes are fixed in aluminium-coated brackets; moveable louvers are situated in front of window openings.


6.42

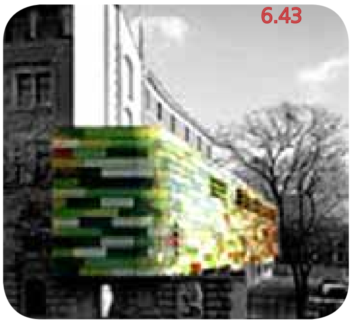

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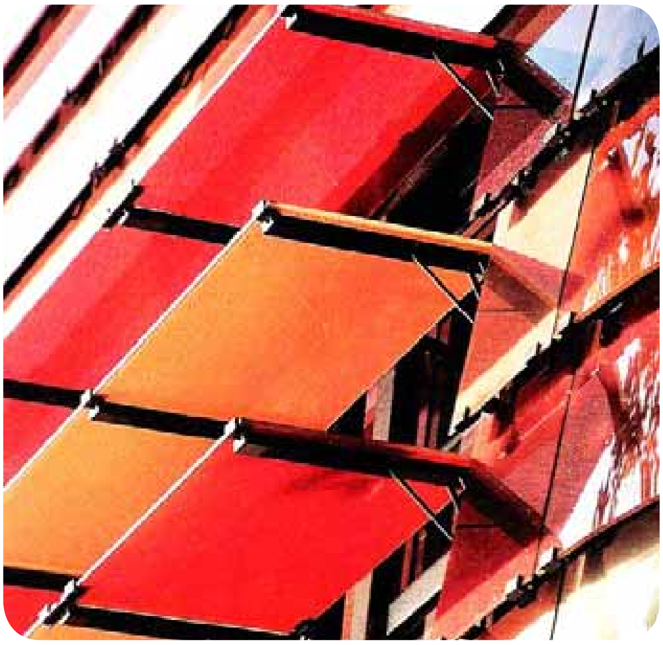
fig. 6.42- 6.45 facade views, berlin fire and police station
fig. 6.46- 6.49 facade detail views
fig. 6.48 facade view, berlin fire + police station

6.46


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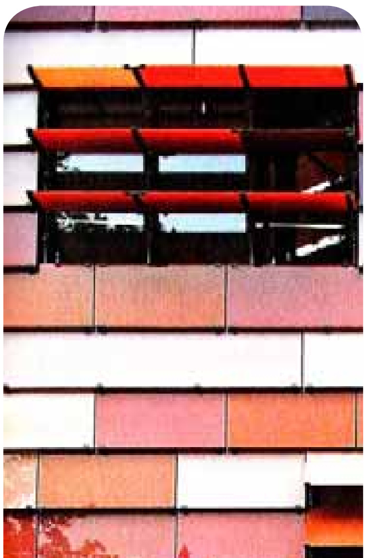

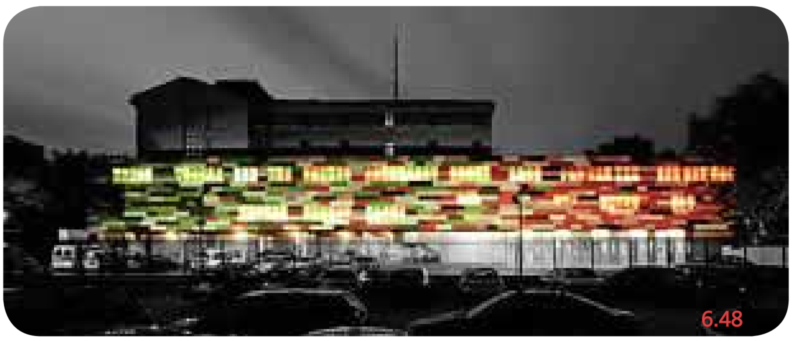
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From the study of these projects, a skin was designed for the western façade, composed of screen-printed glass vertical louvers. To display human interaction with the building, the louvers are to be connected to sensors installed in the walkways. The intention is that movement through the building will be monitored and recorded, then expressed as a variation of colour on the façade. The choice of colours is related to orientation on the specific floors. The transition from the natural to the urban environment is to be expressed in red and green tones on the elevation. The skin creates a climatically responsive layer for the building. It allows for natural ventilation, and can seal completely, insulating the interior from adverse exterior conditions. The perforated steel platform to which the louvers are fixed allows for escape of hot air during warm afternoons. Horizontal bands, concealing turning mechanisms and the slab edge, are to be clad in treated hardwood slats, and emphasise the horizontality required to suggest linear movement on this facade.

fig. 6.49. western elevation_sketch

fig. 6.50 the day commences, the facade a neutral background, anticipating its' users...

...gradually colours of interaction are revealed...

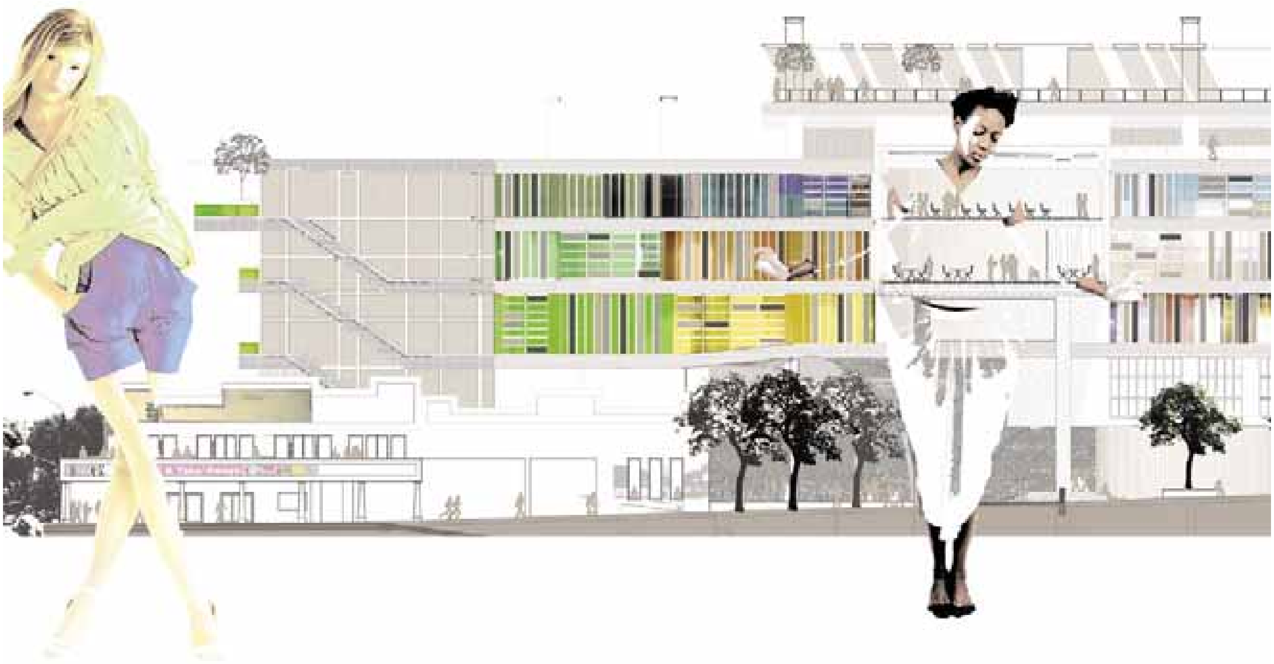


fig. 6.51 ...as the day draws to an end the facade reaches its full colour potential...

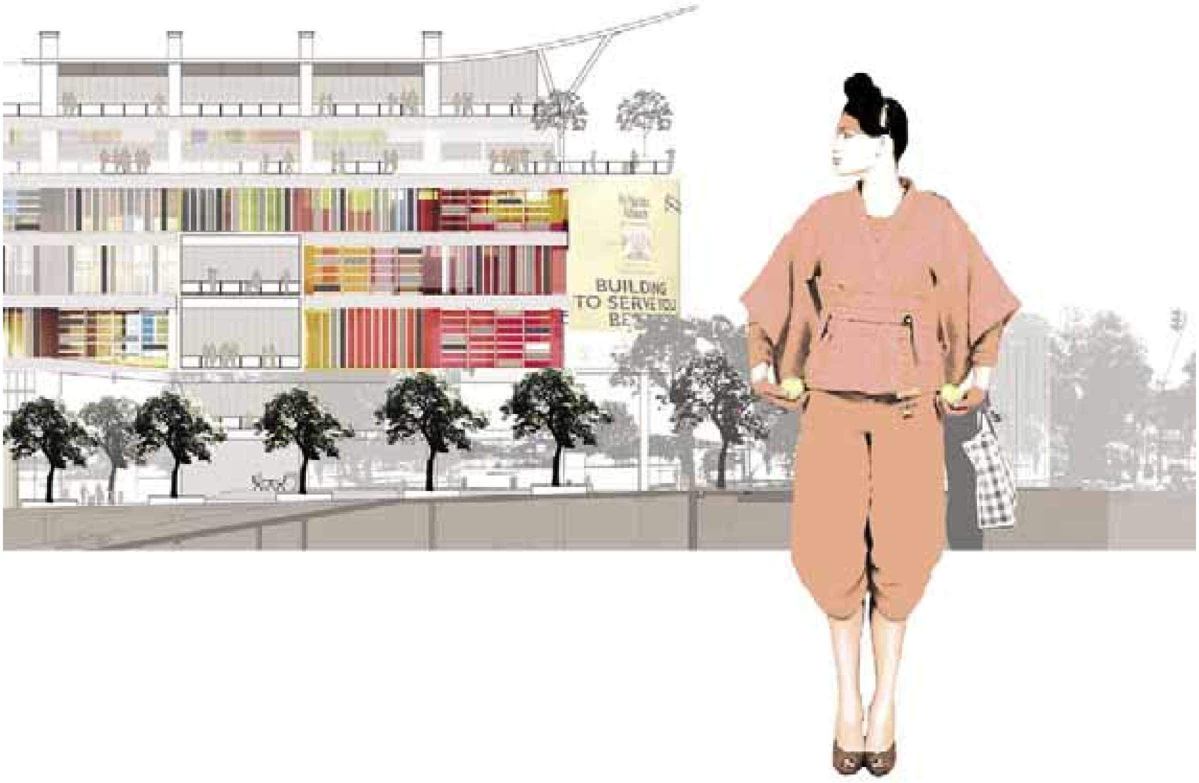

BUILDING
TO SERVE YOU

fig. 6.52 ...to remain as nightime witness to the day's activity.

The eastern façade is an articulated façade, composed of 'boxes' of varying size, height and translucency. These boxes are finished in the same palette of materials expressed on the western façade, however in a disintegrated, seemingly random, manner. The use of glass balustrades further explores the material quality of glass in achieving layers of transparency. The seating, worktops and design alcoves provided within the façade boxes, contributes to the cross-programmed nature of the walkways and their usefulness therein. This façade becomes a metaphor for the city skyline and urban fabric.

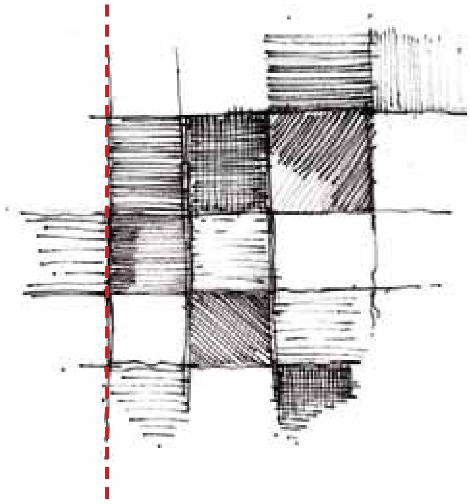
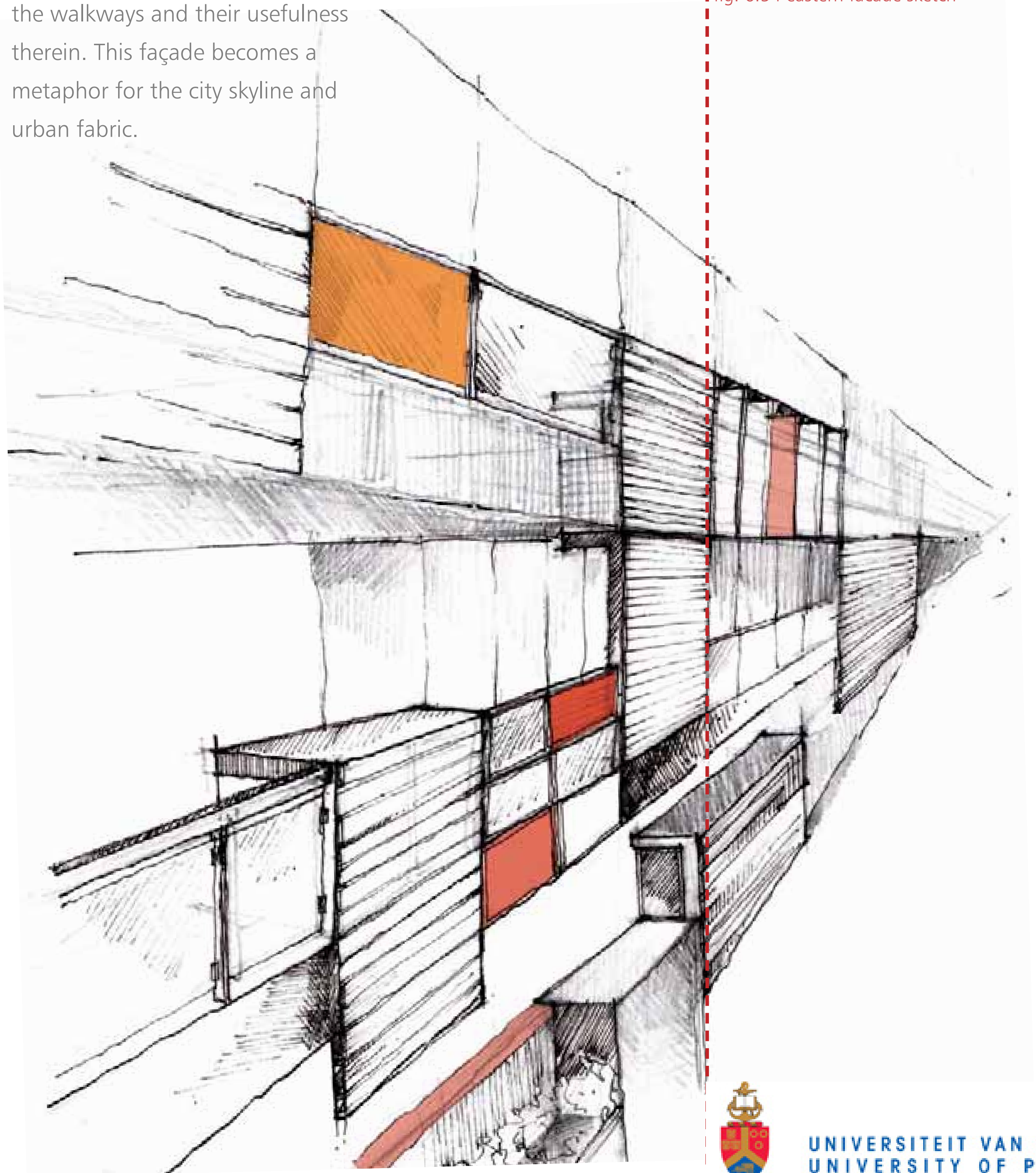
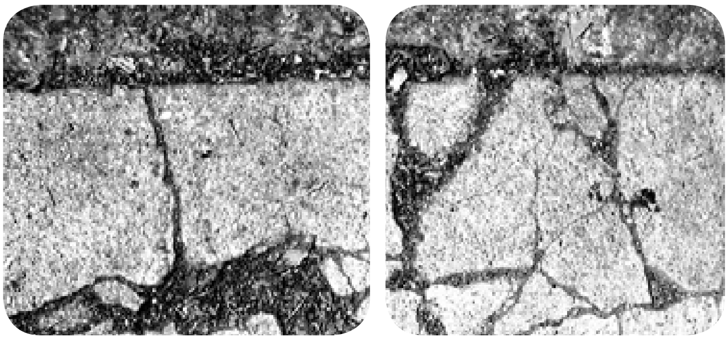


fig. 6.53 facade concept sketch

fig. 6.54 eastern facade sketch

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materials

The choice of materials for the various components were influenced by textures and colours identified on site. Materials denote the nature of the component, and contribute to layering and legibility.

[concrete]
Permanence is suggested through the use of dense 'heavy' materials, primarily concrete. Tile inlay details used in the screed of the building's walkways contribute colour for identification. They contribute a human-scaled detailing and suggest intensity of activity. The pigmented textured screed of the square's paving suggests an 'earthy' quality, relating to the natural. Cast-in-situ concrete street furniture is robust for continued use. The off-shutter finish of the outer sheath of the main central staircase is to lend a sense of permanence to this element, reinforcing its identity as a point of reference.

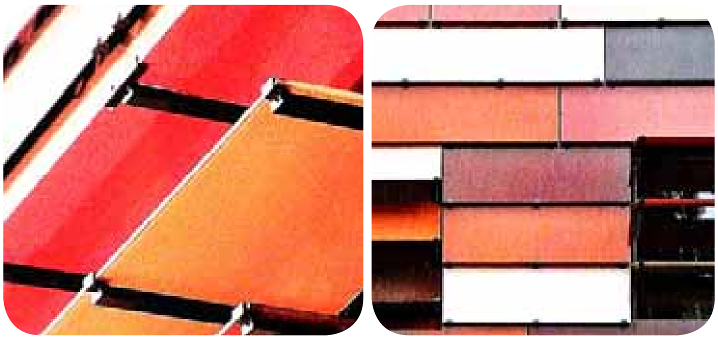
[chronos chromos concrete]
This is a concrete with thermochromic pigments, developed by students at the Royal College of Art in London. Concrete thus becomes a surface for graphic displays. Local colour changes are set off by heat, produced when an electrical current is passed through nickel-chromium wires [Rittel, A. 2007: p.88].

fig.
fig.

This material is to be utilised, with discretion, as main signage within the building. By setting up a grid of wires behind the concrete, signs can be changed as new functions are allocated. Signage is thus accurate, legible and robust in finish. Legibility is also incorporated within the structure, as opposed to flimsy surface signage, which often appears as an after-thought.

[Glass]
Screen-printed glass is used to create interactive colour patterns on the façade, adding vibrancy and visual interest to the project. Translucent, transparent and acid-etched glass are further utilised to create layers from interior to exterior. Shadows and forms behind the glass animate the surface, humanising the building. The use of laminated glass assists in solar reflection and improves safety for users. All glazing frames are to be powder-coated aluminium to reduce future maintenance. Safety glass is to be used in all balustrades and façade louvers.

[Timber]
Treated hardwood slatted timber was selected as additional cladding material, above materials such as aluminium, as a more sustainable choice and for its future recycling possibilities. It reduces glare from the buildings surface, and has low heat transmittance to the interior. It also introduces an irregular, natural component to the facades.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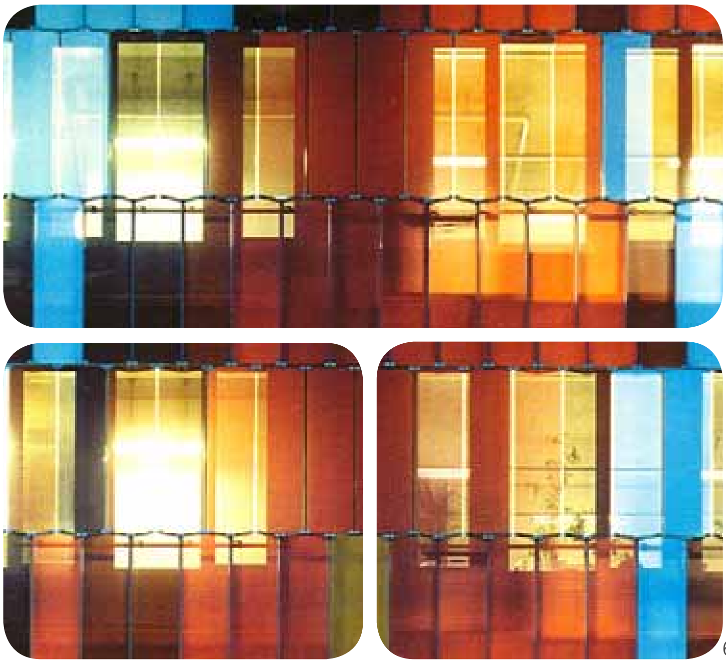
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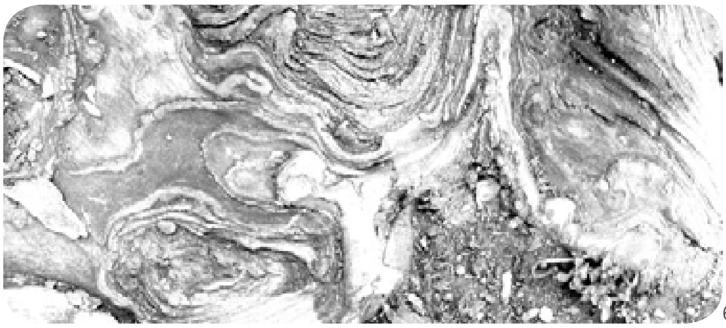
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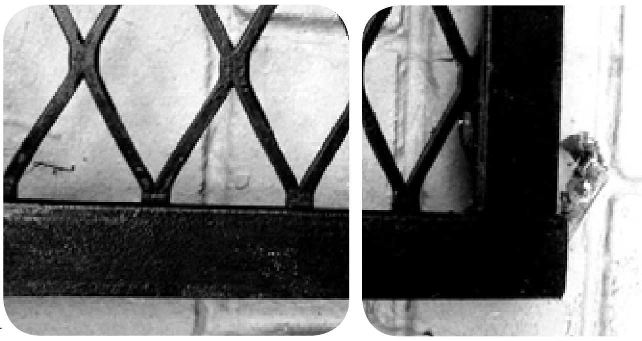
fig. 6.59 -6.60 glass louvers, berlin fire and police station
fig. 6.61 -6.63 existing site textures

6.64


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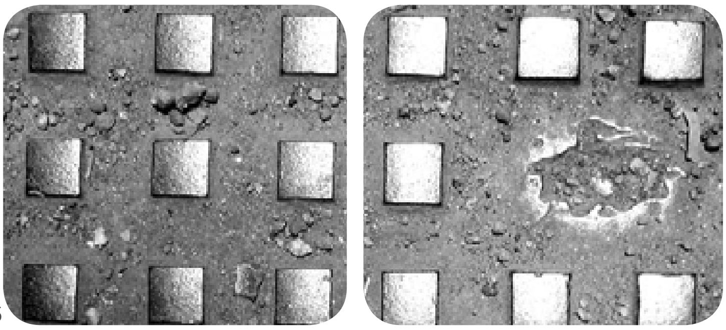

fig. 6. -6. existing site textures

[Steel mesh]
Steel mesh is used to enclose the northern and southern service/ fire escape stairs. It secures the staircases, while allowing visual access from both sides. It creates a robust barrier and assists natural ventilation through the structure. It provides a degree of solar shading to the adjoining spaces. Steel mesh is also used for growth balustrades, in areas such as the southern atrium of the building.

The choice of materials, and their application in the design, is indicated in the technical drawings. Construction details are provided for identified components in the building, limited to those of particular concern to the technical investigation. A unified approach was adopted to the detailing of the building and surrounding components. Details not explicitly presented can be assumed to follow the same rationale as those displayed.

"… the culture of the tectonic still persists as a testament of the spirit: the poetics of construction. All the rest…is mixed up with the lifeworld, and in this it belongs as much to society as ourselves. "
KENNETH FRAMPTON.

fig. 6.67 northern gateway perspective