

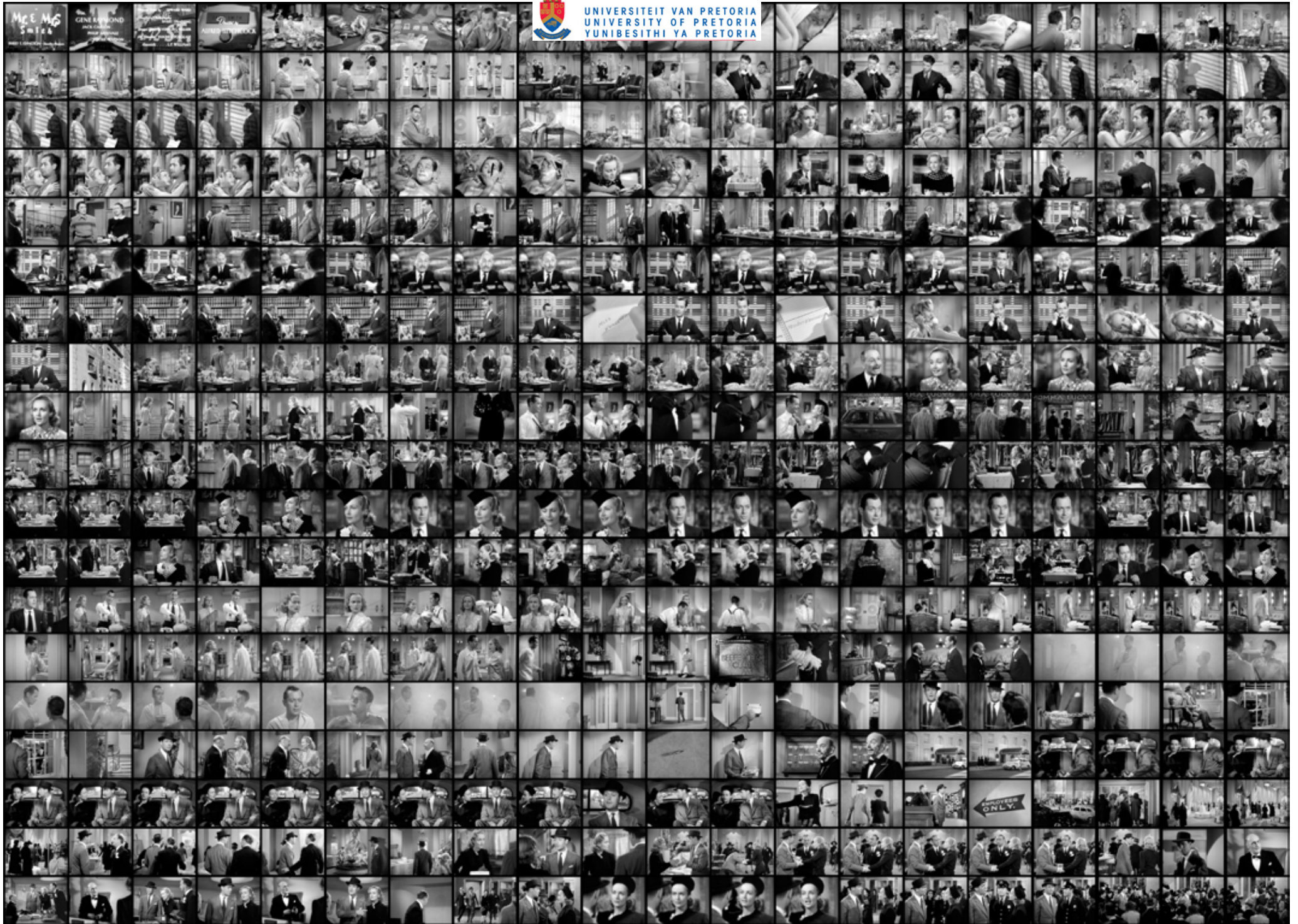
UNIVERSITY OF PRETORIA: school of motion picture production

Traditional film is made up of a series of **individual images** called frames. When these images are shown in rapid **succession** a viewer has the illusion that **motion** is occurring.





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abstract





“Architecture exists, like cinema, in the dimension of time and movement. One conceives and reads a building in terms of sequences. To erect a building is to predict and seek effects of contrast and linkage through which one passes... In the continuous shot/ sequence that a building is, the architect works with cuts and edits, framings and openings.”

Jean Nouvel (Rattenbury, 1994:35)

Figure 3

The film and media industries are rapidly evolving due to advances in digital technology. The process of film-making has changed up to a point where there is no physical film involved, and where it has been replaced by digital production, distribution and projection.

An investigation of the South Campus of the University of Pretoria revealed unutilized space isolated from the Main Campus. The dissertation explores opportunities for reclaiming existing structures and investigates the historical heritage of the site.

The growing interest in film making in South Africa generates a desire for an environment where South African film can be developed and promoted to domestic and international audiences.

The chosen function of the dissertation is a school for motion picture production, which combines education and entertainment on campus. Film activities on the north-western border of the South Campus have the potential of creating a pedestrian magnet to bridge the gap between the two campuses.

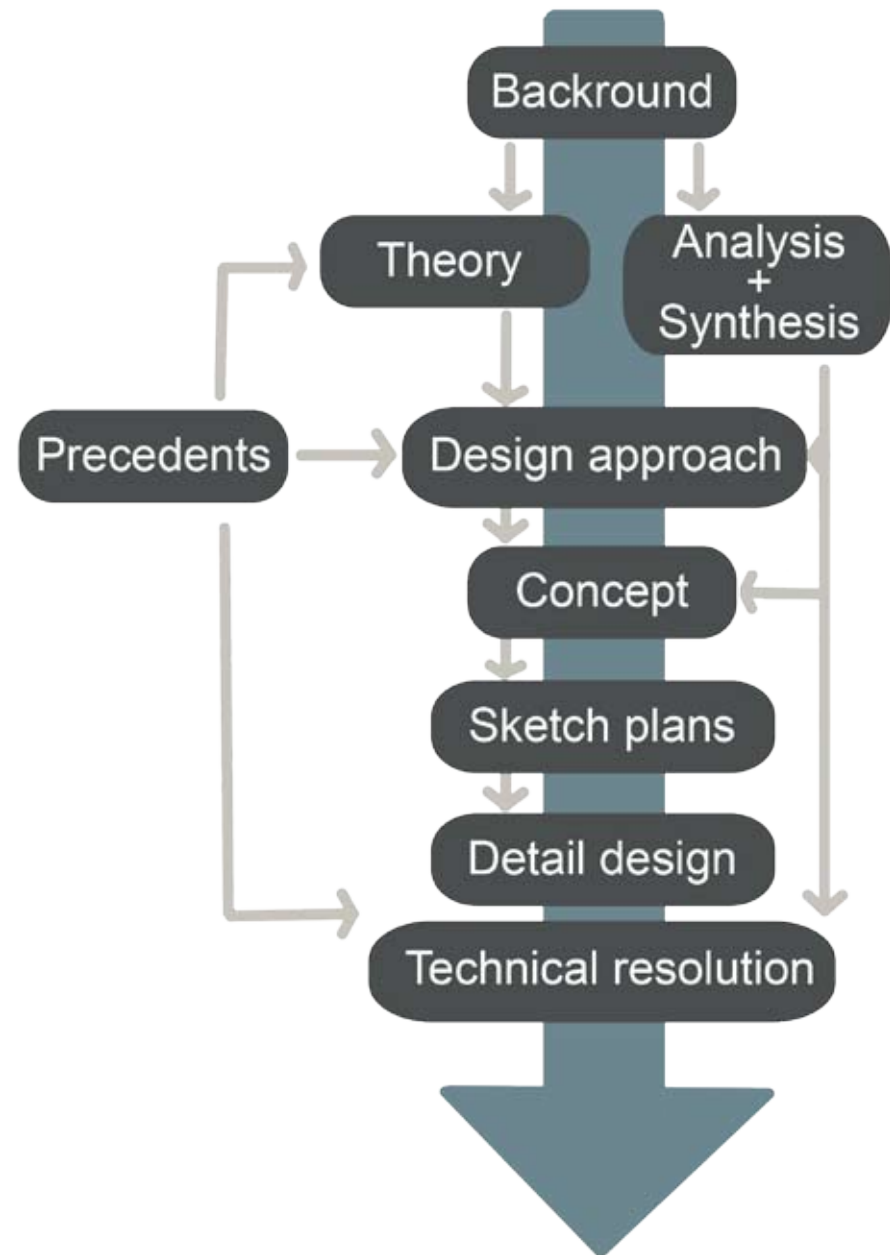


Figure 4: Diagrammatic representation of the research process.

background



problem statement

Lynnwood Road exists as a barrier that separates the South Campus of the University of Pretoria from the Main Campus. An additional lack of primary uses and recreational spaces suppress pedestrian movement into and through the South Campus.

Figure 6: Perspective view of the Hatfield Campus.

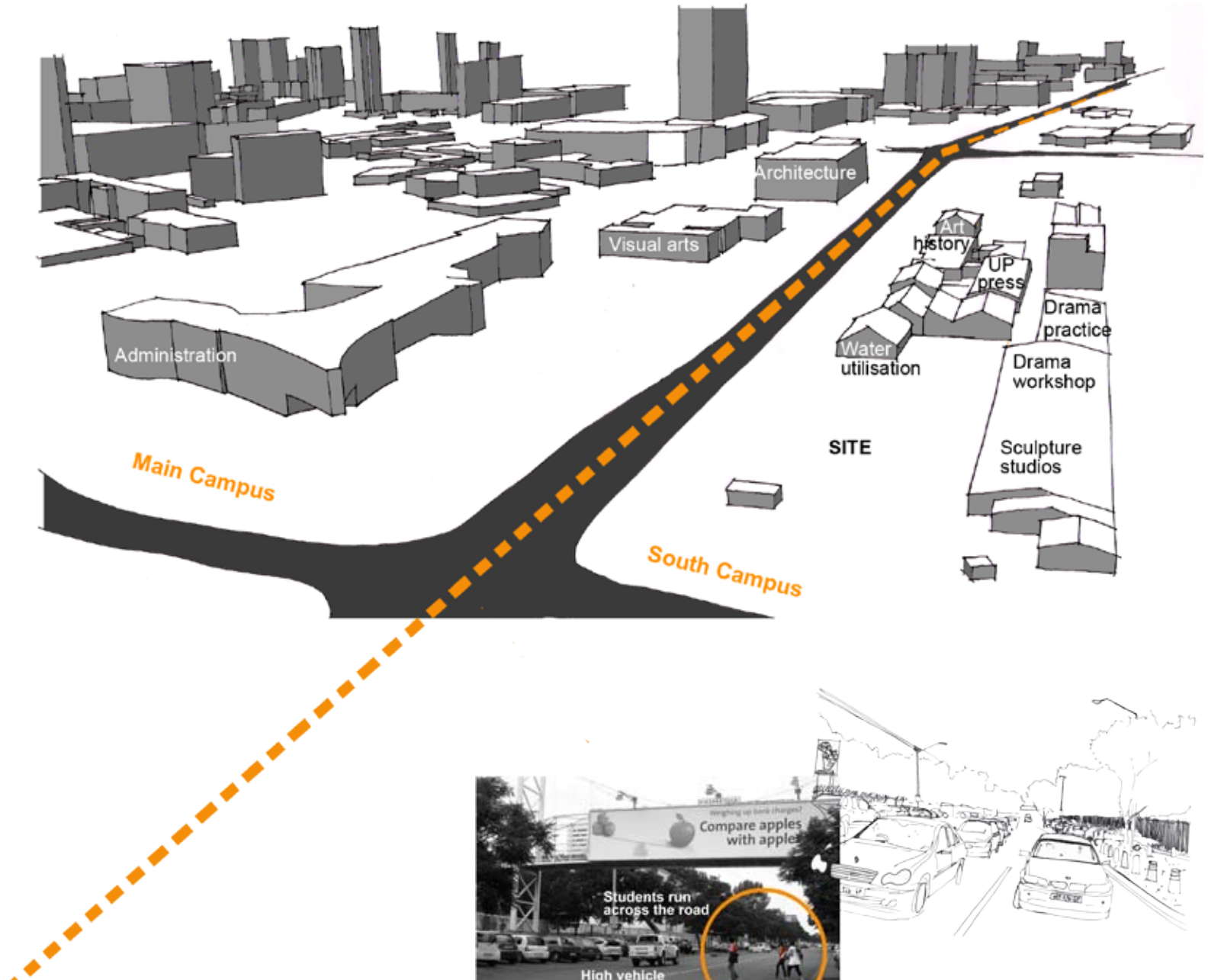
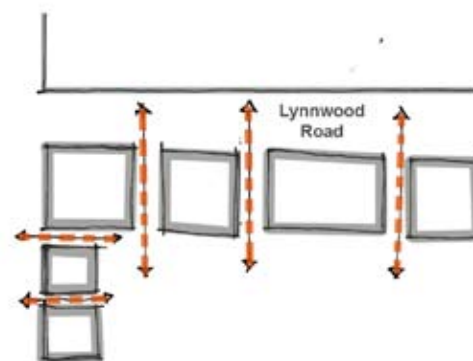
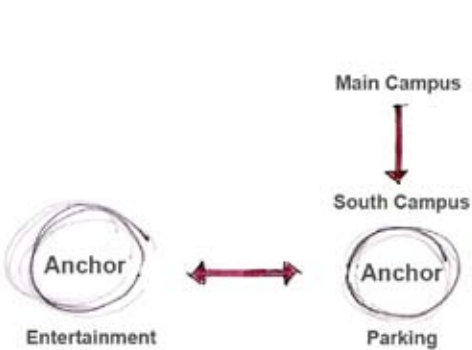


Figure 7: Lynnwood Road.



Figure 8: Figure ground indicating the primary uses on campus.



objective

The dissertation proposes to combine education and entertainment on the South Campus, enabling public interaction on a pedestrian scale. The proposed building should function as an anchor to increase movement through the site, provide ease of access and integrate the site with its surroundings.

Figure 9: Movement between anchors.

Figure 10: Stitches across Lynnwood Road.

research questions

Questions

1. Which building functions are necessary to facilitate education in motion picture production?
2. What is the relationship between architecture and film?

Sub-questions

1. How does the building provide transparency of function to promote education in motion picture production to students and the public?
2. Which functions will allow public interaction without interfering with the private functions of the institutional building?
3. Which interventions will change the site from a vehicle orientated site to a pedestrian orientated one?
4. How can access to the site be improved?
5. Which building functions will create an anchor to draw people onto the site?

Definition of terms

- Education: formal instruction in university subjects and informal learning by observation.
- Public: students not enrolled in the department as well as the general public.
- Anchor: primary use or magnet such as parking facilities, food and recreation spaces, and primary education zones such as the library.
- Integrated: physically or visually connected with and permeable to the immediate surroundings.
- Motion picture: movie or film.

Delimiters

- Education is limited to education in motion picture production and excludes performance art, acting, animation and graphic design.
- Entertainment is limited to cinema and motion pictures and does not include live performance and theatre.
- The building is not primarily a public building and public access is limited to certain events and film festivals.
- The design intervention is restricted to the site, its immediate context and its relation to the South Campus, and excludes the Main Campus.

Assumptions

- The proposed Bus Rapid Transport (BRT) stop on the corner of Lynnwood and University Roads will be completed in 2009.
- The proposed Hatfield Gautrain Station and its supporting feeder and distribution services will be completed as proposed.
- Public transportation facilities proposed in the vicinity of the site will increase the movement of pedestrians around the site.
- The Pretoria Boys' High School will allow an access road to be built on a portion of their grounds.
- The existing activities on South Campus will continue.
- Higher densities of the surrounding areas, as proposed by the Tshwane Regional Spatial Development Framework, will increase the number of people moving into the area.
- The growth of the University will continue at its current rate, resulting in an increased number of students.

dissertation topic

The subject of the dissertation is a school for education in motion picture production which includes sufficient cinema spaces to accommodate entertainment for students and the general public. The building acts as a social anchor addressing access for and movement of pedestrians through the site, and allowing transparency of the educational process.



Figure 11

Figure 12

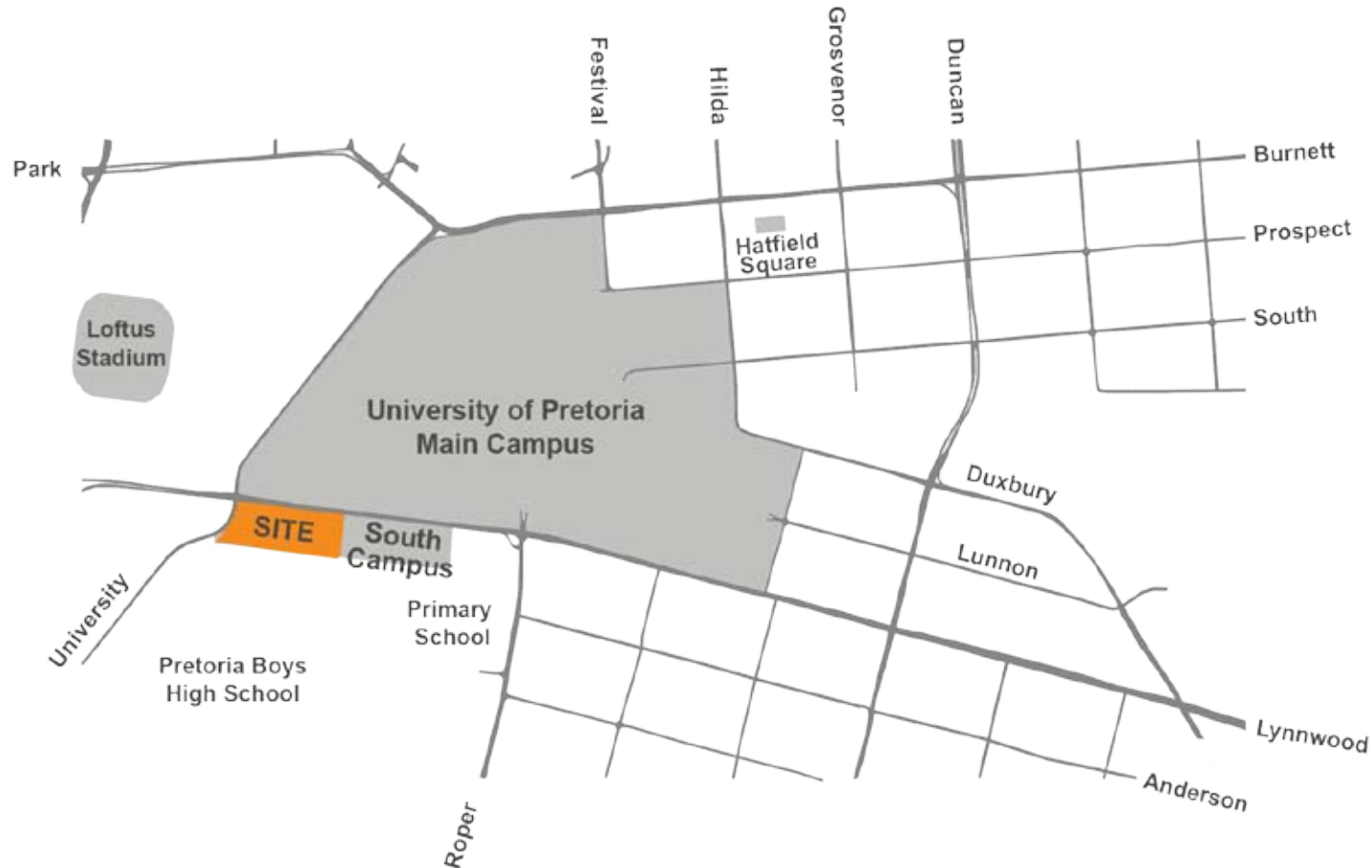


Figure 13: Site location.



choice of site

The chosen site for the design discourse is the north-west corner of the South Campus of the University of Pretoria. Incorporated in the design is the existing building on the south-western corner, which currently houses the Visual Arts Department's sculpture studios, as well as the Drama Department's storage facilities. The site forms part of an educational precinct, surrounded by schools and university grounds.

Adjacent to the site, the junction of Lynnwood and University Roads creates a major node which acts as a gateway from the Central Business District (CBD) and provides good visibility to the site. Several public transport facilities converge at the junction, including existing bus routes, an existing heavy rail stop, a proposed Bus Rapid Transport (BRT) stop and proposed Gautrain feeder and distribution services. These amenities have the potential to deliver increased numbers of pedestrians to the site.

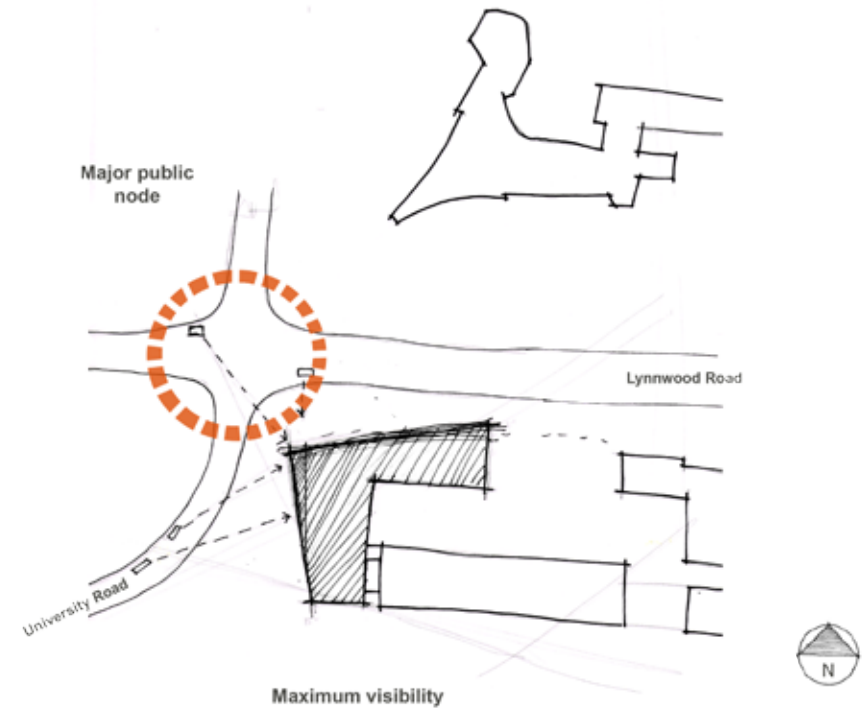


Figure 14: Junction of Lynnwood and University Roads.

Figure 15: Panorama of the University of Pretoria and Lynnwood Road crossing, viewed from the north-western corner.



design motivation

Challenges facing South Africa's film industry include rapidly changing consumer tastes and the constant emergence of new technologies. Technical developments require the continuous upgrading of skills.

According to the Gauteng Film Commission (2007:119) cinema attendance in South Africa is rising. Cinema audiences increased by 4,5% in 2002 and an additional 5% in 2005. Gauteng has the largest cinema audience nationally. Where production is concerned, Gauteng accounts for approximately 85% of all local films. The growing film sector in Gauteng contributes to the growing demand for film production facilities.

Education facilities for film production are mainly located in Johannesburg, therefore film education and production facilities in Pretoria are wanting. The proposed school of motion picture production will encourage and support local creative talent and promote local films among South African and international audiences.

Figure 16: Film activity in South Africa.

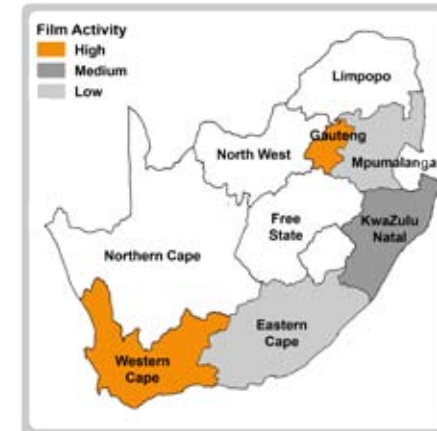


Figure 17: Cinema attendance in South Africa.

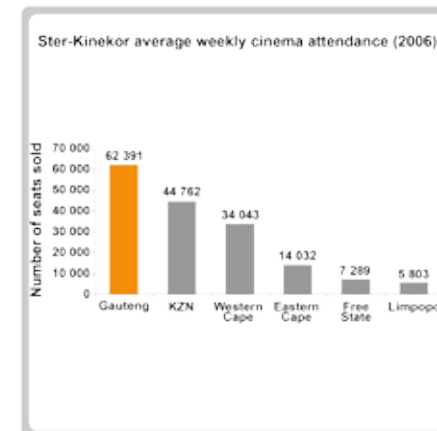




Figure 18

Students

Entertainment facilities

General public



Figure 20

client_user profile

Client: University of Pretoria

- User: A. Educational facilities - students and independent film-makers
- B. Entertainment facilities - students and the general public



Figure 19

Students

Educational facilities

Independent film makers



Figure 21

funding

Funding for the project will be provided by the National Film and Video Foundation, the Gauteng Film Commission and the University of Pretoria.

The vision of the National Film and Video Foundation (NFVF) is “to strive for a quality South African film and video industry that is representative of the nation, commercially viable and encourages development” (National Film and Video Foundation, n.d.). In order to stimulate and advance skills development and film education, the NFVF provides funding for film development, production, exhibition, marketing and training.

Similarly, the Gauteng Film Commission provides funding for “any projects which will develop filming in the province” in order to facilitate the transformation of the film industry and contribute to the economic growth of Gauteng (Gauteng Film Commission, 2007:5).



Figure 22: National Film and Video Foundation logo.



Figure 23: Gauteng Film Commission logo.

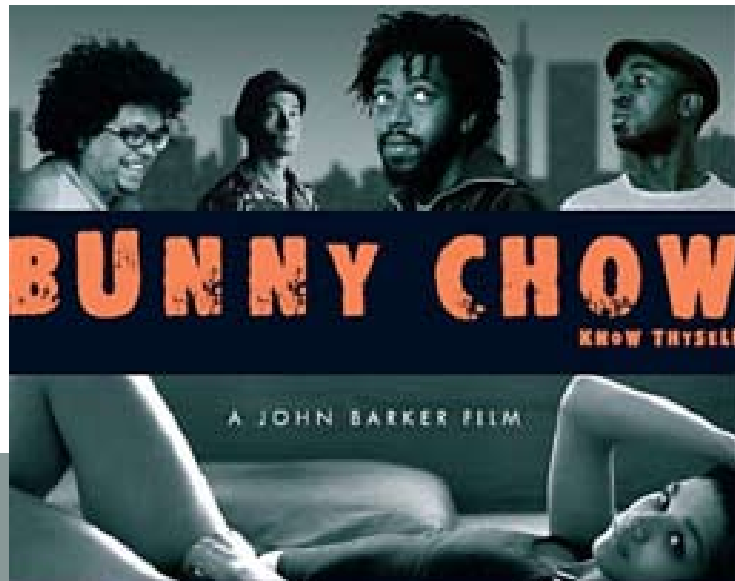
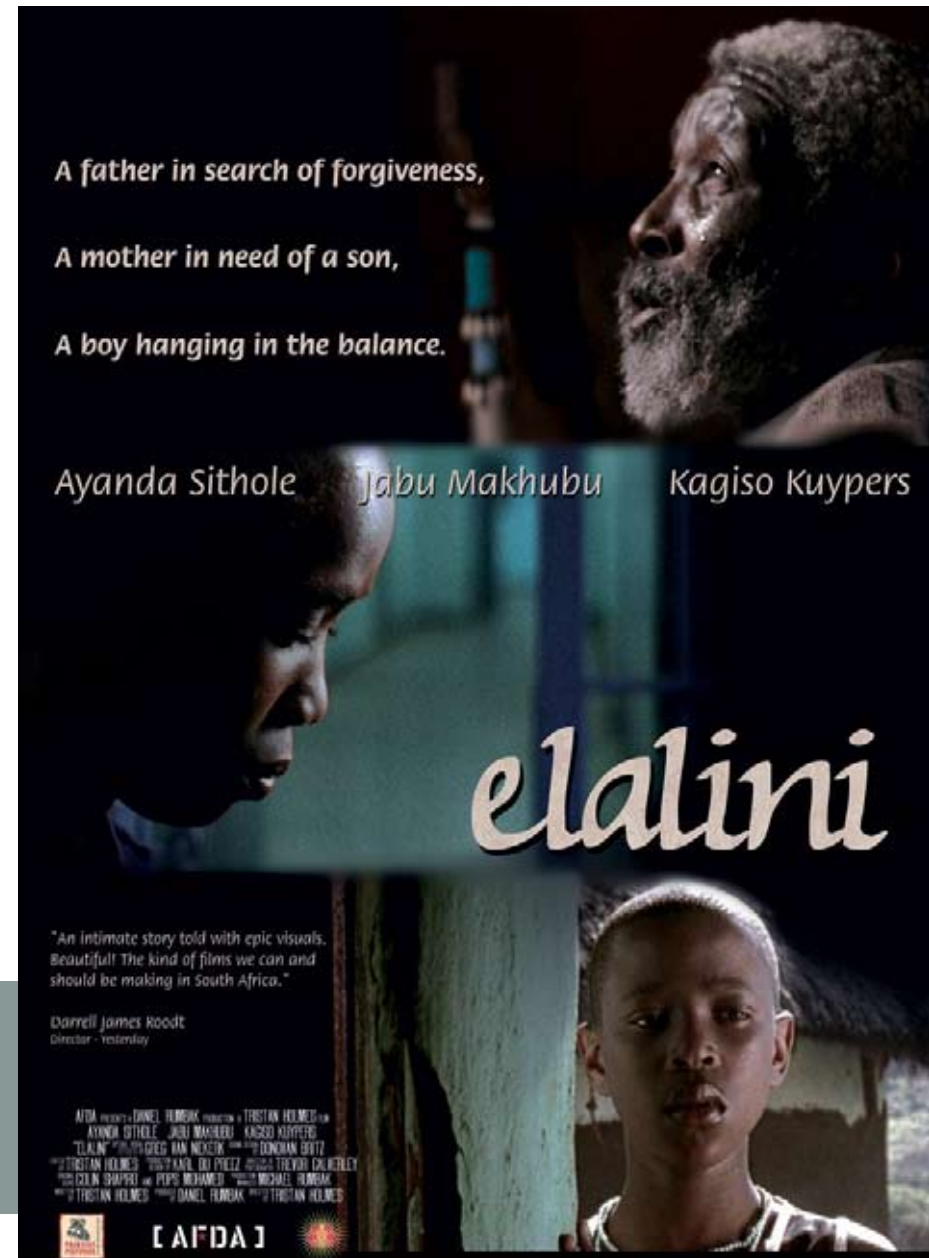


Figure 24: *Bunny Chow*, an independently funded local movie.

Figure 25: South African student film *Elalini* won the Oscar for the best foreign film.



context: analysis + synthesis



history of South Campus

Throughout the history of the University of Pretoria, the South Campus has numerous shifted in scale, program and actors.

The grounds on which the University of Pretoria, including the South Campus, is located today originally formed part of the farm Elandsport. This farm was owned by

Gert Bronkhorst and stretched to the east of the Apies River. In 1857 the farm was sold to Jan Schutte. When James Mears appropriated Elandsport in 1875, the farm was contained by the current University Road to the west, Burnett Street to the north, and Roper Street to the east, and it stretched towards Pretoria Boys' High School in the south. An ox-wagon trail running from east to west divided the farm into two parts, which later became the University of Pretoria and Pretoria Boys' High School. The path became known as College Avenue and later as Lynnwood Road (University of

Figure 27: Map of Pretoria, 1889.

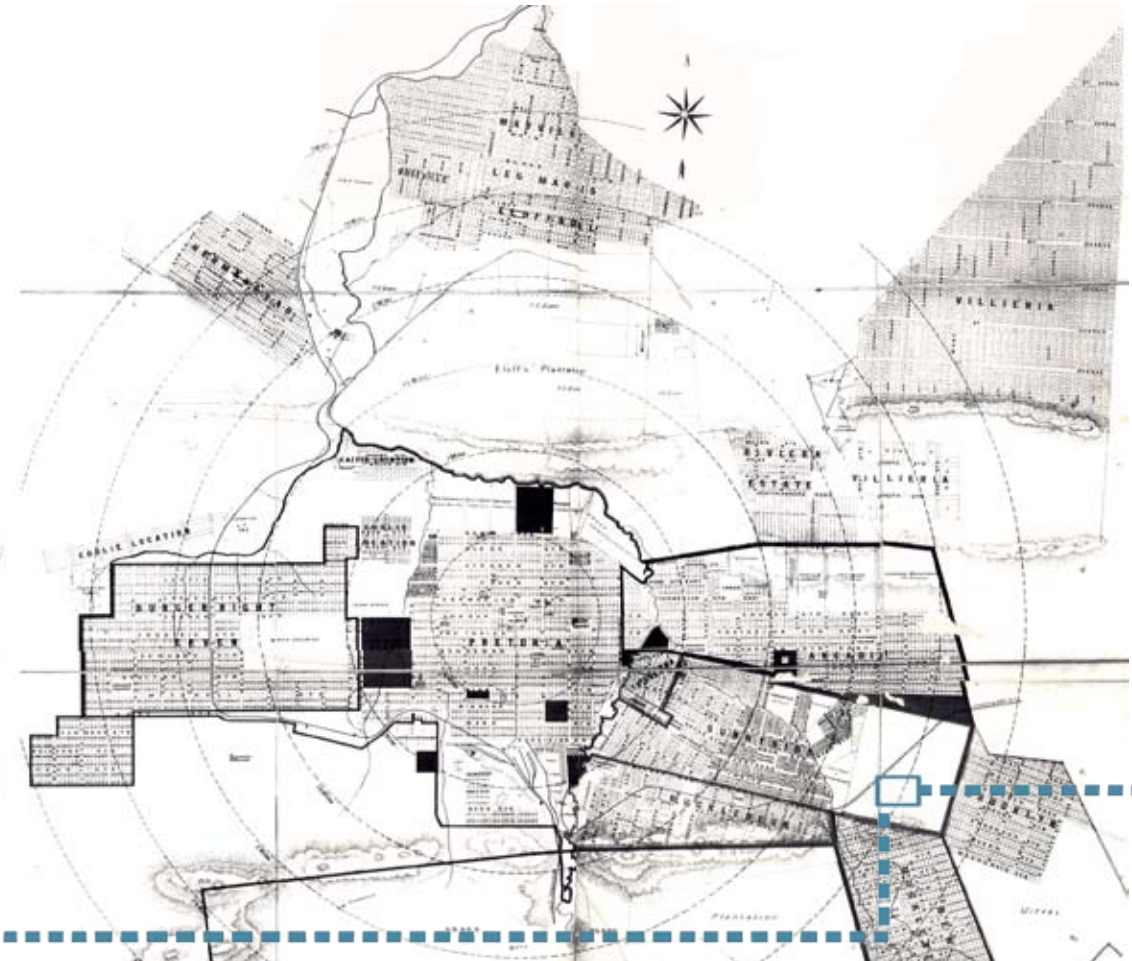
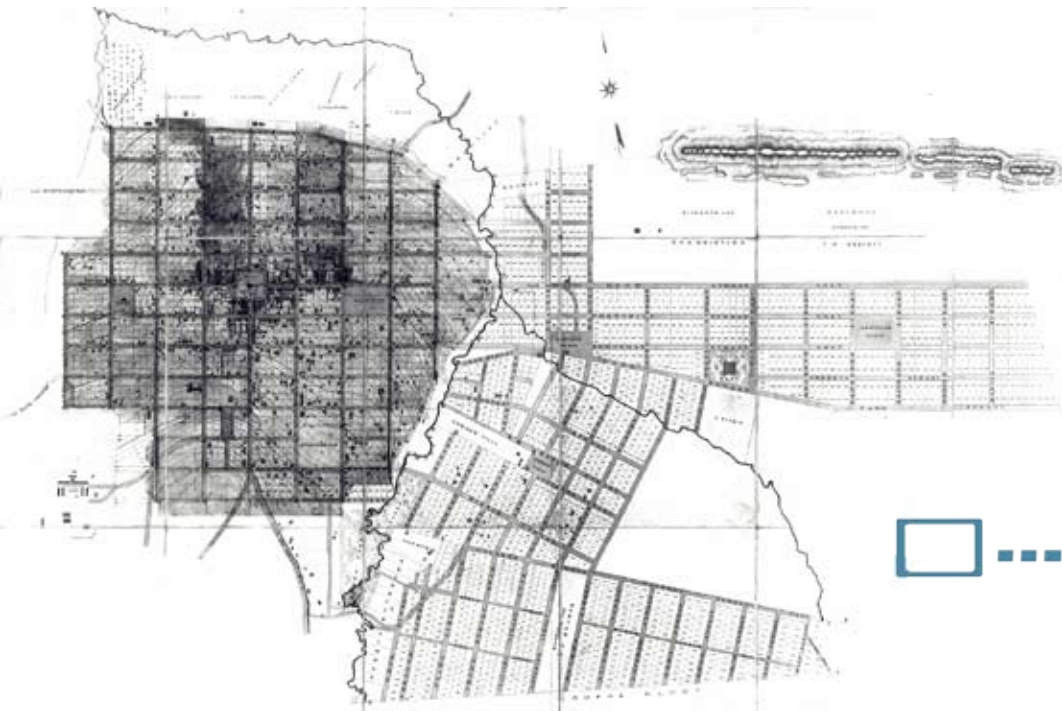


Figure 28: Map of Pretoria, 1900.

Pretoria, 1960:264).

In 1930 a strip of land on the north-western boundary of Pretoria Boys' High School was established as the Fuel Research Institute (Pretoria Boys' High, 2000). The construction of the first building complex along Lynnwood Road was completed in 1933. The architecture of these buildings reflects the style of typical Public Works buildings of the time. In January 1980 the control of the Fuel Research Institute was entrusted to

the Council for Science and Industrial Research (CSIR, 1980). The site, including the buildings, was government property.

In 1990 the University of Pretoria entered into an agreement with the Department of Education and Culture for the acquisition of the South Campus site (University of Pretoria, 1996:501). Renovations were made to the existing buildings to house numerous university functions.



Figure 30: Aerial photograph, 1939.



Figure 29: First buildings of the Fuel Research Institute completed in 1933.



Figure 31: Fuel Research Institute, 1957.



Figure 32: Aerial view of the south-west corner of the University Campus, 1967.

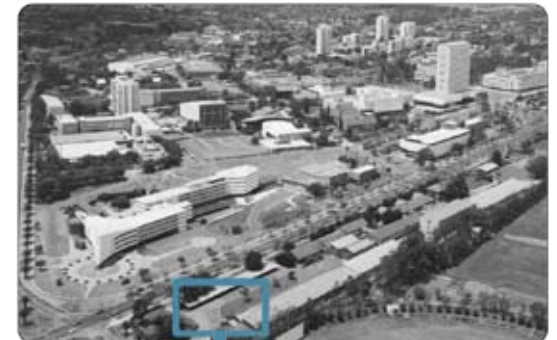


Figure 34: Aerial view of the University Campus, 1989.



Figure 33: Fuel Research Institute, 1980.

The site offers a rich context of industrial heritage, including a collection of red brick buildings dating back to 1933, with high volumes and open spaces between them. Traces of history in the biophysical environment include two rows of trees planted around 1950 that border Lynnwood Road, and a fuel tank embedded in the ground on the western border.

The reason for the South Campus's isolation lies in its heritage. The South Campus was not included in the initial planning of the University of Pretoria, and when the site became part of the University grounds in 1990, no alterations or additions were made to attempt to integrate the two campuses.

- Historically significant buildings
- Healthy buildings which can be adapted
- Sick buildings which structures can be reused or removed



Figure 35: Historic value comparison between the buildings on South Campus.



Figure 36: Heritage buildings and traces of history.

Figure 38: Interior spaces and volumes of existing buildings.

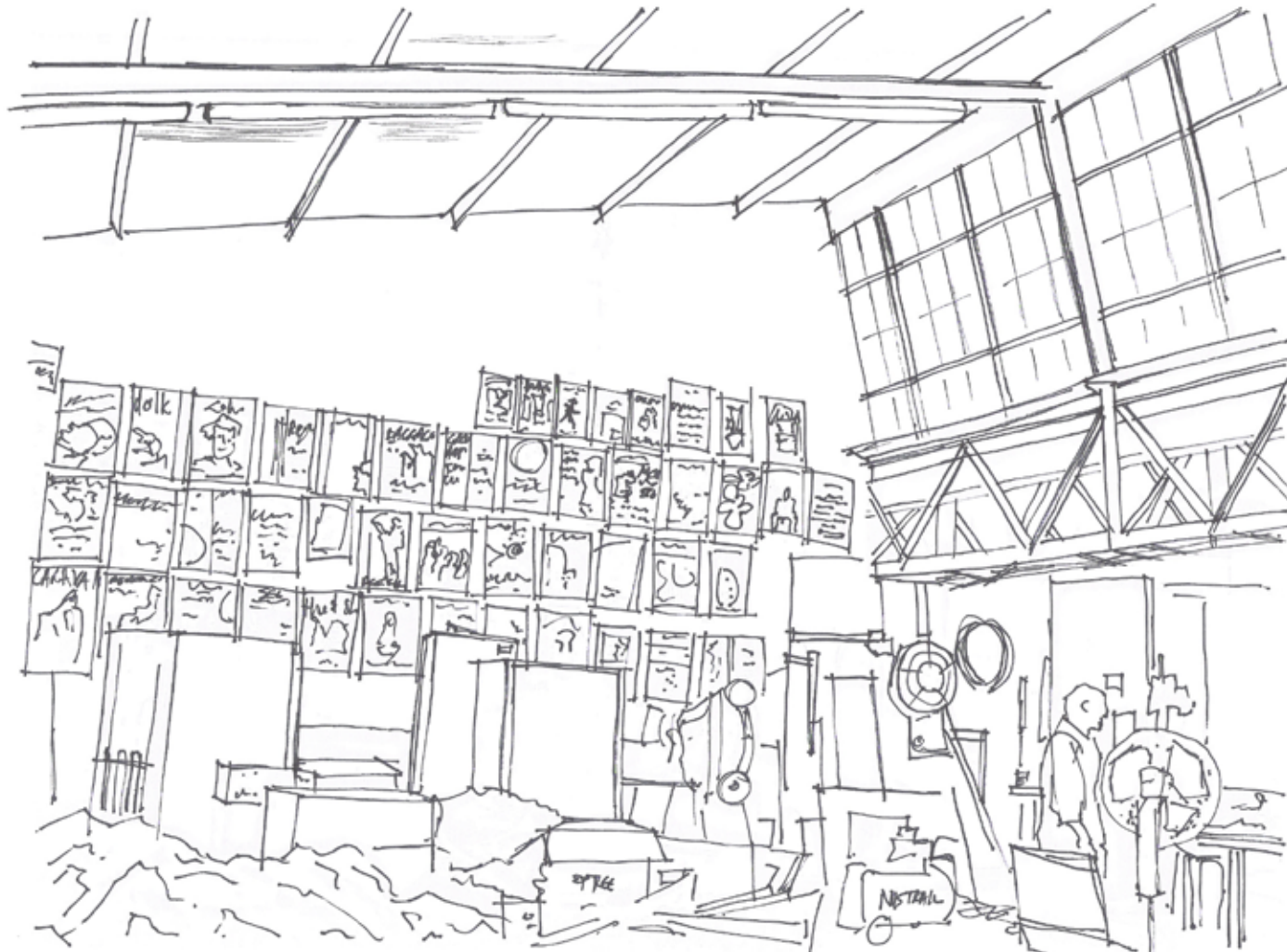


Figure 37: Sketch of the interior of the existing building.



Figure 39: Existing building interior.



Figure 40

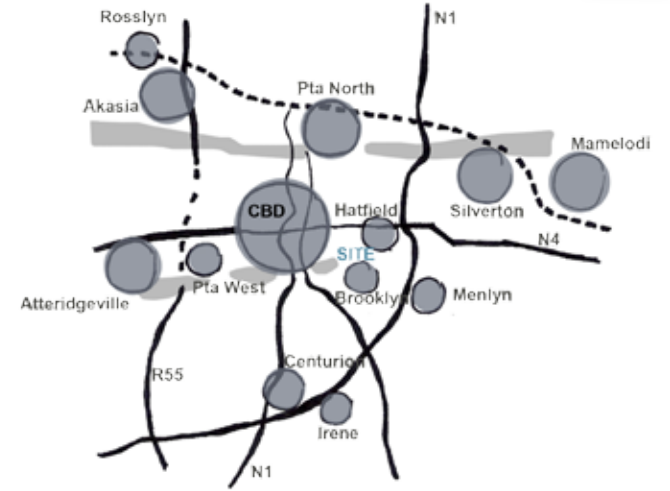


Figure 42: Diagram of Tshwane activity nodes.



Figure 41: Figure ground of Tshwane.

macro scale_ city wide

Various activity nodes can be identified within the City of Tshwane. These activities are clustered around strategic points in the city. The proposed site is located in an educational cluster situated in the Central Western Region of Tshwane.

The site is positioned between two nodes of high activity: the Brooklyn and Hatfield Metropolitan Cores. Brooklyn has developed into a major commercial node proposed to be densified and extended to the north (City of Tshwane Metropolitan Municipality, 2006). Hatfield, as a rapidly developing existing node, will accommodate the future Gautrain Station.

Figure 43: Figure ground of the University of Pretoria and surrounding areas.

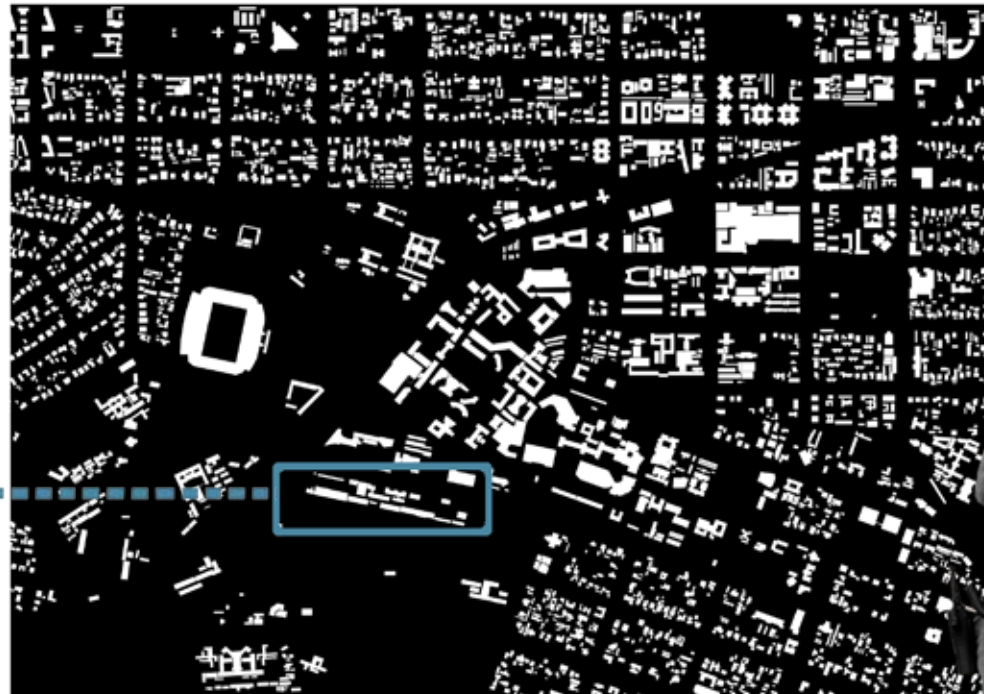


Figure 44



Figure 45: Surrounding land uses.

meso scale_ study area

Access and activities

Current activity around the site is primarily linear along Lynnwood Road. This road forms an east-west vehicular access route between the eastern suburbs and the Pretoria CBD. Pedestrian activity results from the large number of student cars parked along the road, as well as school children and students gathering at bus stops.

The Tshwane Spatial Development Framework proposes for Lynnwood Road to become an activity spine with activities concentrated along specific portions of the road. Where appropriate, traffic calming measures will be implemented to create a pedestrian and cyclist orientated environment (City of Tshwane Metropolitan Municipality, 2006).

Different modes of public transport in close proximity to the site include the railway station on University Road, and several bus and taxi stops along Lynnwood Road. A Bus Rapid Transport (BRT) stop, on the corner of University and Lynnwood Roads, will be completed in 2009 (Claasen, 2008:9). The future Hatfield Gautrain Station is within walking distance of the University of Pretoria, providing access for students from Johannesburg, Midrand and Centurion.

Figure 46: Transport diagram.

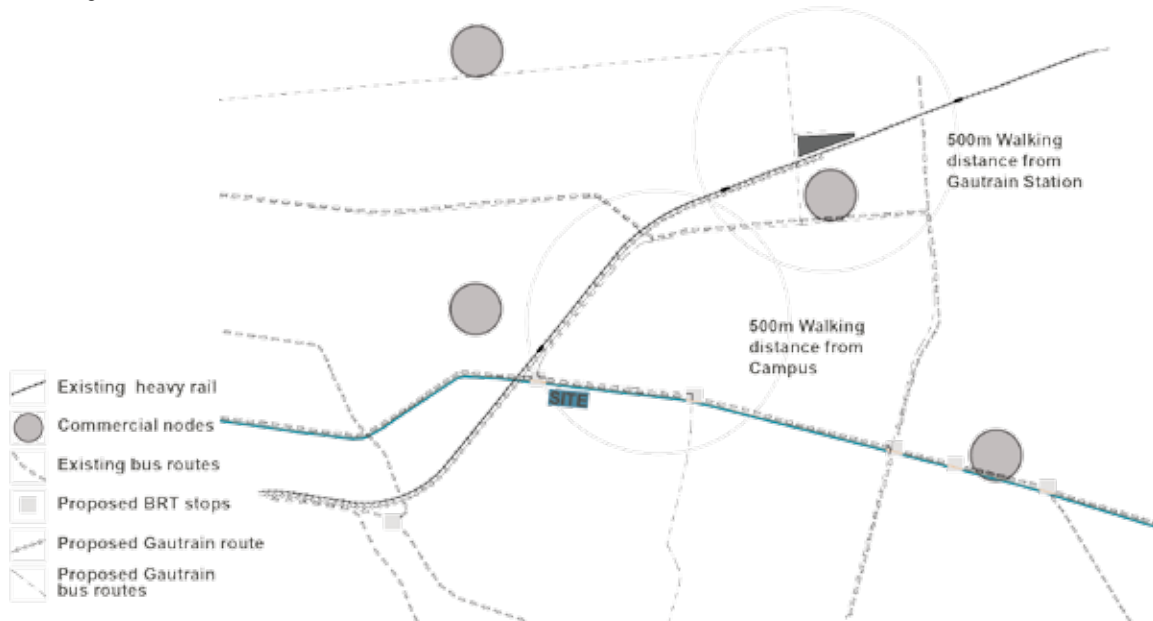


Figure 47: Train station in University Road.



Figure 48: Bus stop in Lynnwood Road.



Forthcoming implementations around the site will generate a flow of pedestrians. Ease of access to the site via different public transport amenities increases the feasibility of the proposed development.

Campus development

The context of the University of Pretoria is changing from suburban to urban. Areas where densification is occurring includes the Hatfield Core and pockets along Lynnwood Road.

The Main Campus is continuously expanding to accommodate the rapid growth of student numbers. Increased walking distances on campus are becoming time-consuming to traverse, resulting in a need to cluster similar facilities.

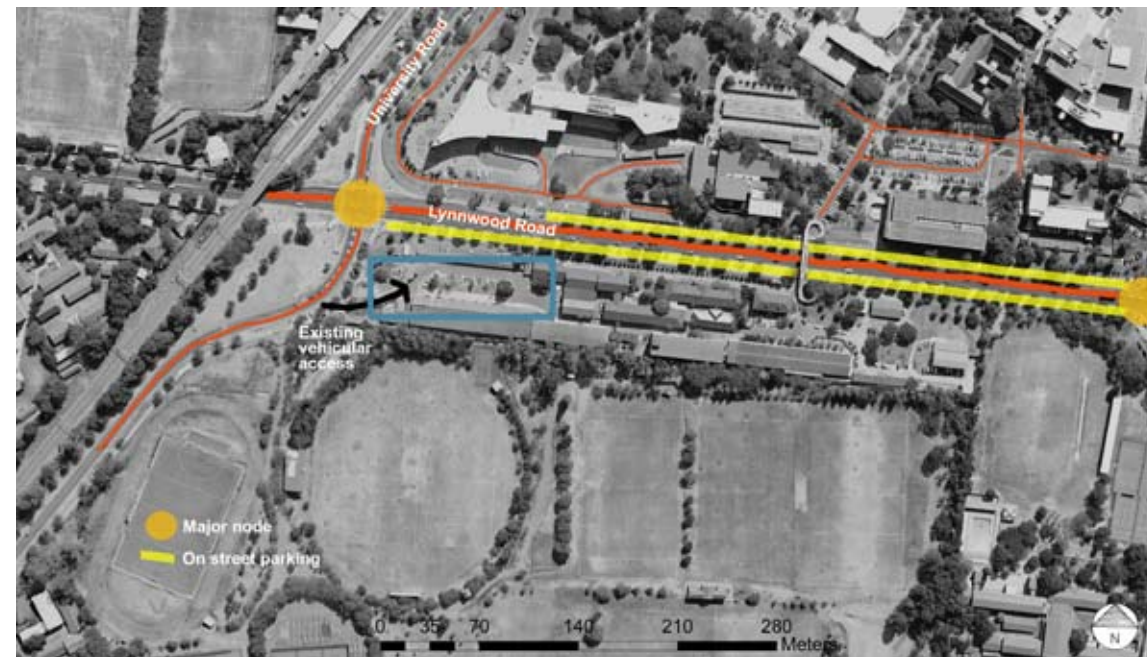
Isolation

The South Campus is an isolated land parcel which is not sufficiently integrated into its surroundings. Permeability is prohibited by palisade fencing surrounding the campus. The fast movement of vehicles on Lynnwood Road and the uncomfortable pedestrian bridge across it, minimizes movement between the two campuses. The school sports fields along the east and south borders are fenced and walled off, therefore prohibiting infiltration into the site. A variety of opportunities present themselves to reconnect the site with its surroundings and create a place with identity.

Figure 49: Pedestrian movement analysis.



Figure 50: Vehicular movement analysis.



micro scale_ site

Social context

It is important for a campus layout to encourage impromptu encounters amongst students, faculty members, visitors and activities. Most casual interchanges, chance meetings, entertainment and study activities on campuses take place outdoors (Francis & Marcus, 1990:143). Some of the criteria necessary to stimulate social interaction can be found on South Campus, but others are desperately lacking.

Social areas located on the South Campus include the cafeteria with indoor and outdoor seating, the eastern green area, and a private courtyard space. These outdoor areas create places where one can study and eat in relative comfort.

The South Campus has no recognizable point of entry; therefore visitors unfamiliar with it have difficulty gaining access. The entrances to the South Campus are located at the two ends of the site, while the edges remain impermeable. Spaces around the entrances discourage gathering and lingering.

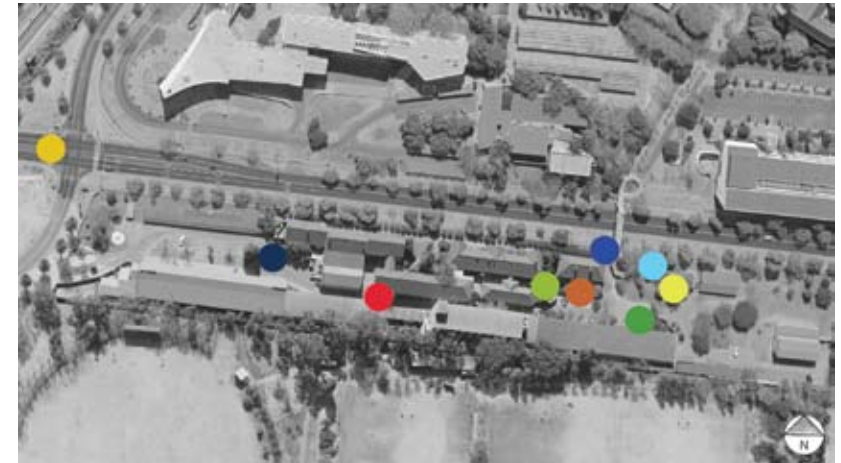


Figure 51: Social study legend.

The campus has not been designed to accommodate a central plaza or gathering place. Any campus community needs a place for friends to meet, bands to play, displays to be placed and people to watch other people (Francis & Marcus, 1990:154).

Trucks servicing the cafeteria and printing press, as well as private vehicles, share the main pedestrian street. The presence of vehicles discourages comfortable pedestrian movement.



Figure 52: Detail site analysis.

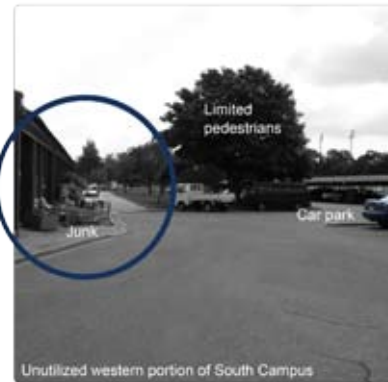
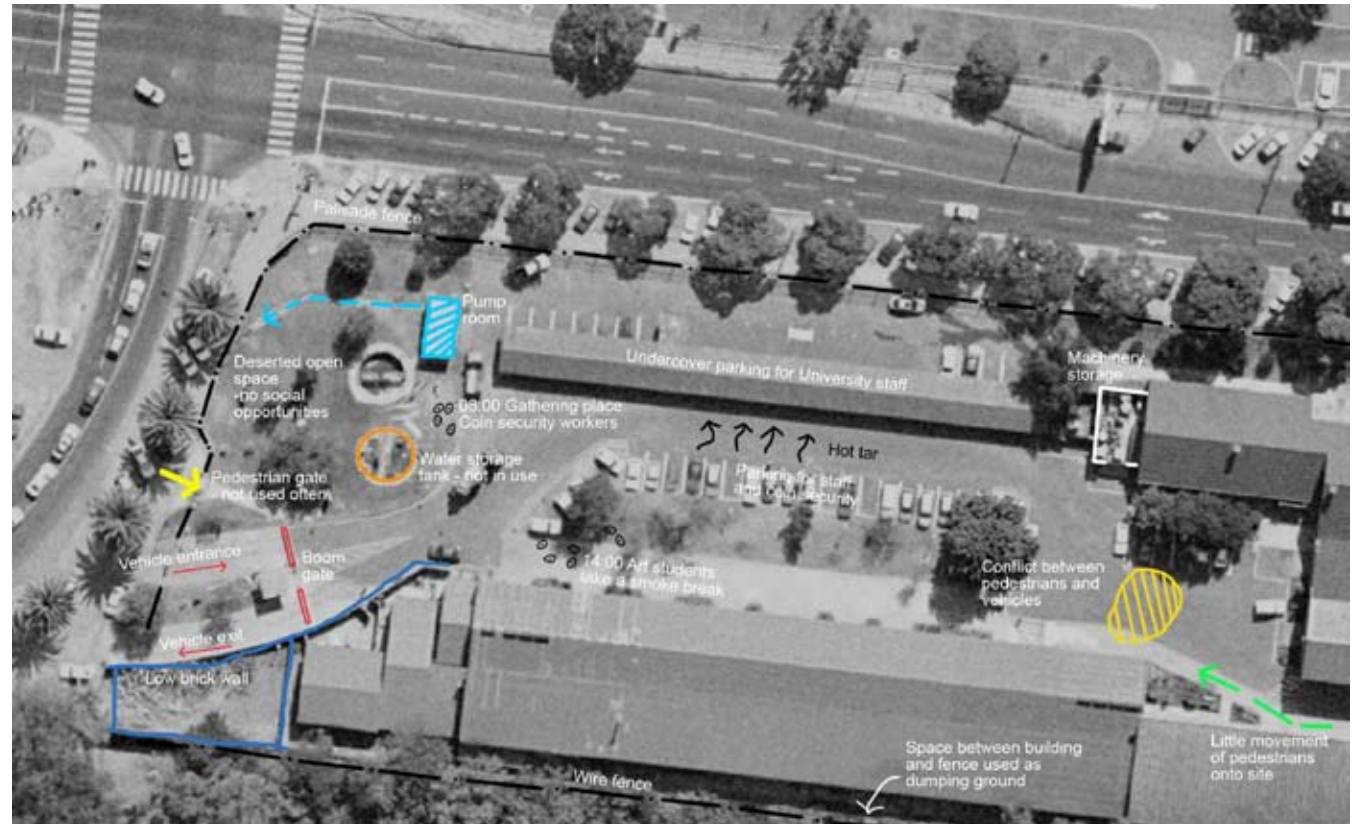
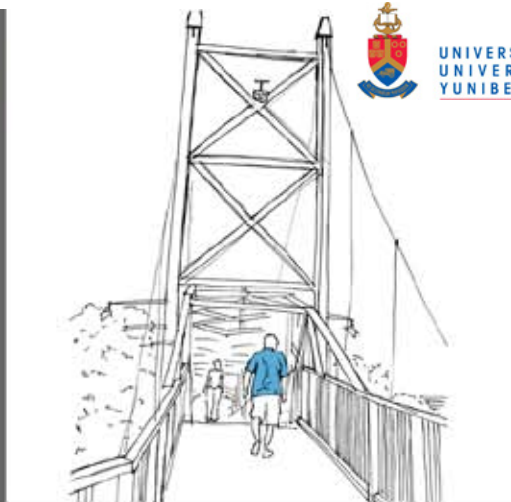
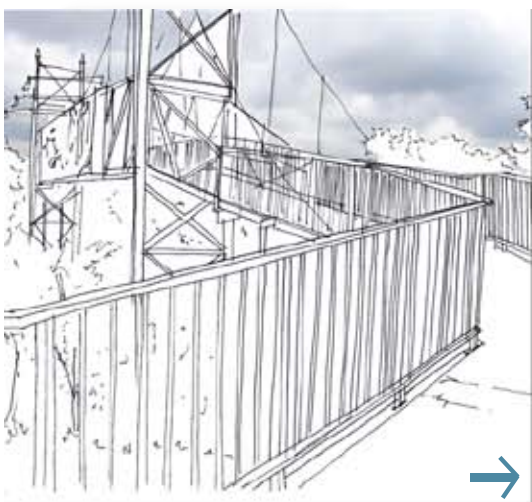
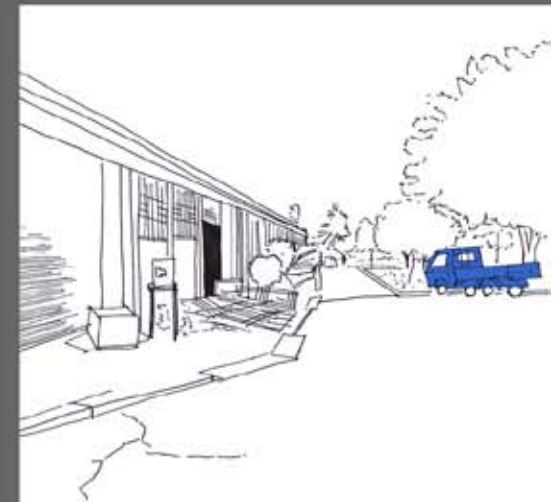
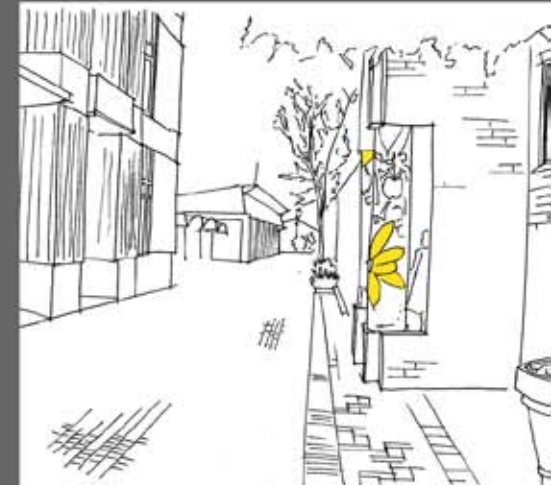
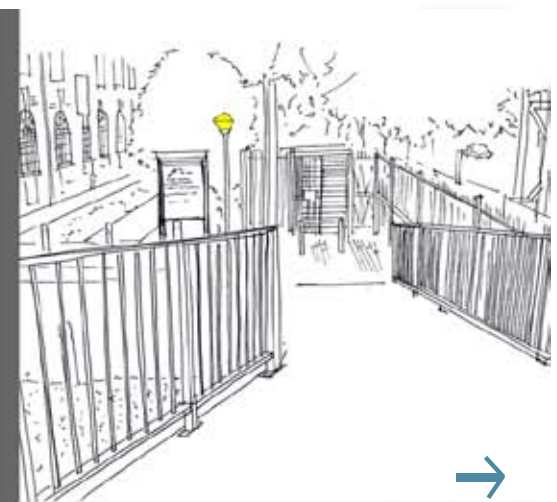
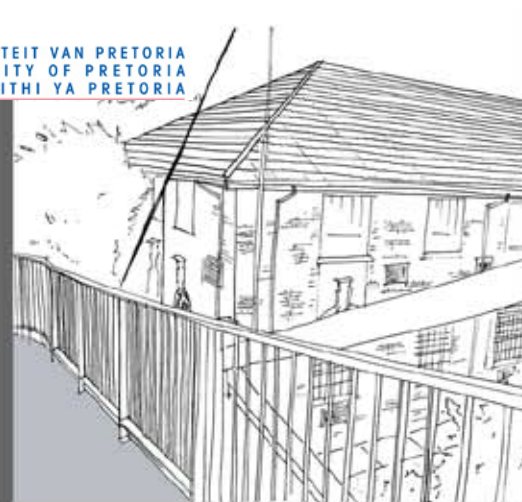


Figure 53: Social study of South Campus.



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA



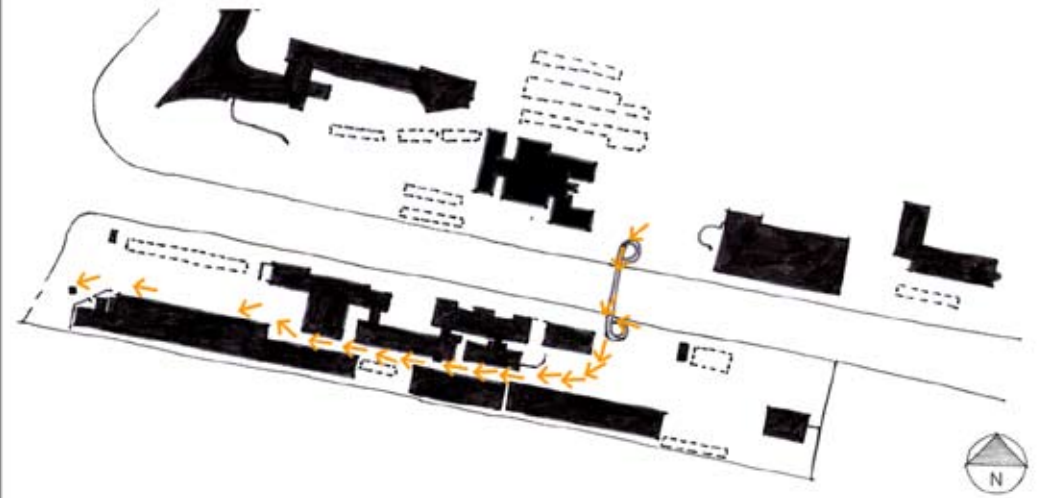
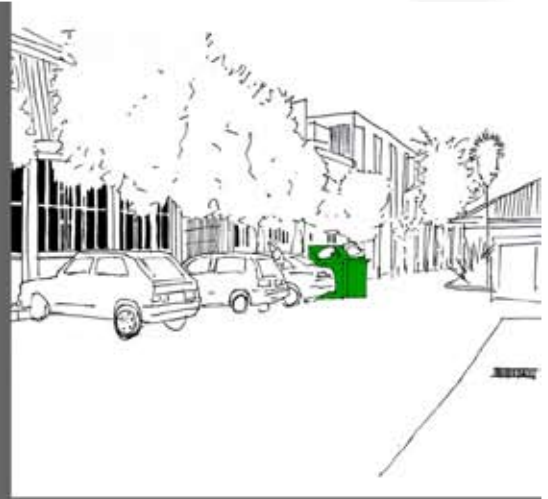


Figure 54: Visual sequence showing progression from Main Campus through South Campus.

Climatic context

Location: 25°45'23"S
28°13'31"E

Climate: Summers: Hot with 60% sunshine days
Winter: Mild to cold with 80% sunshine days but less heat intensity

Sun angles: Summer: 88° altitude
Winter: 44° altitude (Schulze, 1986)

Precipitation: Summer rainfall region prone to late-afternoon thunderstorms and hail (South African Weather Service, n.d.)

Humidity: 59% monthly average

Wind: Summer: north-easterly
Winter: north-westerly (Napier, 2000:8-9)

Topography: 1:56 slope from east to west

Figure 55: Average temperatures in Pretoria.

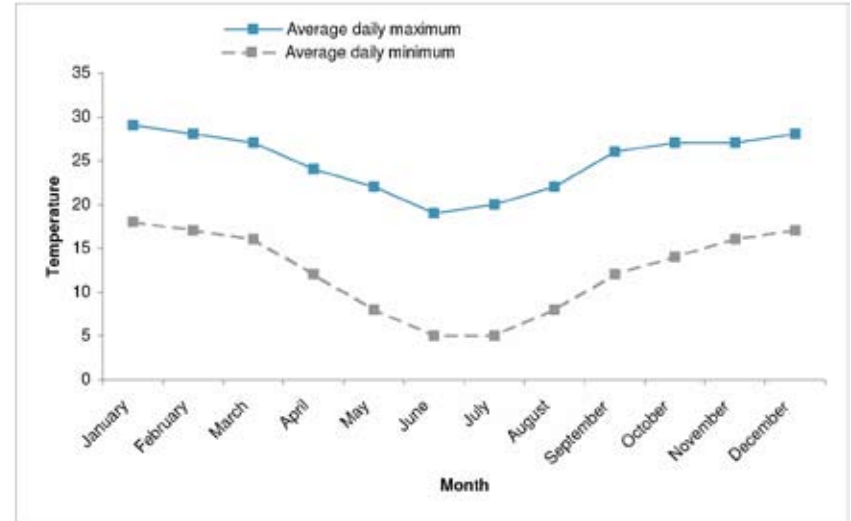


Figure 56: Average rainfall in Pretoria.

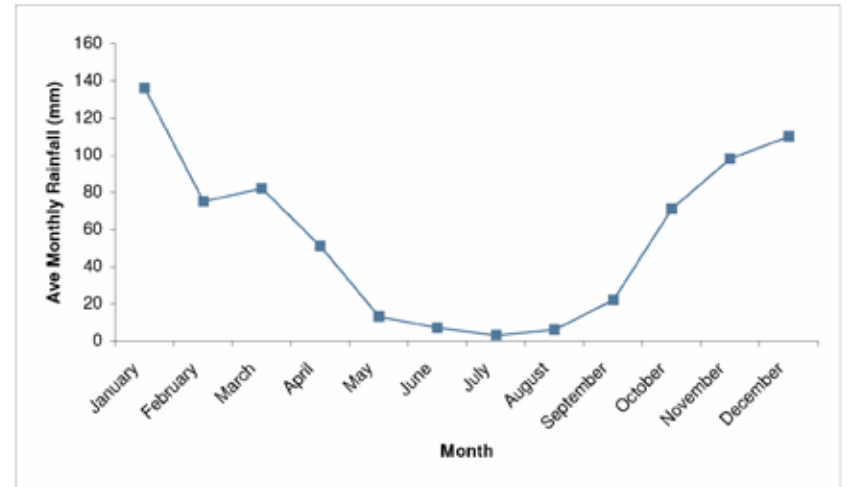
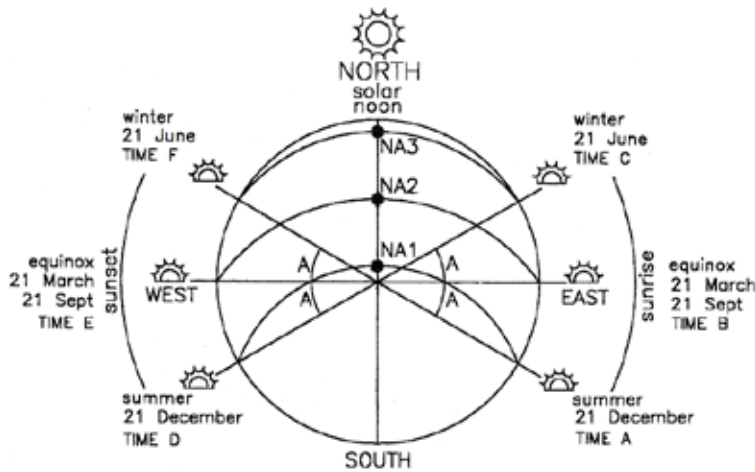


Figure 57: Sun angles for Pretoria.



Solar times	06h00	08h00	10h00	12h00	14h00	16h00	18h00
Clock times	06h18	08h18	10h18	12h18	14h18	16h18	18h18
Azimuth - 21 December	112E	101E	91E	0	91W	101W	112W
Altitude - 21 December	10	35	63	88	63	35	10
Azimuth - 21 March/ September	90E	76E	53E	0	53W	76W	90W
Altitude - 21 March/ September	0	26	51	65	51	26	0
Azimuth - 21 June	-	55E	34E	0	34W	55W	-
Altitude - 21 June	-	14	32	40	32	14	-

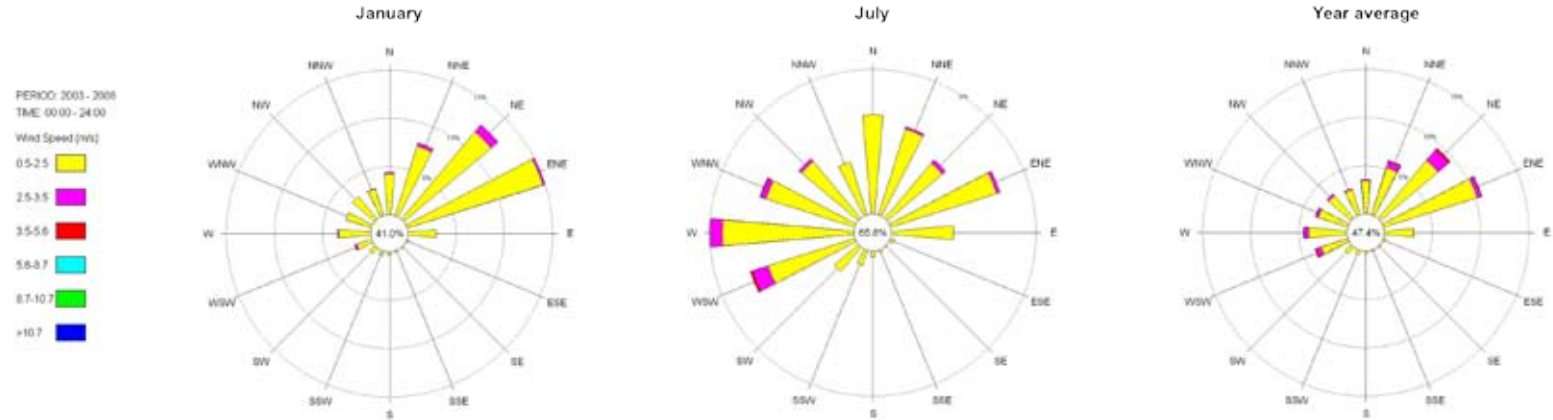


Figure 58: Pretoria wind rose.

Legislative context

Restrictions as per zoning certificate issued by the City Council of Tshwane:

Details: Remainder of Portion 332 of the farm Elandspoor 357-JR, Pretoria
Town-Planning Scheme, 1974

Use zone: Educational

Purpose for which buildings may be erected: Places of instruction and social halls, amongst others

Site area: 29 250m²

Density restriction: None

Floor space ratio: 2, 0

Height: 19m

Coverage: 60%

Coverage used: 8701m² (29.75%)

Coverage available: 8849m² (30.25%)

Building lines: Sides – 4,5m

Street – 3,5m

SABS restrictions

Occupancy class: A2 – Theatrical

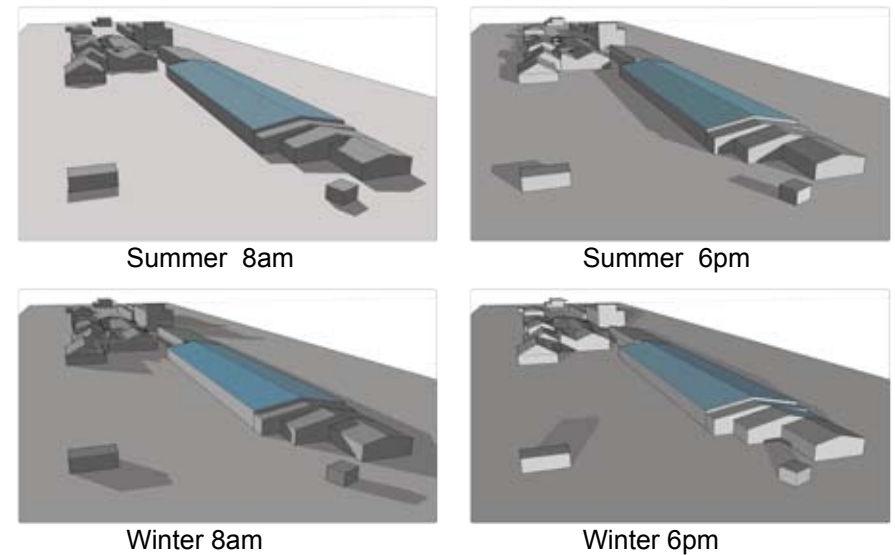


Figure 59: Shadow patterns on South Campus.

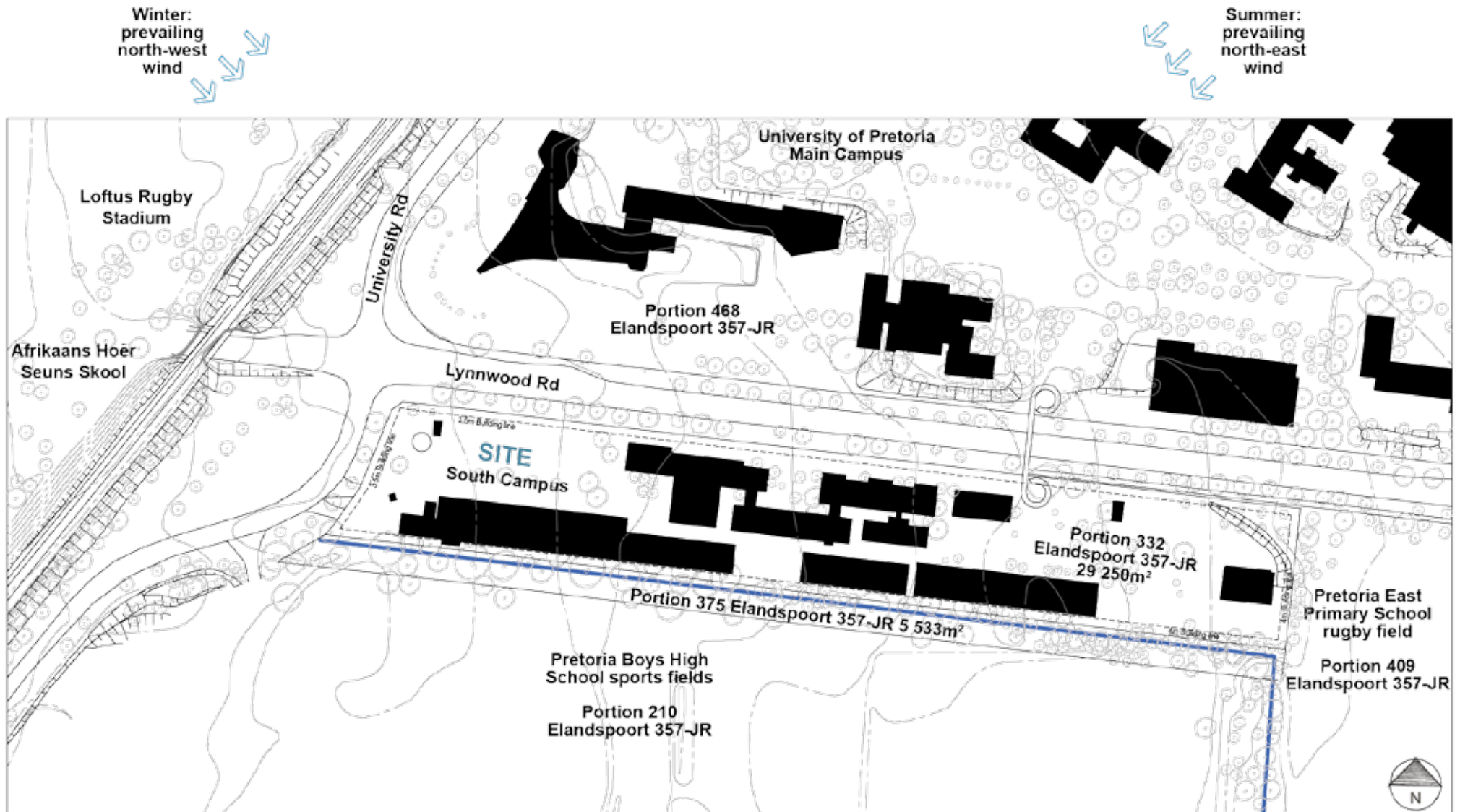


Figure 60: Site analysis diagram.



Figure 61

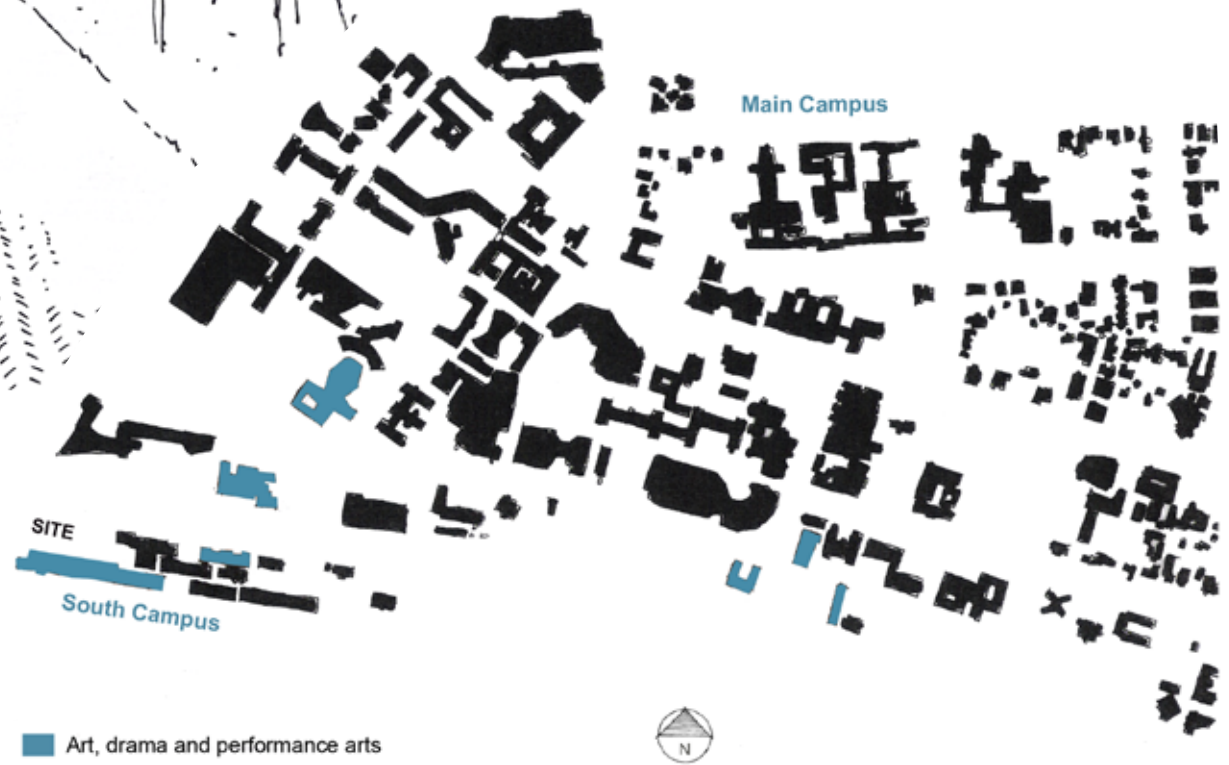


Figure 62: Figure ground indicating buildings of related use.

contextual influences

Reichen and Robert... for the reuse of an industrial site

Luc Besson Cinema Studios

Saint-Denis_ France

2004 – 2010

Film director Luc Besson purchased a former electrical plant located on the banks of the Seine in the Paris suburb of Saint-Denis (Jodidio, 2005:438-443). On a previous occasion, Luc Besson filmed scenes from several movies inside the 220m long building (Plaine Commune, 2008) and now he intends to convert the space into a “Cinema City”.

The aim of the architect is to preserve the valuable industrial heritage of this 1933 Art Deco building. Restorations revolve around the vast nave, and numerous devices including generators, cranes and staircases will be retained (Defawe, n.d.). Old façades will be refurbished to preserve the initial colours of the building, and the addition of new glass is designed to respond to the original plans. The industrial volumes of the plant can be easily adapted to movie-making.



Figure 63: Site location and existing power plant.

precedent study



Figure 65: Proposed Cinema City.



Figure 64: Proposed façade of renovated building.



Figure 66: Cross section showing re-used industrial spaces.

Foster + Partners... for a design responsive towards the existing

Carrée d'Art
 Nîmes_ France
 1984-1993

Located next to the Maison Carrée, a well preserved Roman temple, the Museum of Contemporary Art encourages a dialogue between ancient and modern architecture. Sir Norman Foster recalled that “the challenge was to relate the new and the old, but at the same time create a building that represents its own age with integrity” (Preserve the Modern, 2007).

Primary elements of Roman architecture are present in the Carrée d'Art. The museum contains a large portico, supporting columns and a rectangular foundation. However, the museum does not simply replicate but rather responds to the Roman architecture. The ancient design is expressed through lightweight modern materials such as glass and steel.

In relation to the urban context of Nîmes, the nine-storey structure is partially sunk into the ground to achieve the same scale as the surrounding buildings. Railings, advertising boards and parking were removed to extend the square in front of the building and create a strong pedestrian realm (Foster and Partners, n.d.). Today the square is lined with café tables and clusters of people reigniting the social life of Nîmes.

Although the context on the South Campus does not have the same historic value as the above precedent, careful consideration should be taken in the design of a new building in response to the existing.

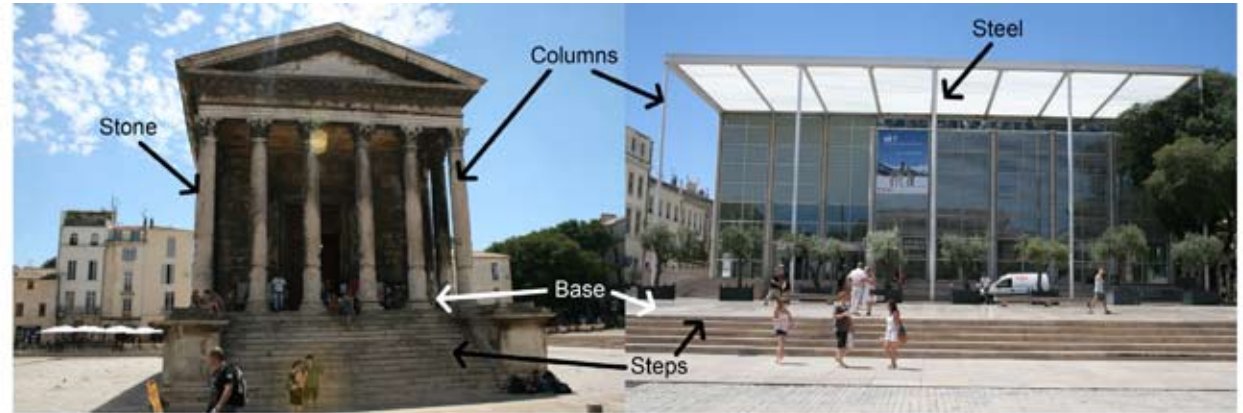


Figure 67: Ancient versus modern.



Figure 68: Place de la Maison Carrée, a public square.



Figure 69: Response to context.

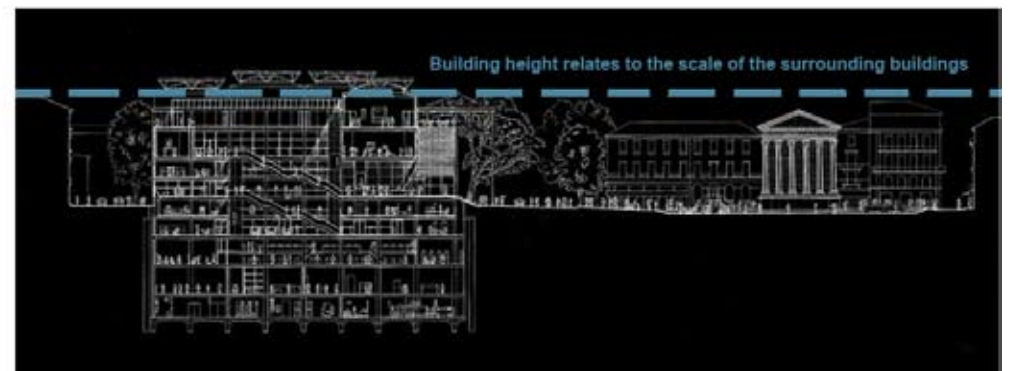


Figure 70: Cross section showing building height in relation to context.



design intention: theory



Figure 72: *The chronicles of Namia.*

design generator

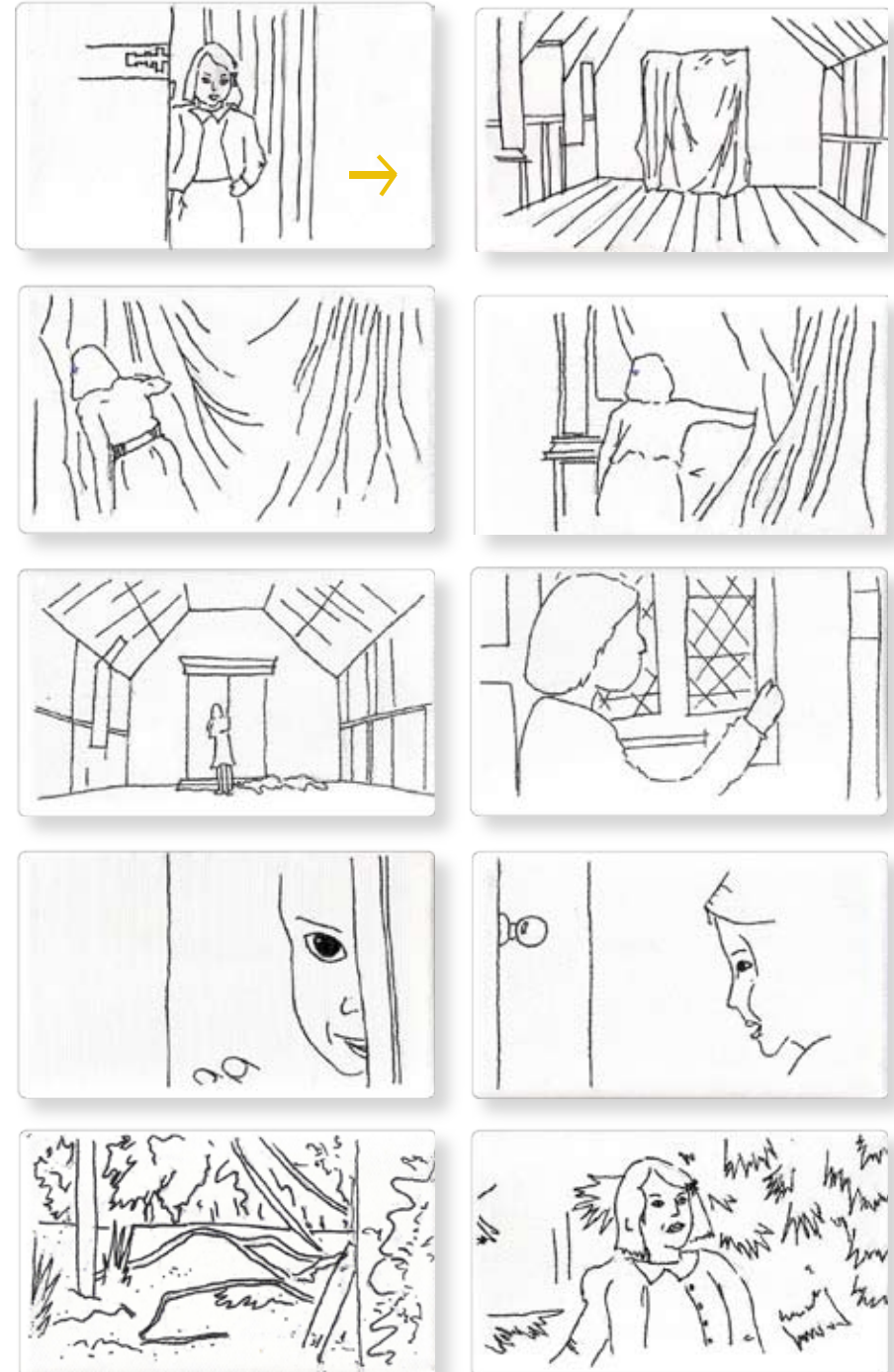
The storyboard

In filmmaking, the storyboard is developed during the pre-production phase to act as a visual sequence complementing the script. The storyboard represents the narrative element of the film in the form of a collected series of simple sketches. Therefore, storyboards are used for the conceptualization of what the film intends to be. Laybourne (1998:103) defines the storyboard as a tool for working out a project's core idea and structure.

In film production, the function of the storyboard is similar to that of concept sketches in architecture. A parallel can be drawn between designing a building and producing a film. The film process allows the producer to design fragments of the film, consequently working with the general and the particulars at the same time. Similarly, the architect uses sketches, photographs, models and 3D renderings to visualize what the building would be.

Hermeneutics can be defined as the study of theories for the interpretation and understanding of text, or the “theory of interpretation” (Compact Oxford English Dictionary, 2005). However, the concept of “text” extends beyond a written document to any object subject to interpretation. The Hermeneutic Circle illustrates that the understanding of text as a whole derives from the reference of the individual parts, and the understanding of the individual parts derives from the reference to the whole (Waever, 1996). Therefore the meaning of the text can be found in its context. In the same way the storyboard allows the producer to design parts of the film. An understanding of the film only comes when these parts are combined to form a complete motion picture.

In the process of interpretation the interpreter, or in the case of a film, the viewer, becomes important. Hans-Georg Gadamer (1989) argues that people have a “historically effected consciousness”. Consequently, since people come from different backgrounds and they can not remove themselves from their background, culture, gender, language etc., that background influences their interpretation. Gadamer’s concept of “Fusion of Horizons” rejects objectivism; when interpreting text, a fusion exists between the history of the text and one’s





own background. Each individual watching a movie or exploring a building has a unique interpretation of it and therefore a unique experience.

The touchstone

The Oxford Dictionary (2005) defines a touchstone as a standard or criterion by which something is judged. Professor P.G. Raman concludes that a touchstone for a thesis project is “something abstract to represent its theme” (Raman, 2008).

As a touchstone for this design dissertation the author conceived a storyboard of a scene from the movie “The Chronicles of Narnia”. Based on the book “The Lion, the Witch and the Wardrobe” by C.S. Lewis, the movie tells the story of four children who journey to a fantasy world called Narnia. The chosen scene for the storyboard starts where Lucy hides in the wardrobe. As she steps back into the wardrobe, her hand touches the branch of a tree. She turns around to discover a magical world at the back of the wardrobe.

The composition of the scene focuses on adventure and discovery. In a similar way, a building should evoke excitement and imagination and stimulate a desire for exploration. Lucy’s transition from the room into Narnia is a transition from the real world into the imaginary, or from the tangible to the intangible.

Figure 73: Storyboard.

architecture and film

A sequence of frames

A film is often called a “movie” or a “motion picture”, since the narrative is conveyed through a rapid succession of images giving the illusion of continuous movement.

The architecture of Bernard Tschumi is inspired by cinematic terms and techniques. Tschumi’s Parc de la Villette in Paris is an urban park designed with consideration of the temporal quality of space, and the spatial quality of time derived from movement.

The Cinematic Promenade is regarded as a film strip composed of “a montage of sequences and frames” (Tschumi, 1987:8). Successive frames of individual gardens represent the image track, and connecting pedestrian walkways represent the sound track.

Tschumi (1987:VI) argues that a cinegram is created by the rapid succession of frames, and therefore exists as a superimposition of independent parts. The relationship between the independent frames and the whole is essential in the understanding of the film, and the sequence of events becomes important.

Space, moment and events

The word “cinema” originates from the Greek word “kinema” which means ‘movement’ (Compact Oxford English Dictionary, 2005).

The Manhattan Transcripts is a series of drawings coordinated by Bernard Tschumi to illustrate an architectural representation of reality. In this representation a relationship is established between space, movement and events.



Figure 76: Alfred Hitchcock’s *Young and Innocent*, 1937.

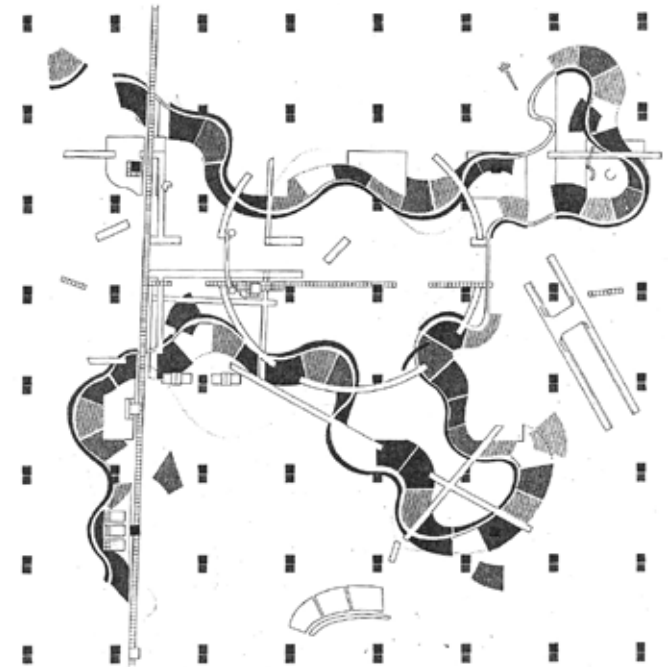


Figure 74: Tschumi’s Parc de la Villette, Cinematic Promenade.

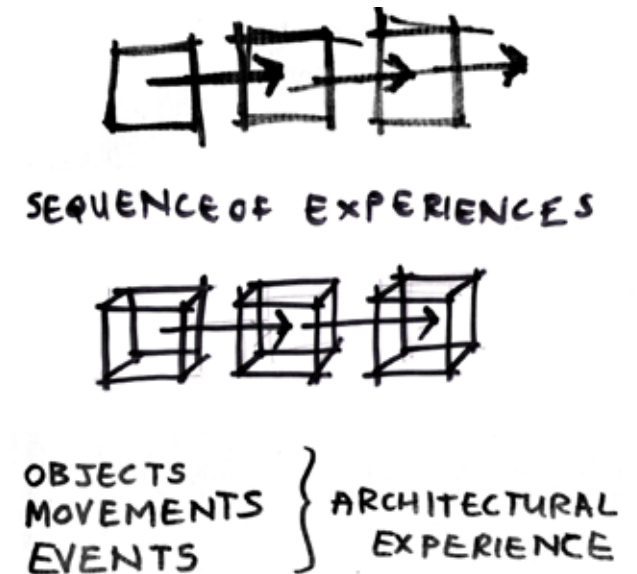


Figure 75

“The Park” consists of a series of photographs and drawings illustrating the account of a murder. Photographs direct action, plans reveal the architectural manifestation, and diagrams indicate the movements of the main protagonists. The attitudes, plans, notations and movements are linked and together they define the architectural space of the park.

Tschumi (1994:9) states that “in their individual state objects, movements, events are simply discontinuous. Only when they unite do they establish an instant of continuity”. The relationship between objects, movements and events formulates the architectural experience. These form three levels to which the element of time is introduced in the form of moments, intervals and sequences.

The chief characteristic of the Transcripts is the sequence. Tschumi (1994:10) defines the sequence as a “composite succession of frames that confronts spaces, movements and events”.

In order to gain the complete experience the succession of one frame after another is necessary. “The Transcripts are thus not self-contained images. They establish a memory of the preceding frames, of the course of events, their final meaning is cumulative; it does not depend on a single frame but on a succession of frames and spaces” (Tschumi, 1994:11). Similarly, movement through a building should be experienced as a sequence of events stimulating a sequence of experiences.

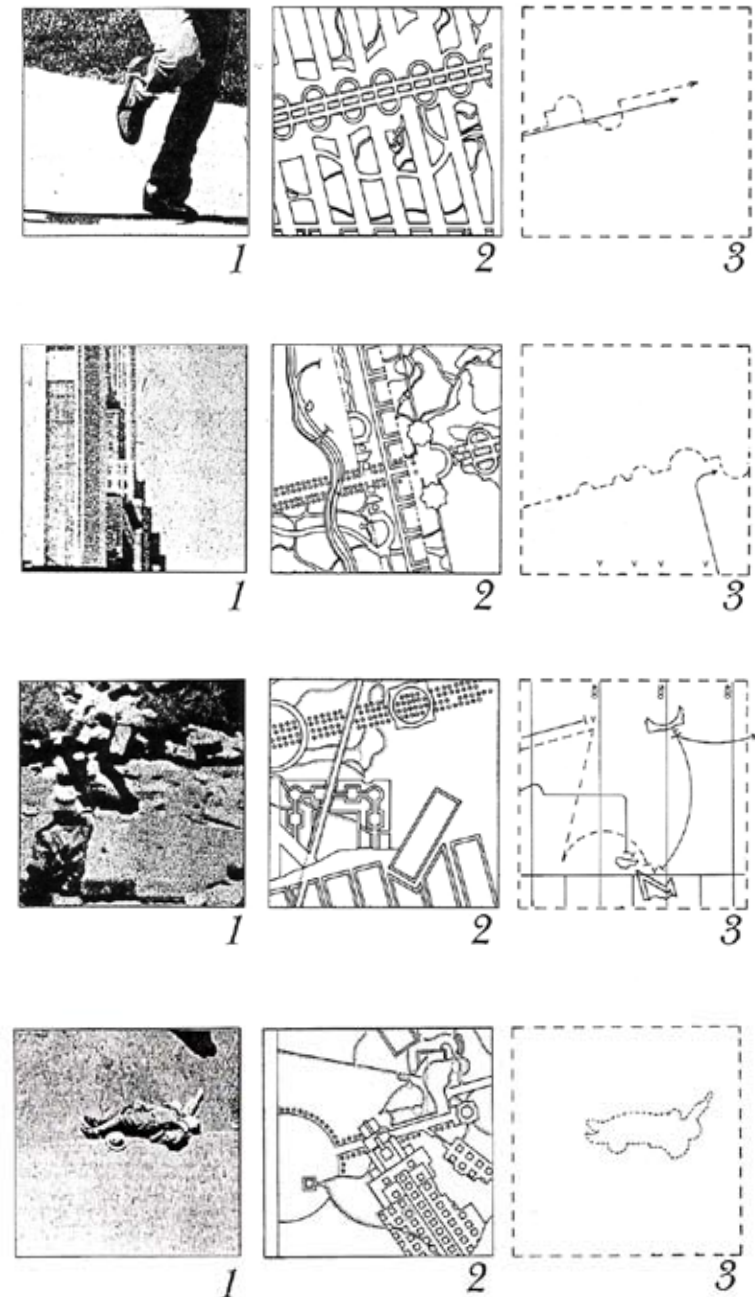


Figure 77: Tschumi's Manhattan Transcripts, The Park.

Individual experience

Yi-Fu Tuan's (1977:5) argument about space and place is narrowed to a single perspective: experience. Space allows movement, whereas place demands pause. "Each pause in movement makes it possible for location to be transformed into place" (Tuan, 1977:6).

Tuan (1977:8) defines experience as "a cover-all term for the various modes through which a person knows and constructs a reality". These modes of experience include:

Sensorimotor
 Tactile
 Visual
 Conceptual

Emotions influence all human experiences; therefore experience can be defined as "a compound of feeling and thought" (Tuan, 1977:10). The mind often expands the experience beyond that which the senses perceive and into the world of the imagination.

Juhani Pallasmaa (2001:35) expands on these ideas by explaining that a master artist makes the viewer think, see and experience things different to those that he is actually exposed to. Catherine Breillat makes a similar comment about the power of the invisible imagery in a film. "The work of a director is a way of hypnotizing: the viewer has to be made to believe to see even that which he is not seeing" (Pallasmaa, 2001:36). A female viewer of the film "Parfait Amour", by Catherine Breillat, complained of excessive bloodiness in the final scene. In reality, however, there was no blood projected on the screen. The blood was only in the imagination of the viewer.

Pallasmaa (2001:9) argues that our experience of reality is a result of our individual perceptions. Consequently, the perception of an image is influenced by imagined and remembered images in the mind of the observer. All arts are engaged in the same issue: the expression of human experiences. Similar concepts are formed in relation to space as perceived through cinema or architecture. The experience of architecture is a combination of the physical realm of architecture and the mental world of the observer.

According to Walter Benjamin (1968:217-251), both architecture and film present objects for simultaneous collective experience. Images stored in the memory influence how one experiences space. Space in architecture is experienced in a kinaesthetic way, or through movement.

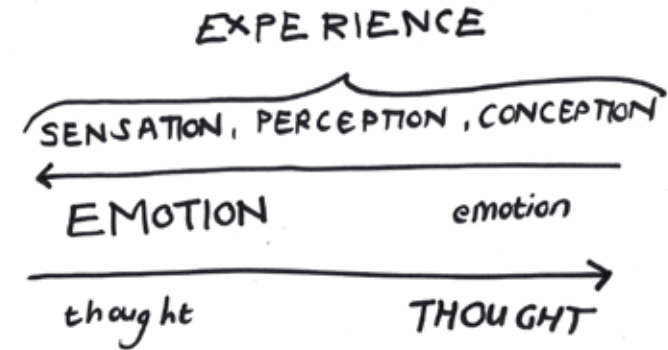


Figure 78: Tuan.

Experience = space + mind

Individual perception

Space = real + imagined

Figure 79: Pallasmaa.

Space is experienced through movement

"I can no longer think what I want to think.
 My thoughts have been replaced by **moving images.**"

Figure 80: Benjamin.

top 10 F/X (digital effects) scenes in movie history

1. "Star Wars" (1977)

Motion controlled photography was used where a computer controls a series of camera movements.



6. "Forrest Gump" (1994)

Digital archival footage was used to compose Tom Hank's character into historical film clips.

2. "Tron" (1982)

First film to use computer imagery to create a 3D (Three Dimensional) world.



7. "The Perfect Storm" (2000)

The organic qualities of water are hard to regenerate in software therefore a new benchmark was reached when the film's CGI water appeared real.

3. "Terminator 2: Judgment Day" (1991)

"Morphing" was used to generate the liquid-metal robot's humanoid texture which was layered onto a CG (Computer Generated) model.

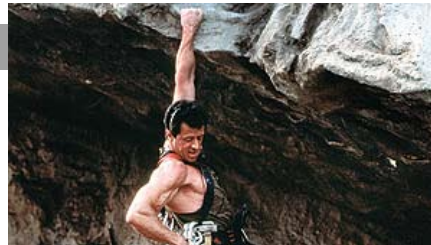


8. "Lord of the Rings" (2001)

For the enormous battle scenes a computer programme called "Massive" was created to generate crowds of artificially intelligent individuals who "make their own decisions".

4. "Cliffhanger" (1993)

The actor was held up by wires that were later digitally removed introducing the green screen to the world of film.



9. "The Polar Express" (2004)

A large motion-capture stage with up to 200 cameras was used to gather data from the actors' performances. Animators used this data to create digital versions of the actors.

5. "Jurassic Park" (1993)

Digital dinosaurs pioneered CGI (Computer Generated Imagery) live animals with realistic movements and textured muscles.



10. "The Day After Tomorrow" (2004)

More than 500 photos of New York City were scanned into a computer, providing a 3D, photorealistic model of the city (McCarthy, 2007:49).

Figure 81: Movie images.

theoretical influences

Henn Architects... for transparency of the process and approach towards the public

VW Transparent Factory

Dresden_ Germany

2000-2001

The Transparent Factory was not built in an industrial zone, but in the centre of the city, within walking distance of the main square (Baumeister, 2007:244).

Both optical transparency and transparency of production is achieved through the design. The factory walls are made almost entirely out of glass and the experience of car production is made visible to the outside world. Manufacturing processes which are usually hidden are revealed to the public. Approximately 250 visitors, including tourists and customers, explore the factory each day (Markus, 2003).

Glass bridges offer views of the work floor and theatre spot lights are mounted high above the workers (Patton, 2002). The automation process is revealed to the passing visitor in a theatrical manner.

The factory handles the final phase of car production, namely assembly. Painted car bodies arrive by truck while other parts are brought by a tram which runs on the public transport tracks. Completed cars placed in a glass storage tower are visible from the outside.



Figure 82: VW Transparent Factory.



Figure 83: Factory located in the city centre.



Figure 84: Physical transparency and transparency of process.

Jean Nouvel... for framing views to the outside

100 11th Avenue Residences

New York_ USA

2007

Construction work has started on Nouvel's new glass and steel landmark building. 100 11th will be a 23 storey apartment building in Manhattan, located on the Hudson River (100 11th Ave Residences, n.d.).

Design themes used throughout the building include amplified, direct and reflected light, and carefully framed views of the outside world. A curved curtain wall containing different sized panes of colourless glass forms the building's southern façade. Each window pane is set at a unique angle and provides a slightly different degree of transparency, designed to frame specific views. This creates visual excitement for the viewer within. The curtain wall also captures daylight patterns which change throughout the day and year.

The black brick cladding of the north and east façades contrasts the southern curtain wall. These façades refer to the masonry characteristics of the industrial architecture typical of the area (Fairs, 2007). Different-sized windows are punched out of the solid façades, creating dramatic frames for outside views.

At the building's base, a seven-storey glass street wall reflects fleeting images of the life on the streets beyond the building (Fairs, 2007). Without using complicated technology, Nouvel has succeeded in creating an interactive public face for the building.

precedent study



Figure 85: Manhattan context of the 100 11th Ave Residences.



Figure 86: Glass curtain wall on south façade.



Figure 87: Communal spaces along the north façade.



Figure 88: Tilted window frames.



Figure 89: Views from within.

design approach



building programme

The vision of the proposed school is to teach movie making, film production, film theory and screen writing. Students develop the required skills under the guidance of professional instructors. After production, students are allowed to showcase their work in film festivals. Through an analysis of various international and local film schools a brief was formulated. The school will house approximately 300 students.

Accommodation list

A. Film facilities

- Pre-production

- Producer's laboratory (8 cubicles): 20m²
Equipped with production cubicles, the space provides high speed internet connectivity and cutting edge budgeting and scheduling software.
- Meeting room: 40m²
A student conference space, primarily for screenwriting activities.
- Production design studio: 100m²
Primarily an artist's studio for the production of storyboards, the space contains drafting tables, white boards and pin-up boards.
- Make-up and costume design studio: 35m²

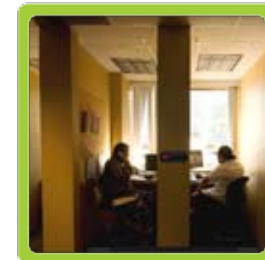


Figure 91:
Producer's lab,
LA Film School.

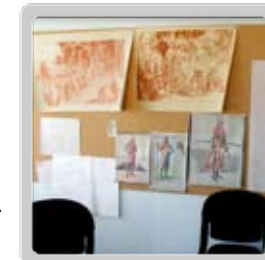
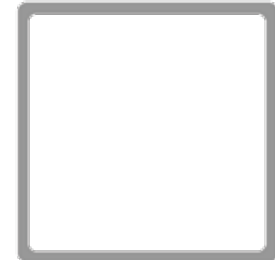
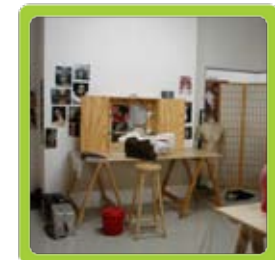


Figure 92:
Production
design studio, LA
Film School.



Figure 93: Make-
up and costume,
Newtown City
Varsity.



- Production

- Sound stages (min height 7m):

A single acoustically isolated space with the necessary technical infrastructure for the filming of 35mm film, 16mm film and digital video productions. A full lighting grid is suspended from the ceiling for the placement and manipulation of lights.

- Multi-camera studio: 350m²
 - Special effects studio: 120m²

- Model or set building studio: 250m²

- Post-production

- Video editing laboratory (9 computers): 40m²

The computer lab contains all the latest editing software.

- Sound recording or mixing studio:

- Large: 25m² + 30m² (voice booth)
 - Small: 20m² + 10m² (voice booth)

- Audio editing suites (x2): 20m²

- Dubbing stage: 40m²

An acoustically isolated space containing a mixing console and screen for final sound and film editing.

- Other

- Server room: 20m²

- Equipment store: 85m²

The store provides the necessary consumables required by students to complete production assignments.

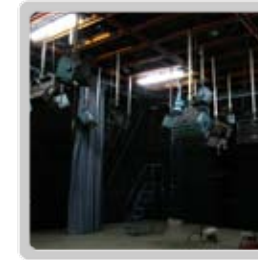


Figure 94: Sound stage, WITS, LA Film School.



Figure 95: Special effects studio, LA Film School, AFDA.



Figure 96: Set building studio, WITS, LA Film School.



Figure 97: Editing lab, Newtown City Varsity, The Video Lab.

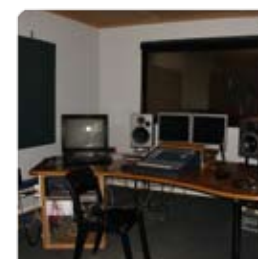
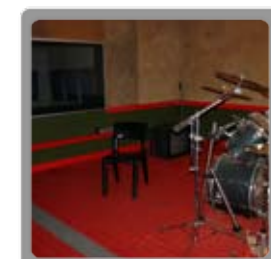


Figure 98: Sound recording and voice booth, AFDA.



B. School facilities

- Offices

- Management (x2): 40m²
- Staff (x18): 180m²
- Tea room and lounge: 30m²
- Meeting room: 20m²

- Lecture rooms (180 people): 180m²

Lecture rooms are equipped with roof-mounted projectors, display screens and loudspeakers. Students film classes as part of their training. Sound is recorded with microphones to allow access to international lecturers through videoconferencing.

- Library: 100m²

Sufficient library space is provided for the relevant books and DVD's (Digital Video Disks). Computer labs are equipped with a digital library, with catalogues containing follies, stock footage, sound effects and music.

- Ablutions

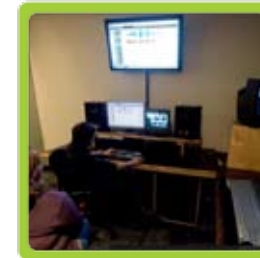


Figure 99: Audio editing, LA Film School.

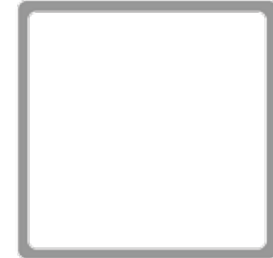


Figure 100: Dubbing stage, LA Film School.



Figure 101: Server room and equipment store, The Video Lab, LA Film School.



Figure 102: Lecture room, AFDA.

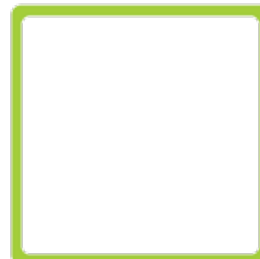


Figure 103: Screening theatre, LA Film School.



C. Public facilities

- Reception and lobby: 150m²
 - Exhibition spaces:
Facilities for digital displays and interactive projections are located in auditorium lobbies and walkways. These enable previews of film footage.
- Informal lecture room (80 people): 100m²

The open auditorium allows informal screenings of student films to be viewed by students and the public throughout the day. Informal school lectures and departmental events can be accommodated here.
- Large auditorium (200 people): 300m²

The cinema is used as the primary public space for film festivals and special events. Educational functions include film study screenings and the revision of student work. The auditorium is furnished with appropriate equipment and finishes for the screening of motion pictures.
- Kiosk and ticket office 15m²
- Waiting lobby
 - Courtyard seating
 - Internet facilities
- Ablutions

Course breakdown

1. Bachelor of Arts in Motion Picture Production: 3 years

- Producing
- Scriptwriting
- Directing
- Cinematography
- Production design
- Costume, make-up and styling
- Video editing
- Visual effects
- Sound design
- Multi-camera production
- Film study
- Film history

1. Bachelor of Arts in Motion Picture Production Honours: 1 year

- Multi-camera production
- Documentary production
- Music video production
- Commercial production

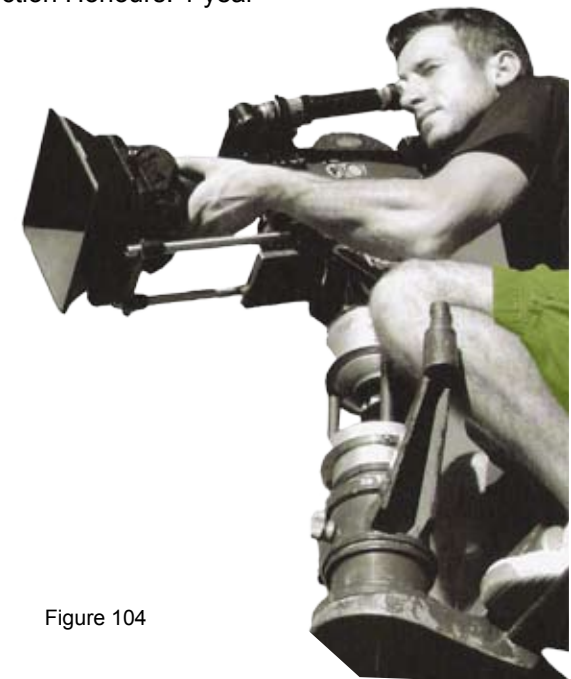


Figure 104

proposed campus design guidelines

After studying a variety of urban design principles and various case studies on campus design, a series of guidelines for campus design were formulated.

- Group a **variety** of activities together, including non-academic activities. The clustering of activities creates a dynamic place which attracts many different types of people at different times of the day.
- Encourage maximum **impromptu encounters**.
- Improve the **edges** of the campus to create a better quality interface where the campus and town edges meet. Revitalize the public streets around these edges.
- Redesign campus **security**. Alan Hatman, the architect of the Capitol in Washington, stated “we put in security components but made sure they did not look like a fortress. You have to invite people into a place. Letting them know they are welcome to walk there, to sit down on a bench...” (Walljasper, 2008:2).
- Enhance **legibility** on campus. Simplify and clarify access and enhance the campus arrival experience by designing a threshold.
- Promote **alternative modes of transport**. Encourage bicycling (the University of New Hampshire offers free bike rentals), car pools (the University of Washington lets these vehicles park for free) and public mass transit (the University of Colorado subsidizes students’ bus fees). Parking systems should be integrated into the campus fabric.
- Consciously design for **permeability**.

Figure 105: Diagrams of campus design guidelines.



Figure 106: Diagrams of site principles.



site principles

Vision for the South Campus

Ecology and technology form the basis of all educational programmes on the South Campus, enabling the site to become a living laboratory.

Site principles

In conjunction with landscape architecture student Elmie Erasmus, several principles were developed to improve the current conditions on the South Campus in order to achieve the proposed vision for the site.

1. **Launch** highlights a synthesis between landscape and architecture. Vertical landscapes are investigated, including green façades, hanging gardens and fire escape ecosystems. Launch indicates a range of support structures that reinforce and guide the growth of plants. The structures can be temporary or permanent.
2. **Stratify** redefines the ground as a three-dimensional profile and ignores the conventional separation between paving, surfaces and soil. A seamless transition between softscape and hardscape is attempted. For example,

a paving system gains a dual function: as a surface to travel on and as infrastructure which distributes water for the irrigation of surrounding plants.

3. **Fluid** focuses on landscape structures designed to accommodate the seasonal fluctuation of water flow in terms of volume, frequency and velocity.
4. **Digestive** explores the landscape, including buildings, as a metabolic system. All materials and processes are inputs and outputs within a cycle. Digestive includes in situ strategies for a zero waste approach.
5. **Grooming** defines maintenance as a continuum of actions. The scope of maintenance is broadened beyond post-construction management.
6. **Translate** introduces the conversion of technology into different on-site displays and the adaptation of energy forces (wind, solar, etc.) for new mechanical uses.
7. **Volatile** conceives weather dynamics as a tectonic landscape experience. Technology is used to recreate artificial weather events. The site becomes active and functions as a living laboratory for students to study.



proposed building guidelines

- **Respect the existing silhouette** of buildings and landscapes.
- **Prevent scale anomalies** of masses. Maintain the existing heights of the surrounding structures; therefore the building should have a maximum height of 10m.
- **Complement materials** or match the materials of surrounding buildings. Use the red brick of the existing building as the predominant material.
- **Respect the existing rhythms** of façades and spatial elements.
- **The building entrance** should encourage interaction and act as a threshold or introduction to the function of the building.
- **Incorporate an interactive building façade.**
- Provide **transparency of function**, where the building function and the academic activities become visible to the passer-by.
- **Create a sequence of events.**
- **Stimulate experiences.**
- **Frame views** towards the outside.

Figure 107: North elevation along Lynnwood Road.



Figure 108: Historic red brick buildings.

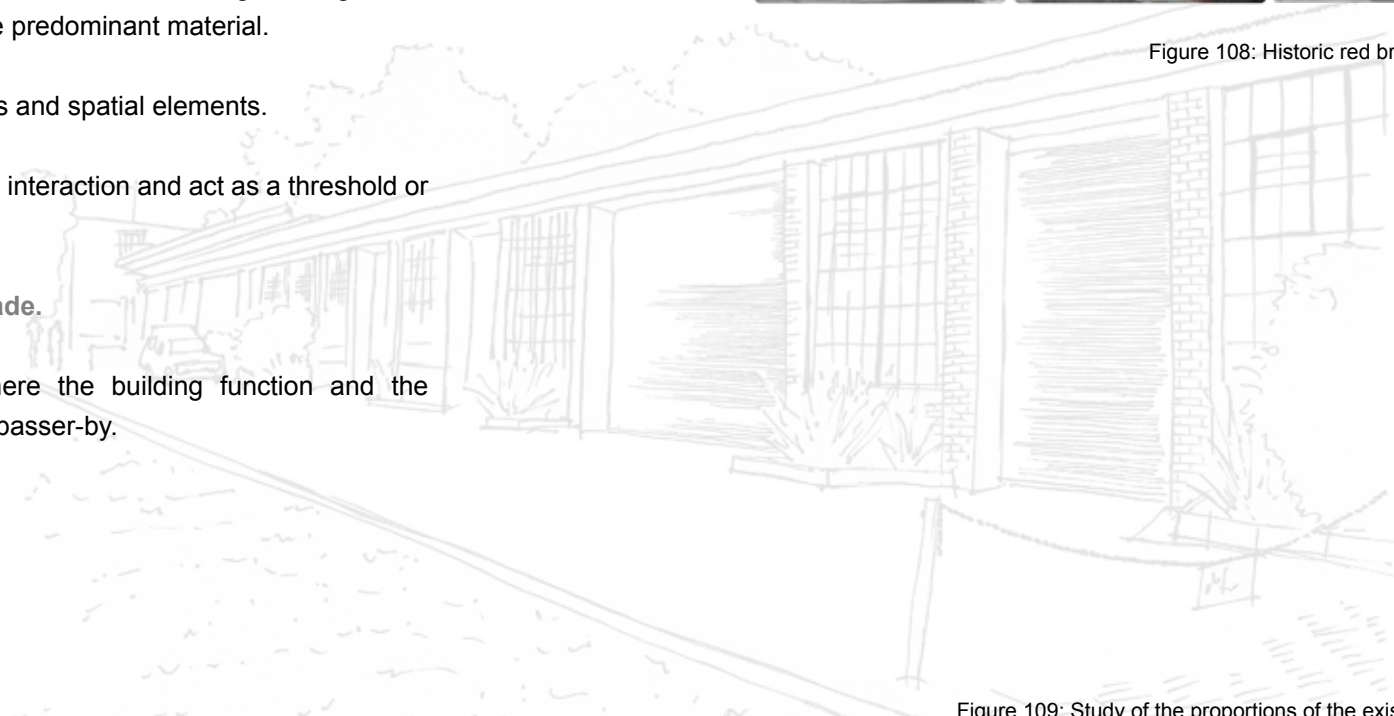


Figure 109: Study of the proportions of the existing building.



“Look! The moonlight shows us for what we really are! We are not among the living so we cannot die, but neither are we dead! For too long I’ve been parched of thirst and unable to quench it. Too long I’ve been starving to death and haven’t died. I feel nothing. Not the wind on my face nor the spray of the sea, nor the warmth of a woman’s flesh. You best start believing in ghost stories, Miss Turner. You’re in one!”

“Pirates of the Caribbean: Curse of the Black Pearl”, 2003.



Figure 110



Figure 111: Computer Generated face of Davy Jones, *Pirates of the Caribbean: Dead Man's Chest*, 2006 .

programmatic influences

Saucier + Perotte... for innovative programme and responsive public interface

Cinematheque Quebecoise
Montreal_ Canada
1997

This urban cinema centre, which includes a film school, was built between two existing structures to incorporate a brick school building. Glass and steel layers allow glimpses of the past by exposing fragments of the concrete structure of the existing school.

The movement patterns of the city were considered in the design of the building's public interface. A gridded glass screen spans the main elevation across the restored stone and brick façades of the old school. Moving images are projected onto a translucent portion of the screen that is visible from the street. An internal walkway, located between the projector and the screen, adds silhouettes of movement within the building to the series of projections. This combination of transparency and opacity stimulates the curiosity of onlookers.

The notion of the cinema as an enclosed space, confined by rigid walls, is deliberately questioned. Suspended above the entrance is a canopy of seating facing a suspended projection screen. By placing the screen and seating in mid-air the cinema ceases to be private and enclosed and becomes an activity node that forms part of the public realm (Heathcote, 2001:187).

“The building creates and frames a series of glimpses, combining activity and artefact, old and new architecture, actors and audiences, street and room. These are images that are projected into the life and spaces of the city” (Saucier & Perotte, n.d.).

Figure 112: Cinematheque Quebecoise.



precedent study

Figure 113: Section.



Figure 114: Ground floor plan.

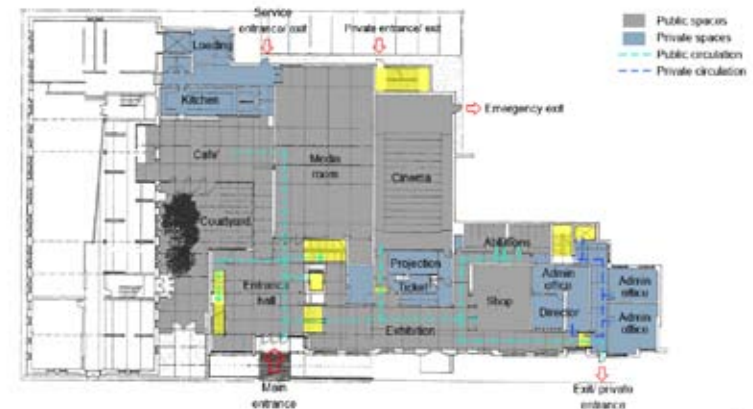


Figure 115: First floor plan.



AFDA Film School... for comprehensive programme
Braamfontein_ Johannesburg

AFDA, the South African School of Motion Picture, Media and Performance, is an independent tertiary institution. The school is the most comprehensive film school in South Africa and the winner of the 2006 Oscar in the Honorary Foreign Film category of the Student Academy Awards (AFDA, 2008). The relocation of film school facilities in existing industrial buildings prevented optimal spatial organization. The buildings were not initially designed for the purpose of a film school and therefore the precedent can not be studied for circulation and layout. Programmatically, however, AFDA contains a wide range of facilities necessary for education in film production.

precedent study

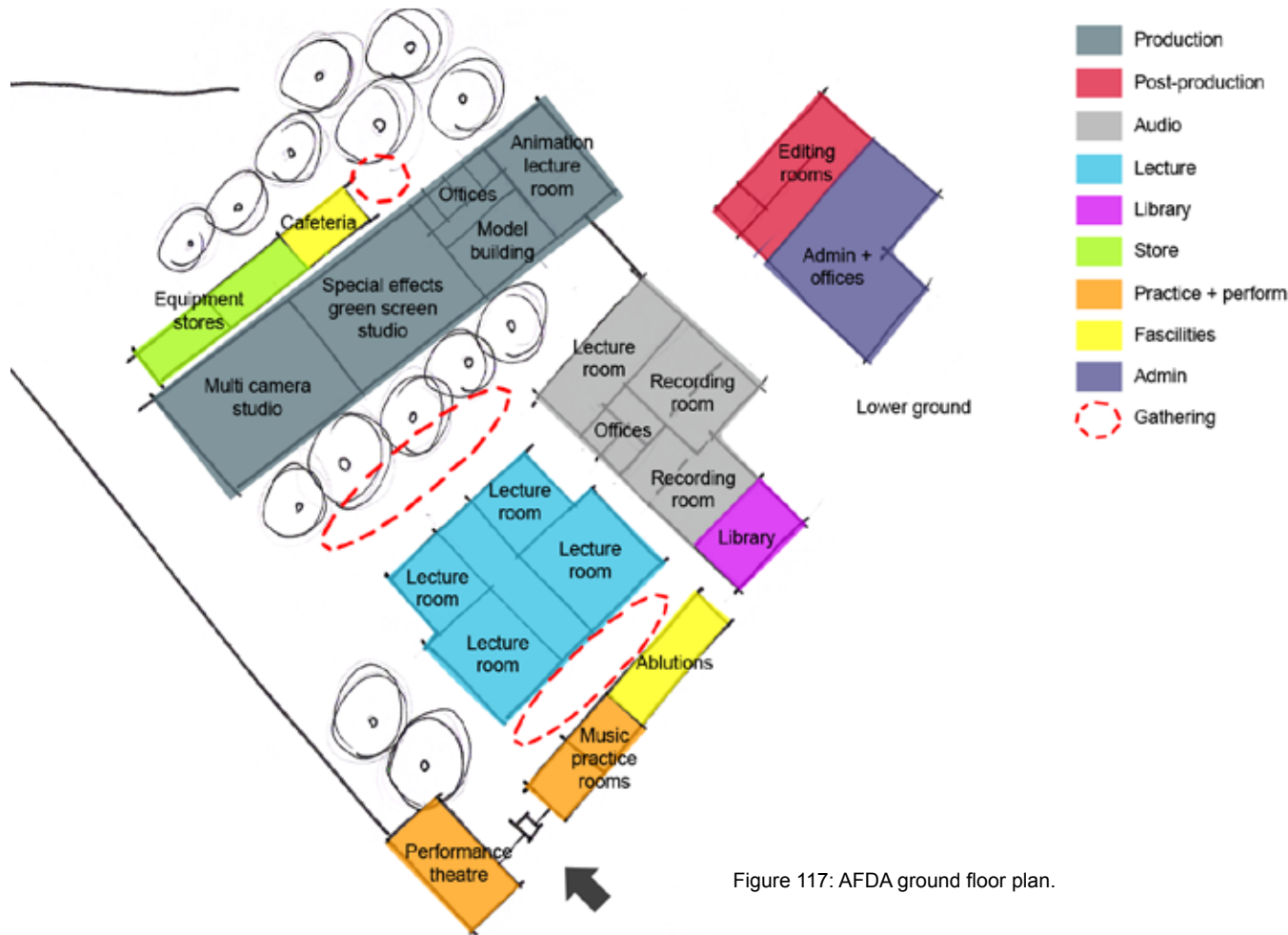
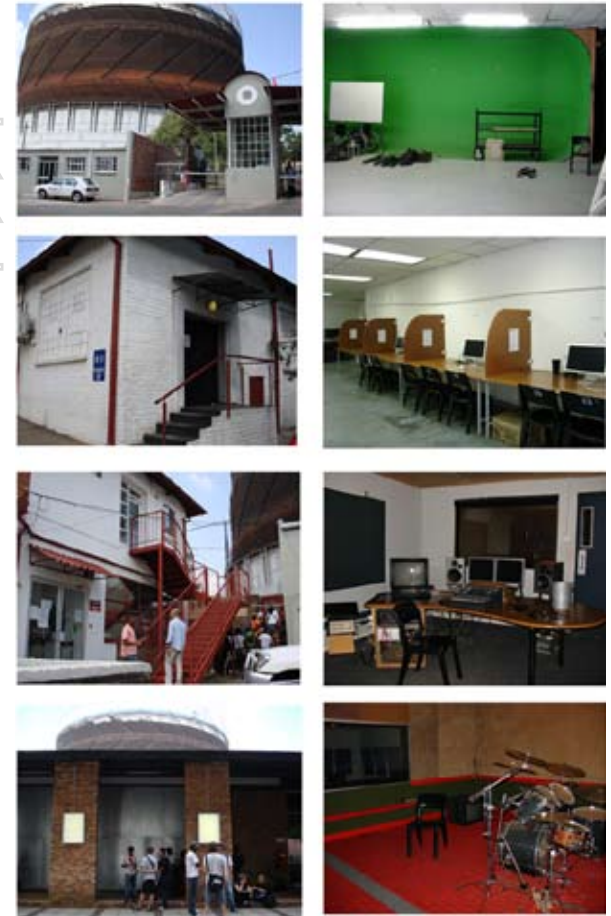


Figure 117: AFDA ground floor plan.

Figure 116: AFDA photographs.

design development: conceptual exploration



proposed campus framework

The graduate class of 2008 has developed a group framework for the future development of the University of Pretoria campus. The vision statement that has been formulated proposes “transforming the University of Pretoria from an isolated, fragmented knowledge production institution, to a University City, a city of innovation” (see Appendix B).

proposed site framework

In conjunction with landscape architecture student Elmie Erasmus and architecture student Pedri Lotz, a framework was developed to improve the South Campus and to attain the goals stated in the vision for the site. Site implementations include an art and architecture building by Pedri Lotz. This building acts as a living bridge across Lynnwood Road to improve the connection between the South and Main Campuses. A parkade is proposed for the eastern corner of the site to help solve the current parking problem on campus.

To establish the site as a living laboratory, various ecological and technological approaches are introduced. Elmie Erasmus’s landscape design implements both vegetation and water strategies, including a wetland system. Unutilized buildings are re-designed to house new functions. New building functions include an Earth Centre, Internet Café and Biotechnical Laboratory.



Figure 119: Conceptual site model, June 2008.



building form development

The building form is generated by the surrounding context and by programmatic implications. Movement patterns of vehicles and pedestrians on the **existing site** are taken into consideration. The corner site represents an important visual node for vehicles waiting at the intersection.

In order to reinforce the **edges** along University and Lynnwood Roads, an L-shaped building is proposed. The enclosure thus achieved generates an open social square which gives definition to the campus space. In keeping with the scale of the existing buildings, the main **volume** of the new building should have a height of approximately 10m.

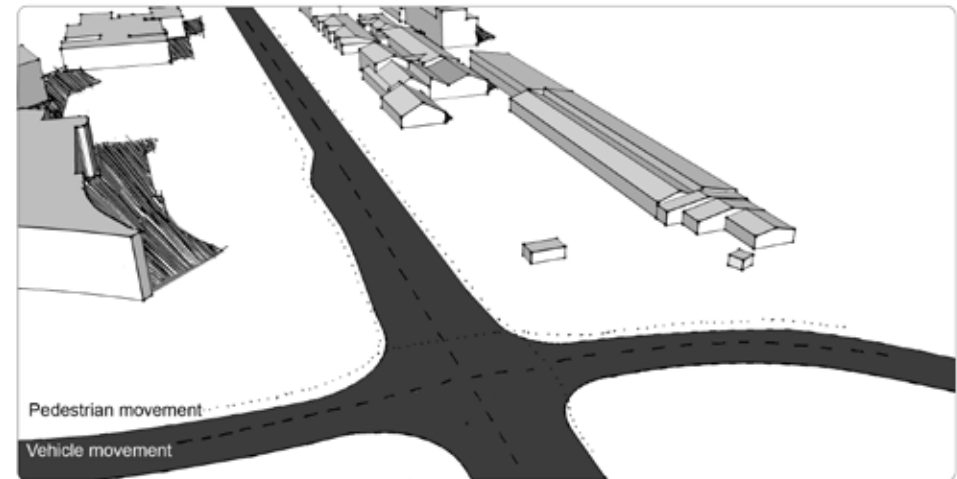


Figure 121: Perspective view of the existing site.

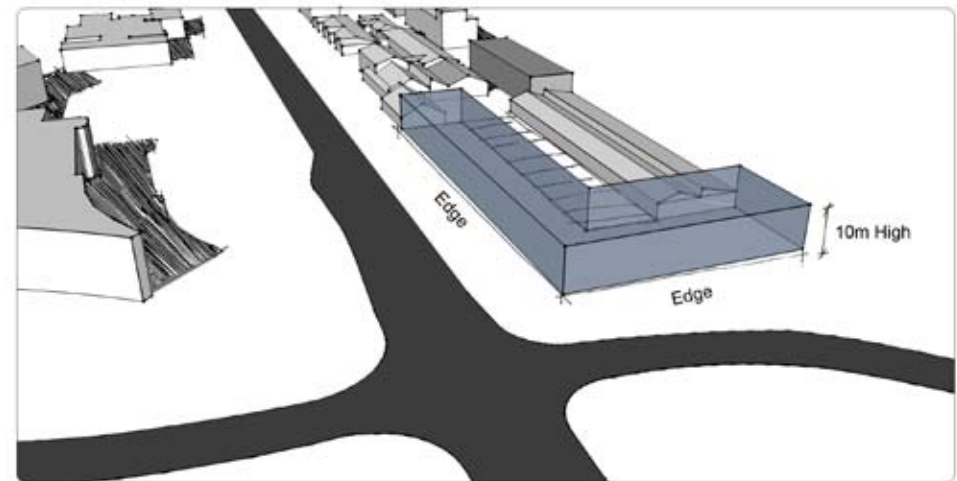


Figure 122: Perspective view of the edge design.

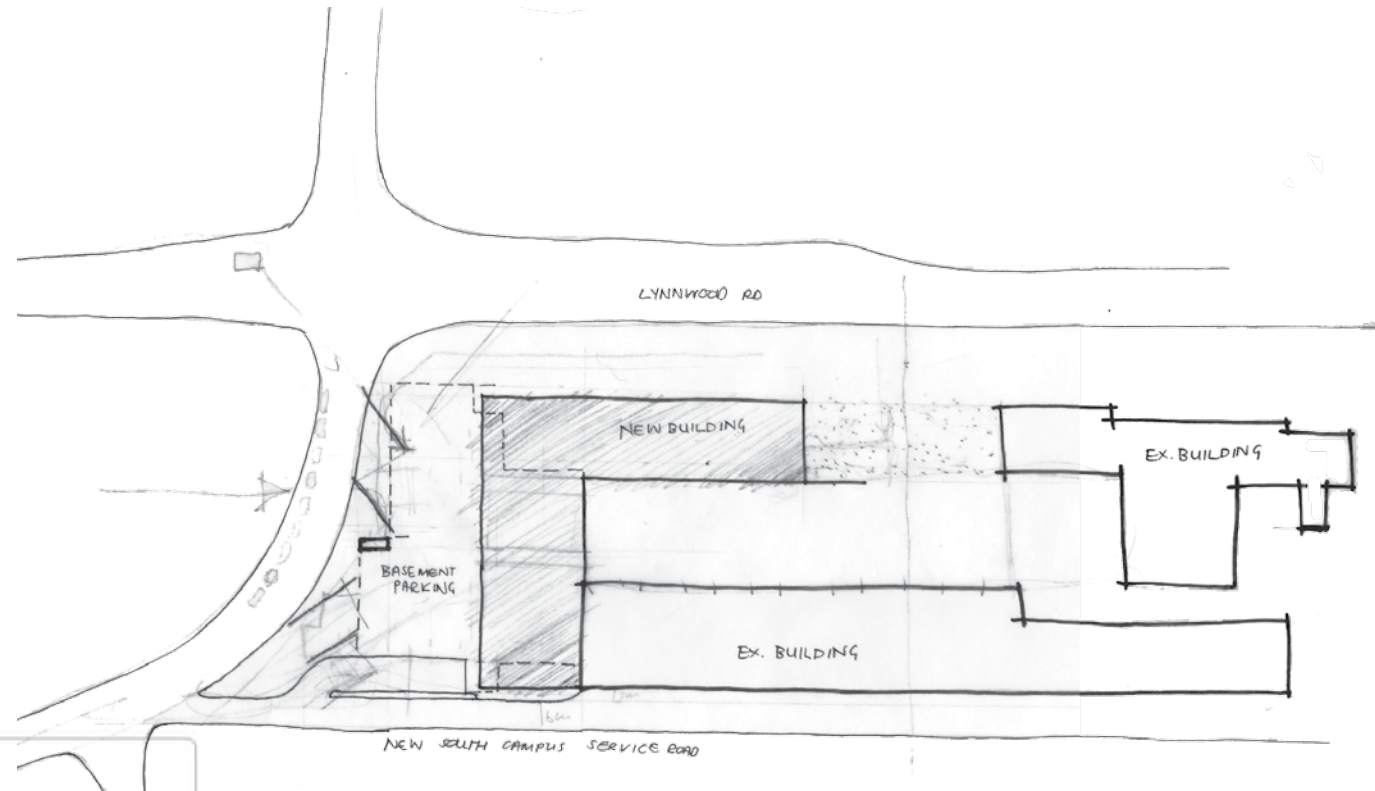


Figure 123: Plan concept sketch of the length of the building, May 2008.

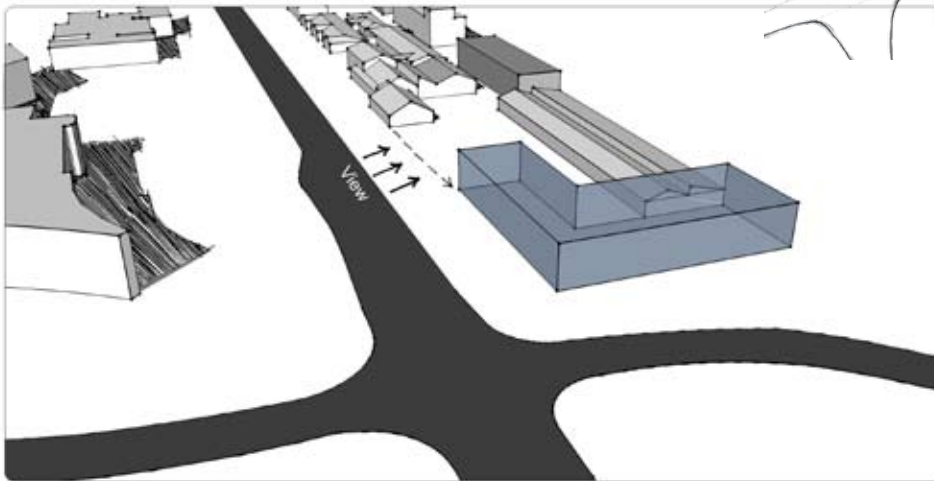


Figure 124: Perspective view of the length of the building.

To mitigate the claustrophobic feeling that exists on the South Campus, the **length** of the building from east to west is reduced. The open section thus created allows views to and from the street.

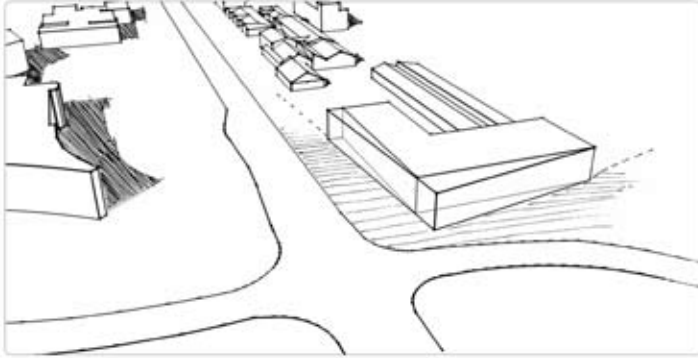


Figure 125: Conceptual design of the building façade.

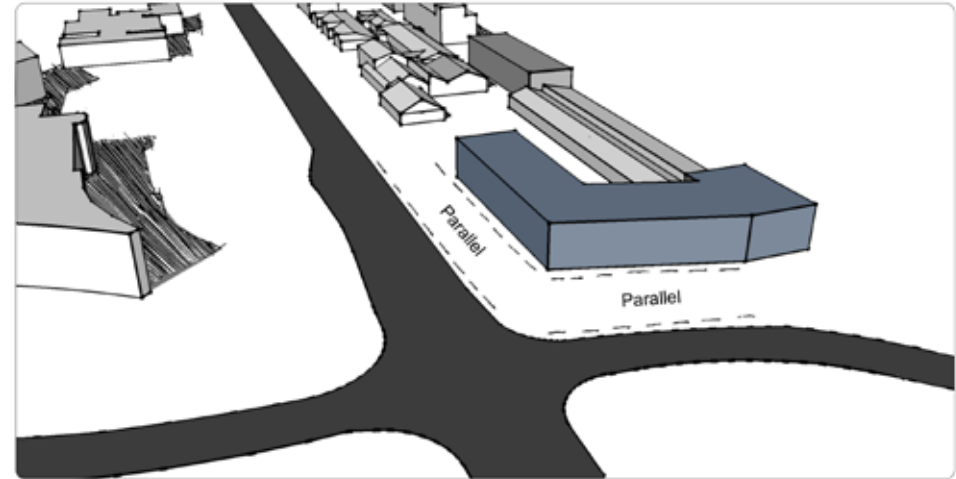


Figure 126: Perspective view of the final façade concept.

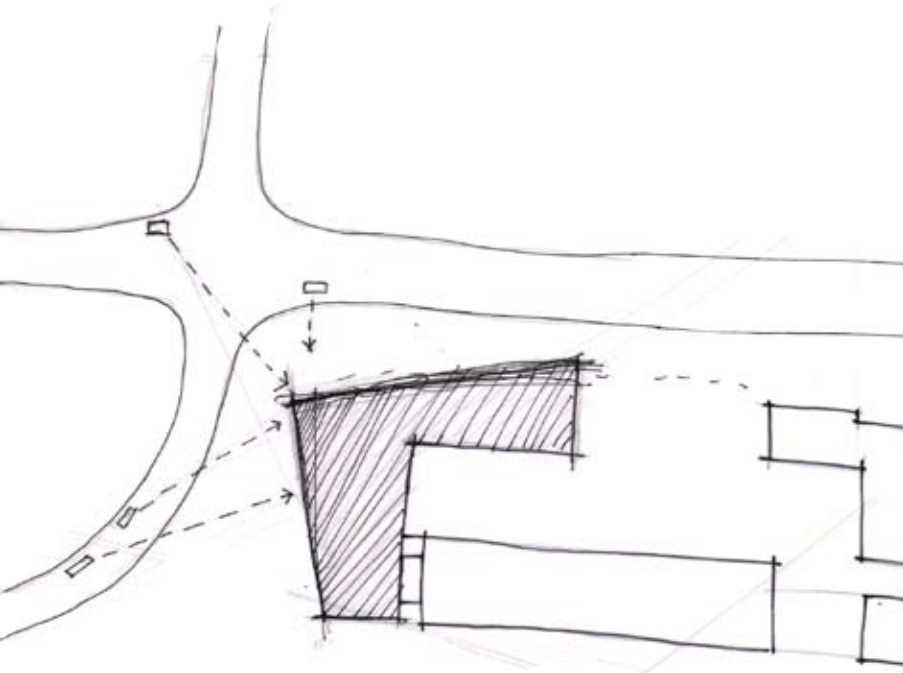


Figure 127: Plan concept sketch of the façade development, June 2008.

Conceptually, the north and west **façades** were set at a slight angle to University and Lynnwood Roads respectively. The motivation for this was to establish a visual relationship with the traffic moving through the gateway to and from of the CBD. However, the angles interrupted the existing edge conditions, creating uncomfortable sidewalk spaces. Therefore the building façades were changed to follow the line of the adjacent road angle.

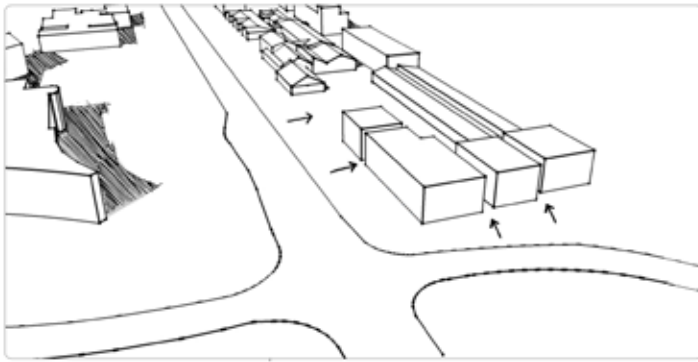


Figure 128: Conceptual design for permeability.

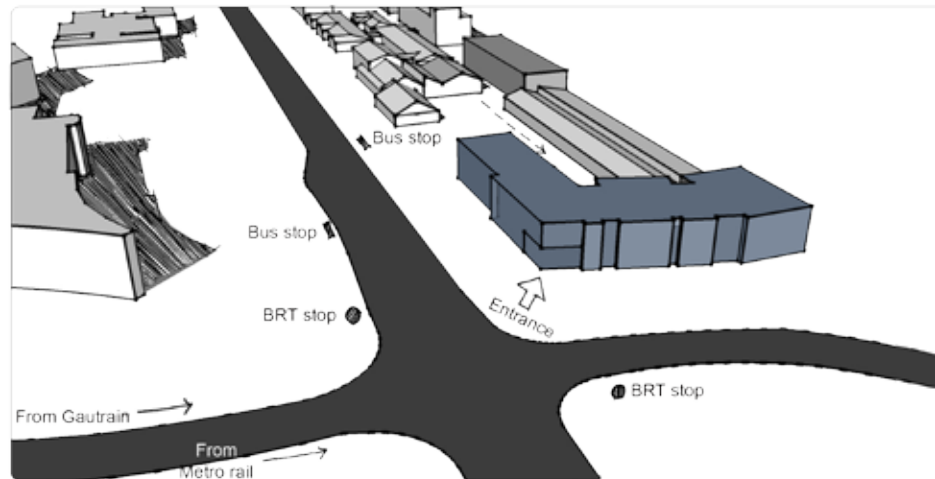


Figure 129: Perspective view of the final entrance concept.

Permeability is achieved by allowing movement into the site through the building. Multiple entrances were allocated, separating different functions within the building. This concept introduces the idea of different structures, each with its own function. However, the envisioned goal of the institutional building demanded several functions to be grouped together in one facility. Consequently a dominant entry point was established.

A visually legible corner entrance grants **access** to the building. Visitors approach the school from on-site parking, street parking, or public transport amenities located at the intersection. The primary movement of visitors is thus towards the north-west corner of the building. Students coming from the Main Campus will approach from the east, therefore a secondary entrance is provided from the inner courtyard.

The materials selected for the building **skin** are responsive to the different conditions at each face of the building. Façades facing the courtyard consist of red brick corresponding with the existing buildings, while street facing façades introduce contrasting glass and steel.

Figure 131: Walkway along the street edge.



precedent study

Figure 132: Seattle Public Library.



Figure 130: Concept model, June 2008.



experience

Cinema creates an experience over time. Through movement inside and around the building, certain experiences are generated. An initial concept of a tilted building was developed to arouse a reaction from the passer-by. This concept was refined to a single slightly slanted wall on the northern façade which stimulates curiosity and enhances the spatial experience of the observer.

Rem Koolhaas designed the **Seattle Public Library** with nearly 10 000 pieces of glass positioned at dynamic angles. The angled glass façade makes the building “transparent and open” (Jodidio, 2006:334) and activities on every floor are visible from street level. The purpose of the unusual structural shape is to control the quality of light reaching interior spaces. A glass overhang extends the building onto the sidewalk. People passing the library pass through the slanted walkway and experience a part of the building.

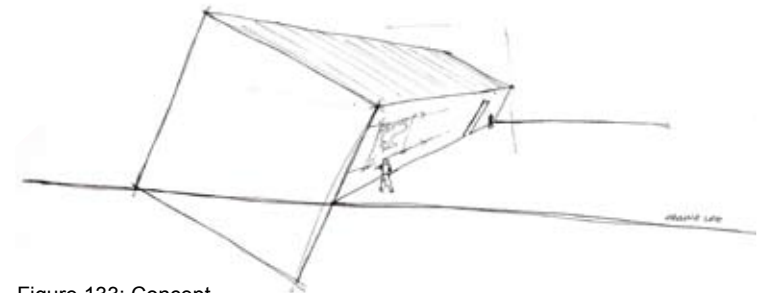
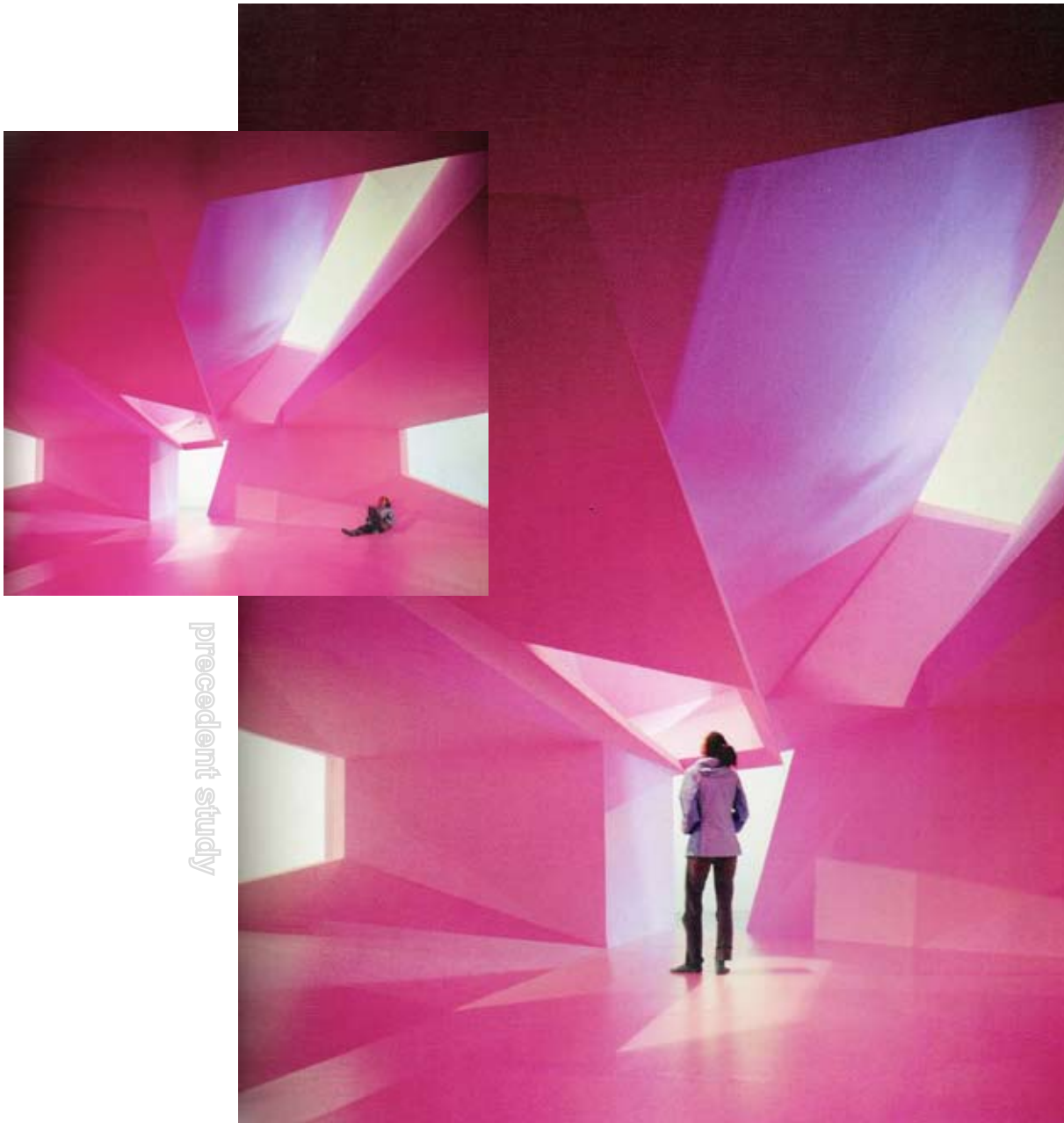


Figure 133: Concept sketch, March 2008.



Figure 134: Proposed perspective view of the slanted wall on the northern façade.



precedent study

Figure 135:
Holiday Home.

Similar spatial experiences are evoked in the interior of the proposed building, where screens are placed at unexpected angles. Several precedents, including UN Studio's [Holiday Home](#) and Steven Holl's [New York University Department of Philosophy](#), illustrate the spatial effects generated by multi-faceted walls. In the proposed experimentation cinema, multiple projection screens are installed at different angles. Screens are located adjacent to the side walls and ceiling, introducing another spatial dimension to the room. Projections onto these screens are made possible through roof-mounted projectors. Fragments of the film are shown on the side screens creating the illusion that the motion picture continues towards the viewer into the realm of reality. Interplay between the real and the virtual is produced. The screens can be adapted as students explore the different projection possibilities. Screens are made of coated fibreglass fabric with a special acoustic weave to assist in acoustic absorption (Prolith Africa, n.d).

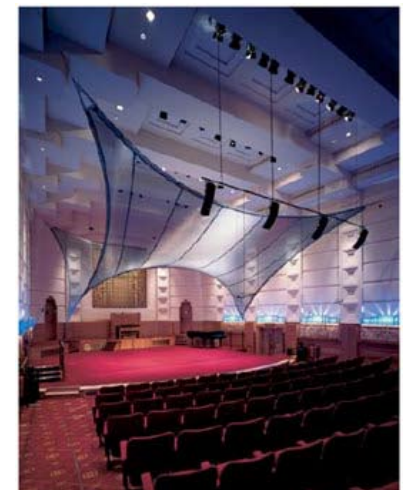
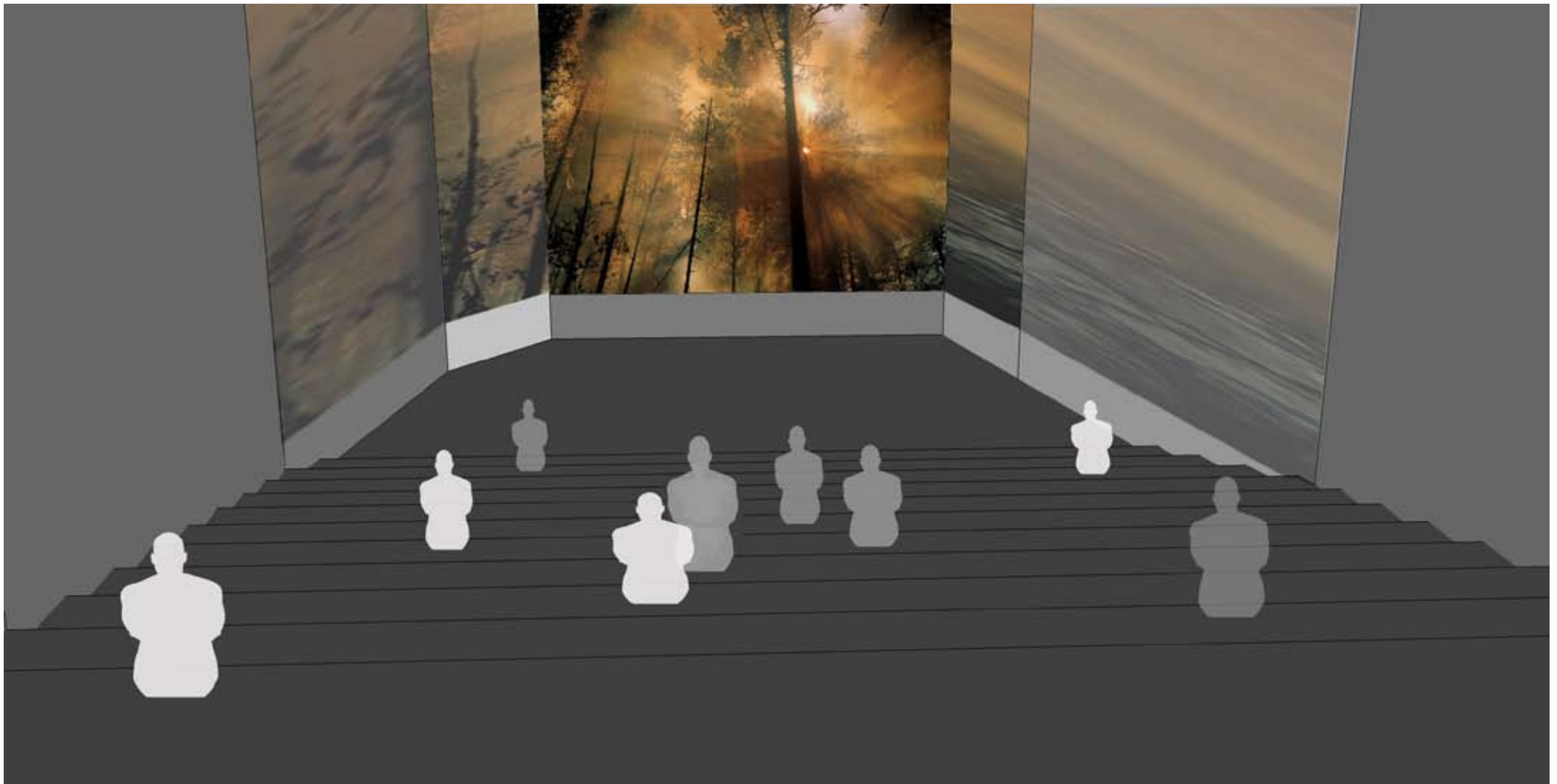
Figure 136: Acoustic
fibreglass fabric.

Figure 137: NYU
Department of Philosophy.



precedent study

Figure 138: Proposed cinema perspective illustrating the multiple projection possibilities.



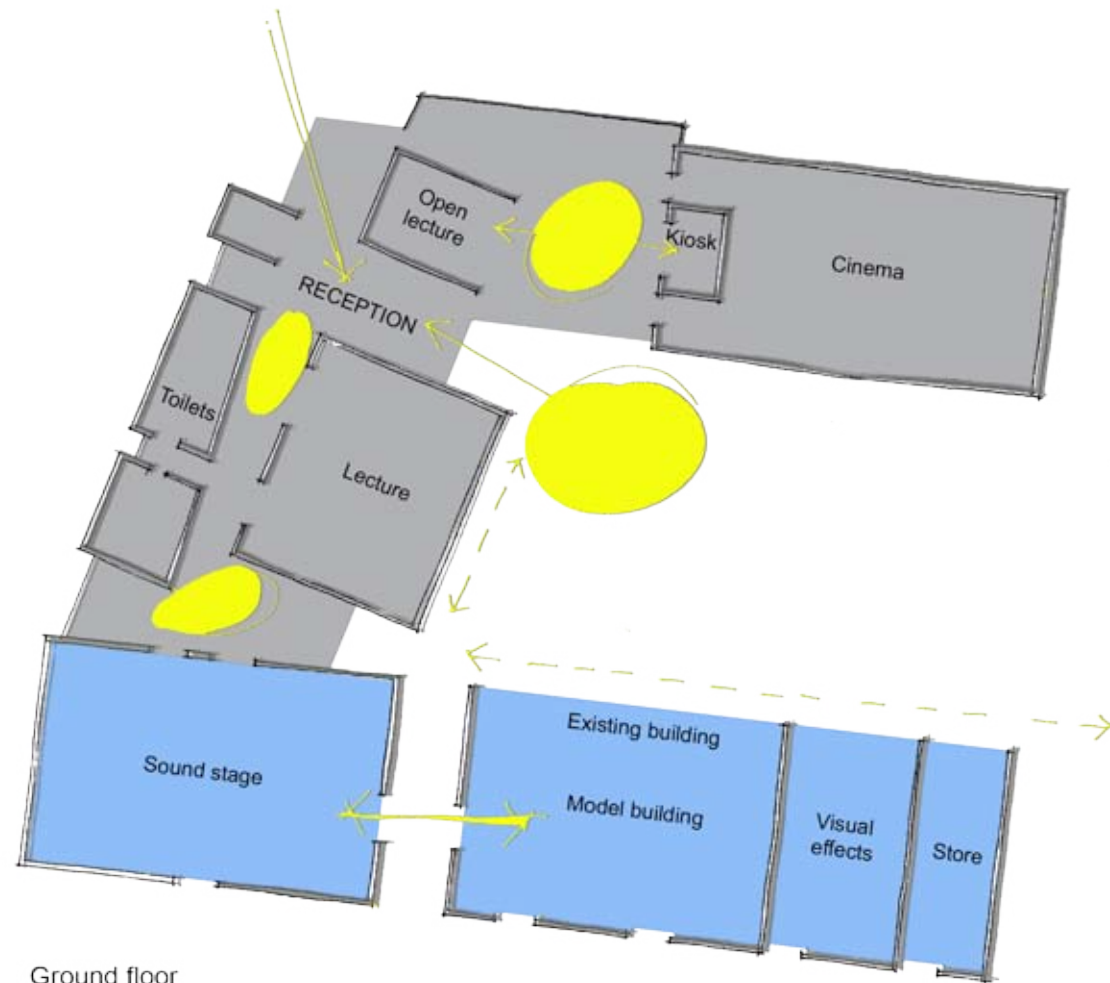
The proposed building concept involved two main contradictory spaces defined as:

Real	versus	imaginary
Tangible		intangible
Solid		void

The real or tangible spaces are enhanced by traditional brick and concrete construction. Transitional zones, where movement or pause between functions occurs, become the imaginary or intangible spaces. These spaces are enclosed by lightweight steel and glass construction.

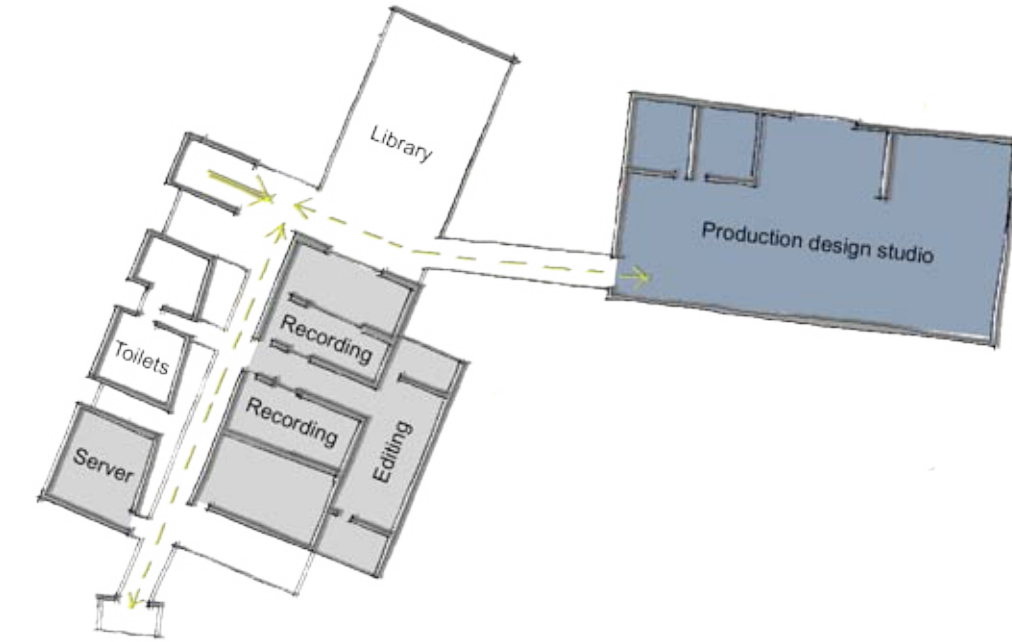
movement

The building is made up of a series of events so that movement through it offers a sequence of experiences. Visual legibility allows unfamiliar visitors to navigate the building with ease. Similar functions are grouped together, for example pre-production, production and post-production activities. Publicly accessible spaces are limited to the ground floor while students and lecturers are located on the first and second floors respectively. To reinforce legibility, different colours are used to classify each floor. Signage and furnishings on each floor are colour-coded to establish a clear identity.

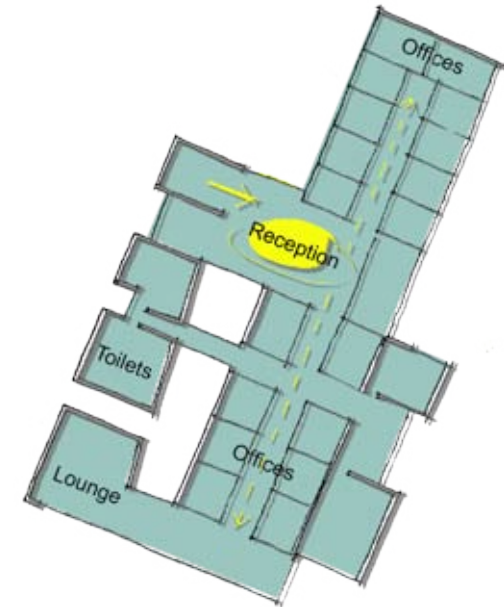


Ground floor

- Public access
- Production
- Pre-production
- Post-production
- Lecturers' offices
- Movement
- Pause



First floor



Second floor

Figure 139: Proposed floor plans illustrating internal circulation patterns.

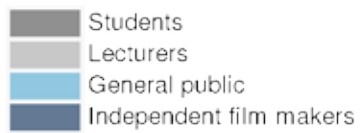
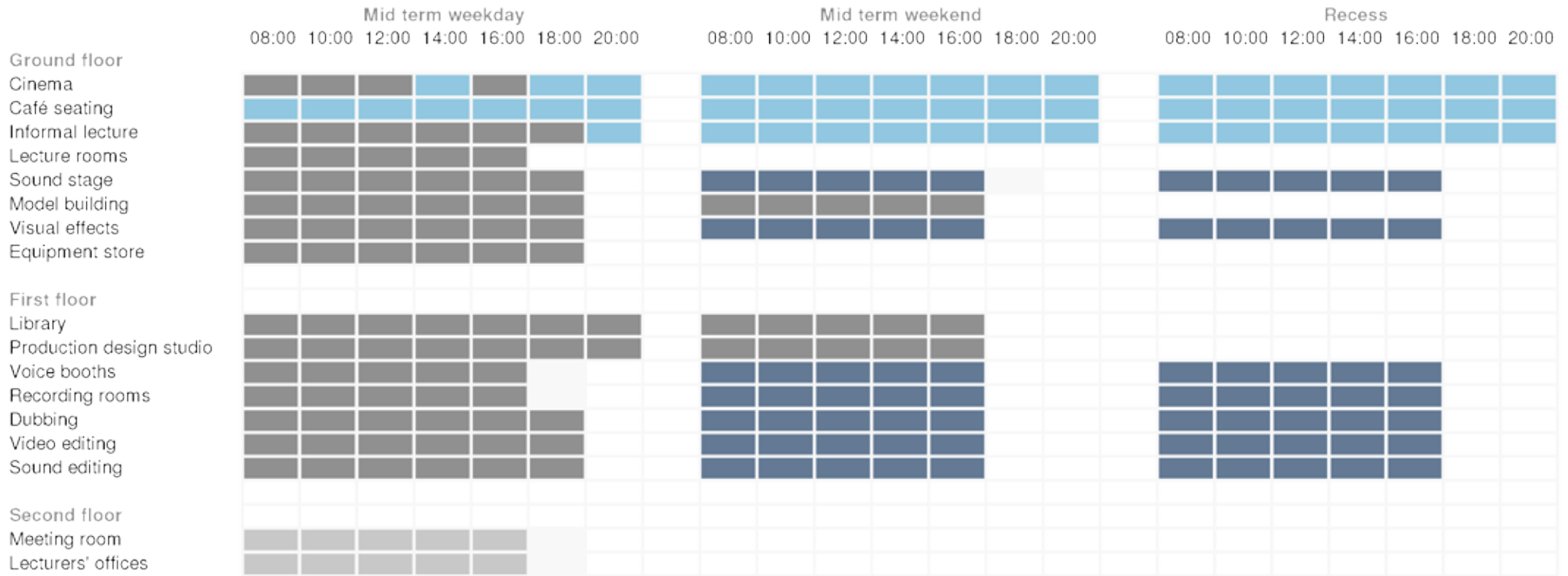


Figure 140: Building occupation time sheet.

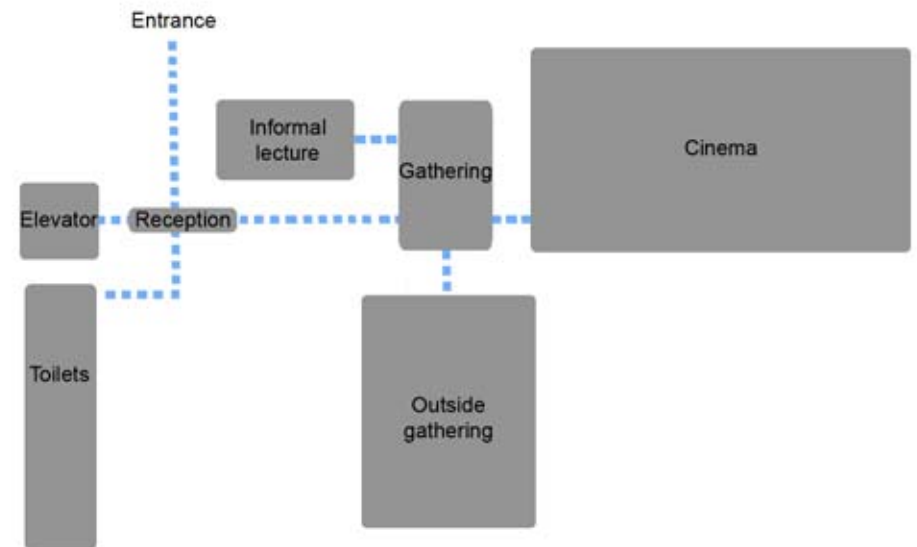


Figure 141: Visitors circulation: ground floor.

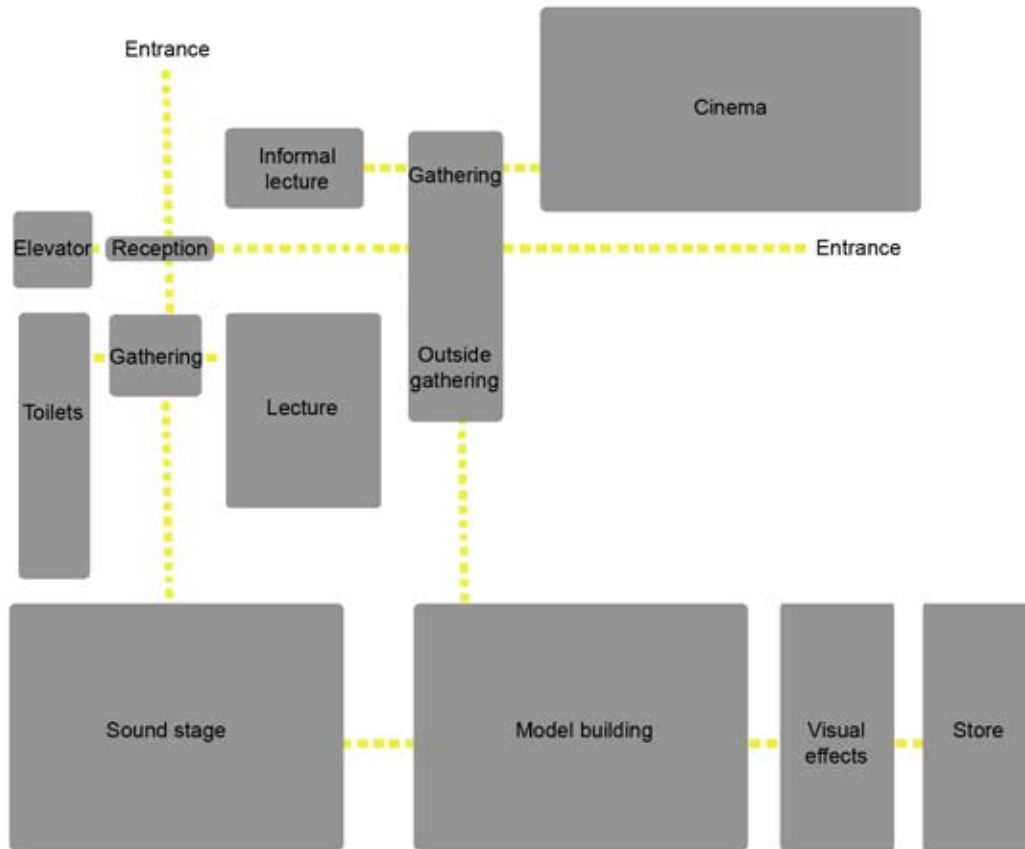


Figure 142: Students circulation: ground floor.

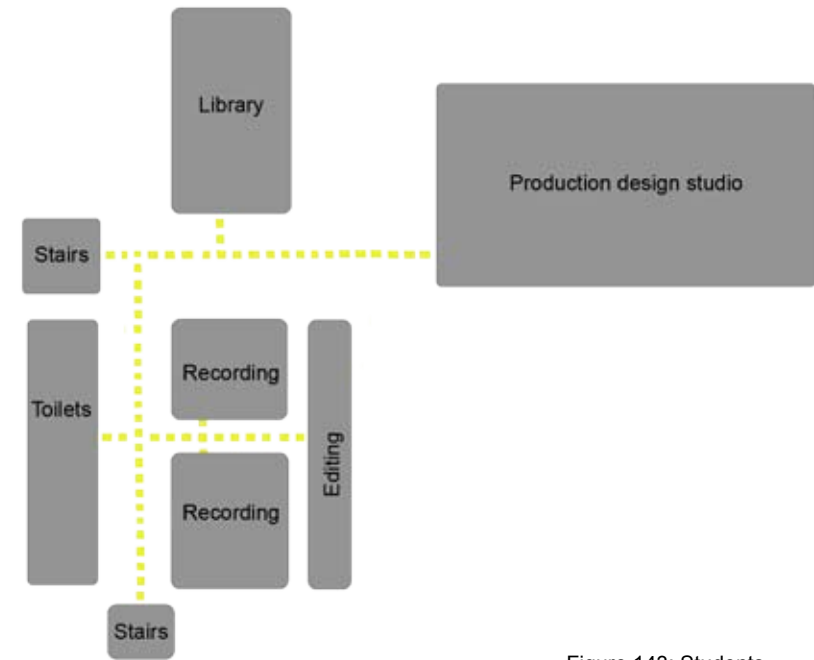


Figure 143: Students circulation: first floor.

transparency

The process of film making becomes transparent through the structure. Windows are located throughout the building to allow views into the lecture rooms, sound stage and recording studios.

An open lecture room questions the need for traditional closed spaces and introduces informal viewing. Student films are screened throughout the day and visitors can watch while they wait. Rem Koolhaas introduced the idea of an open lecture room in the [Seattle Public Library](#). Another example is the suspended cinema in the [Cinematheque Quebecoise in Montreal](#) by Saucier and Perotte.

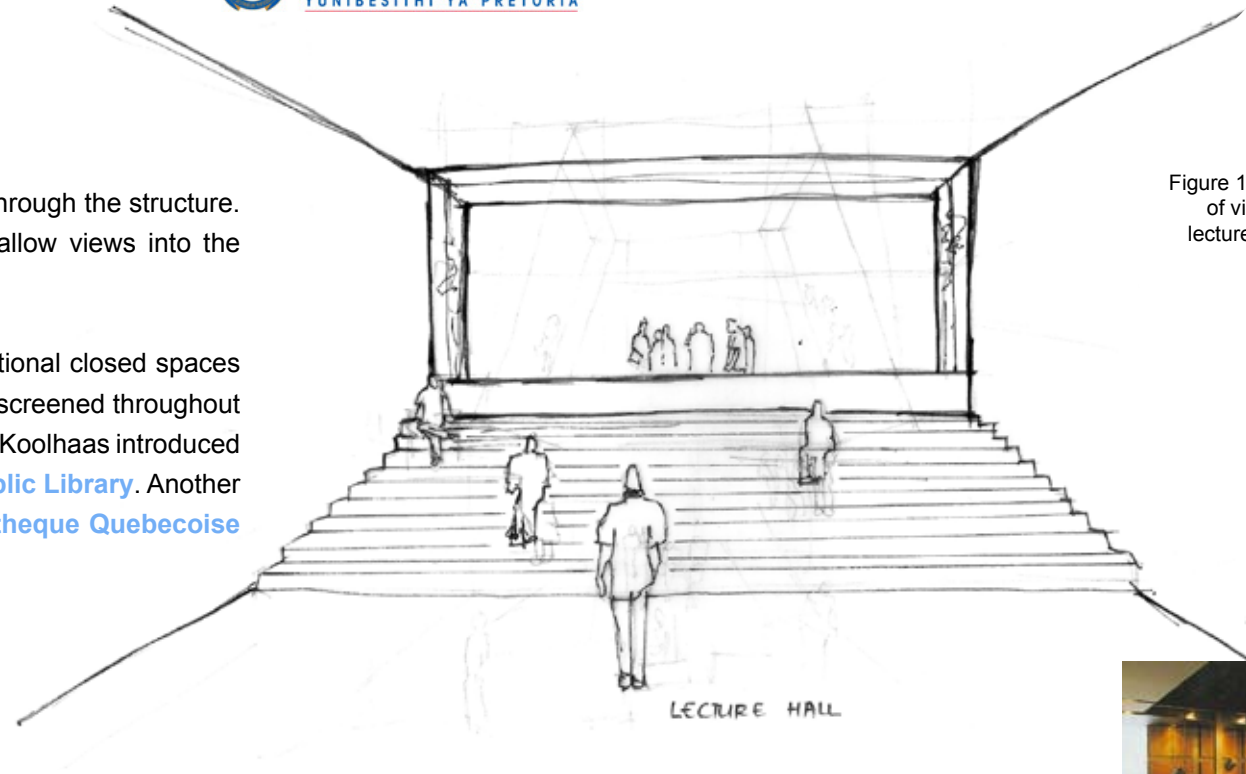
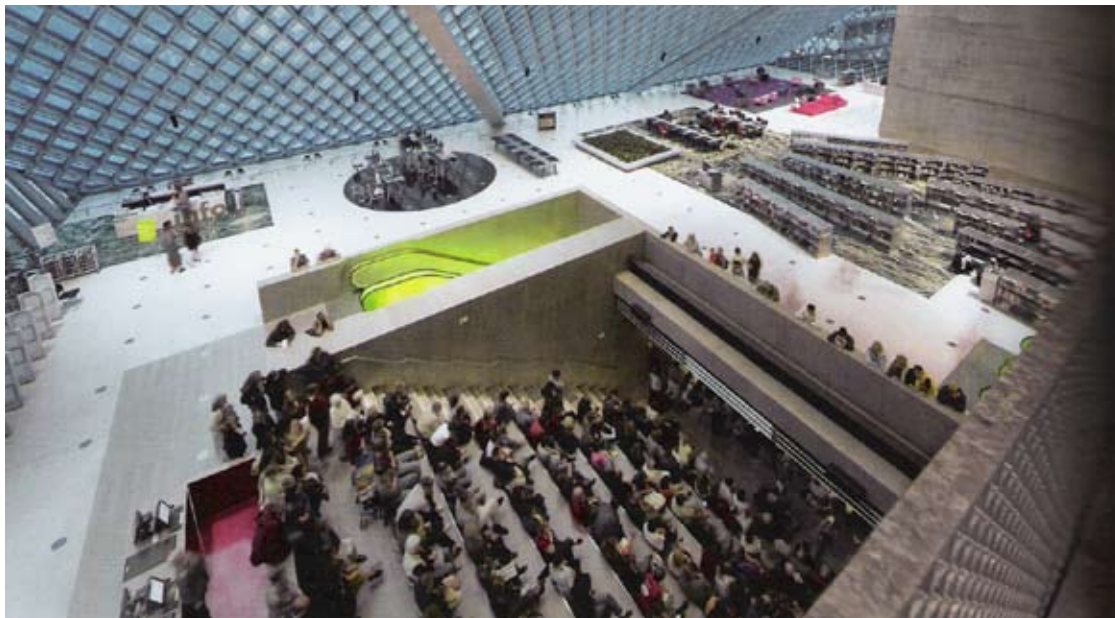


Figure 144: Concept sketch of viewing windows into lecture rooms, April 2008.



precedent study

Figure 146: Open lecture room of the Seattle Public Library.

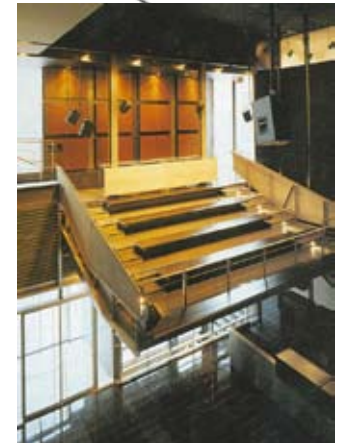


Figure 145: Suspended cinema of the Cinematheque Quebecoise.

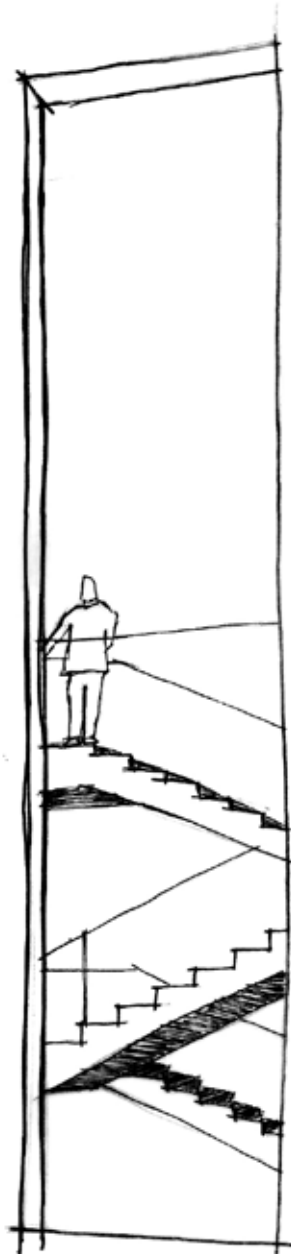


Figure 147: Concept sketch of framed views, April 2008.

Windows are consciously located to frame specific views of the interior or exterior. The architecture therefore focuses one's attention on certain views, generating a sequence of images as one move through the building. Framed views include a narrow cityscape visible from the western staircase, a sky view through several skylights and a longitudinal view into the staircase. Meeting rooms and studios are also visible from the atrium, inviting guests to understand the filming process. Strategic placement of window openings also introduces various light patterns which penetrate the building interior, creating a phenomenal experience of light. Precedents include the **Chapel of Notre Dame du Haut** in Ronchamp by Le Corbusier, **Sarphatistraat Offices** in Amsterdam by Steven Holl, and **Baragwanath Transport Facility and Traders' Market** in Johannesburg by Urban Solutions.



Figure 148: Baragwanath Transport Facility.

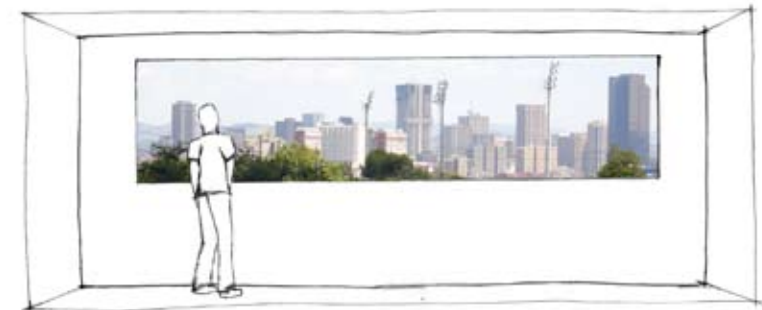


Figure 149: Concept sketch of city view, March 2008.



Figure 150: Notre Dame du Haut.

precedent study



Figure 151: Sarphatistraat Offices.



Figure 152: Sarphatistraat Offices: interior.



Figure 153: Sarphatistraat Offices: night view.



Figure 154:
Concept model of
proposed building's
east elevation,
June 2008.



Figure 155: Proposed perspective
view from the south-east.

interactivity

The building skin acts as an interactive public interface. Throughout the design development the northern façade has evolved from a rigid envelope into a dynamic skin. The façade is composed of glass louvres continuously rotating to provide optimal solar shading. As the façade goes into motion the appearance of the building changes. Human activity is visible inside.

The west elevation includes a translucent glass screen. Projections onto the screen become part of the building texture visible to oncoming traffic. Movement of people inside the building becomes entwined with the images projected onto the screen, blurring the boundary between reality and illusion.

Figure 156: Concept model of building skin, June 2008.

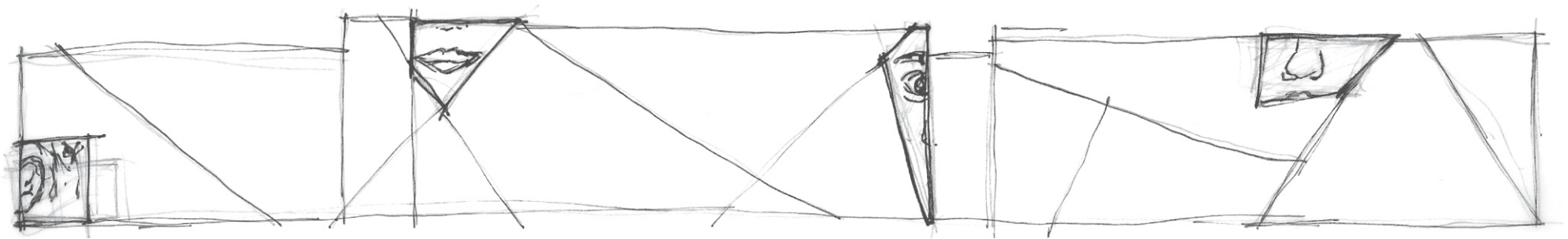


Figure 157: Concept elevation of the north façade, April 2008.

Figure 158: Proposed perspective view from the north-west.





Figure 159: Crown Fountain.

Crown Fountain is an interactive public fountain located in Millennium Park in Chicago. Jaime Plensa designed the fountain as a black granite reflecting pool located between two glass brick sculptures (Millennium Park Chicago, 2008). Water is incorporated in the form of a cascade and spouting water nozzle and the fountain is animated through a dynamic exhibit of lights and electronic images. Digital videos of Chicago residents are displayed on LED screens, creating the illusion that water is spouting from their mouths.

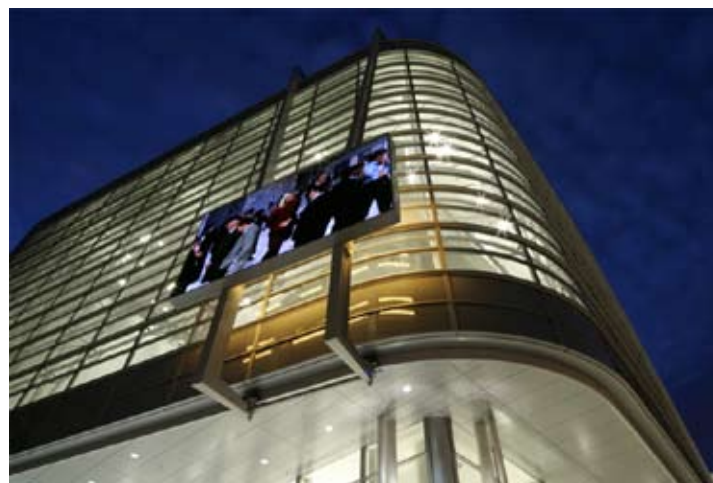
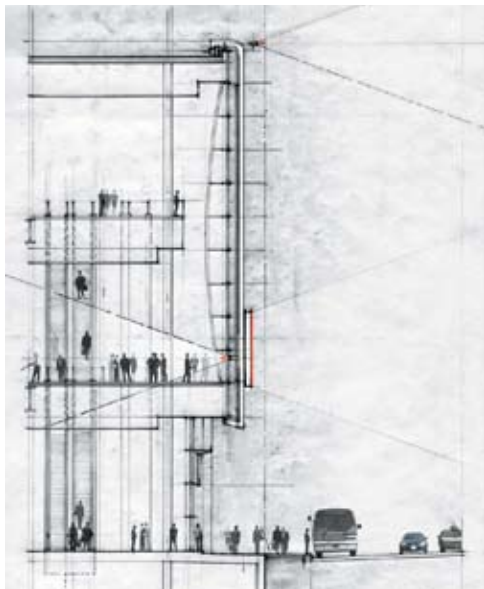


Figure 160: Moscone Convention Centre.

Diller, Scofidio and Renfro's Facsimile installation on the **Moscone Convention Centre** in San Francisco contains a street-facing video monitor suspended from the roof via a steel skeleton. The monitor moves slowly along the periphery of the glass façade. A video camera is mounted on the back, recording the crowded gathering space and transmitting live feed to the monitor. Pre-recorded video footage is randomly substituted. The screen acts as a magnifying lens exhibiting a virtual transparency of the office building.

A similar concept is adapted for the screen on the western façade of the proposed building. Student footage filmed in the school, as well as film trailers and university advertisements are displayed.

Walkways accommodate various events rather than solely facilitating movement. As a result open spaces and walkways encourage activity and lingering. Digital displays along the walkways interact with the user and allow 'windows' into the rooms beyond. Live feed from cameras are projected onto the displays, making the filming process transparent to visitors.

Images and sound are selected at various points and relocated at other points, creating intriguing effects throughout the building.



Figure 161: Proposed perspective showing digital displays located in building walkways.

technical investigation



tectonic and stereotomic elements

Gottfried Semper distinguished structural elements as either lightweight tectonics of the frame or heavy stereotomics of the earthwork. The tectonic signifies lightweight linear components assembled to embody a spatial matrix, while the stereotomic is framed out of the repetitious stacking of heavy-weight elements to generate volume. In German, tectonic or 'Die wand', indicates a screen-like woven fabric while stereotomic, or 'Die mauer', signifies massive fortification (Edwards, 2004).

The word 'tectonic' originates from the Greek 'tekton' which means carpenter or builder. Therefore, tectonic signifies the "fusion of technique with art, of construction with poetry" (Lecuyer, 2001:15), as when the potential of construction and material is explored beyond their structural purpose. The art of construction becomes expressive.

The technical investigation addresses these two components and reflects the reality of changing technologies and social behaviours.

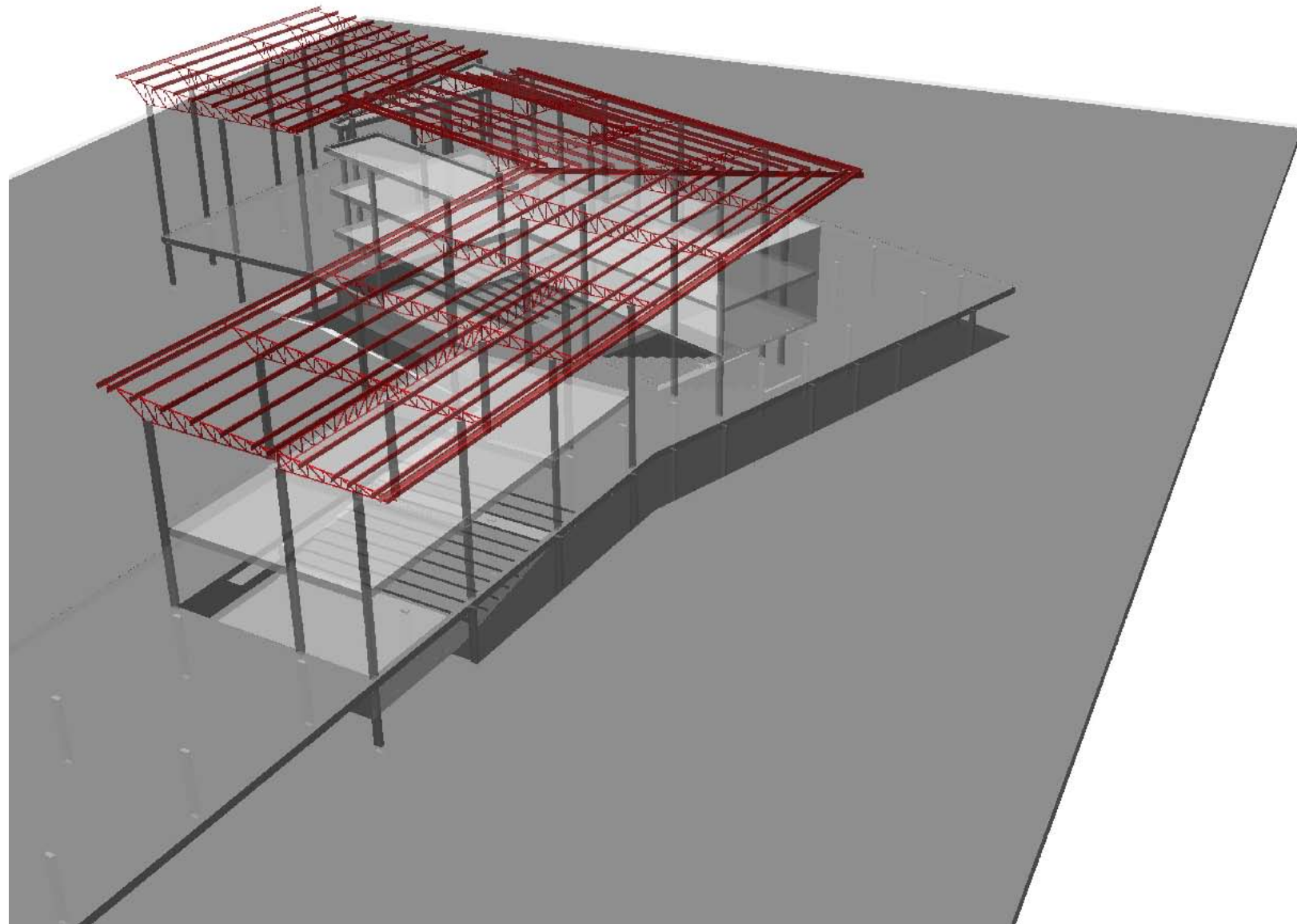


Figure 163: Structural model of the proposed building.

Stereotomic

A concrete structure was selected to serve as load-bearing component.

The building structure originates in the basement. Due to the shallow ground water level in Pretoria, a tanked basement system is employed to withstand horizontal and vertical ground water pressure. Storm water penetration or water entering the basement through ventilation louvres can be drained by mechanical sumps. Ventilation shafts, located at strategic points, introduce fresh air and ensure cross ventilation at basement level.

From the entrance, the basement slopes to gain the required depth to accommodate the cinema and lecture rooms which step down from ground floor level. Once clear of the above obstructions, the basement floor slopes upwards to minimize excavation costs. The extra ceiling height created in the centre allows for a suspended steel-frame mezzanine used for air-conditioning and services.

A column grid of 8.5m x 8.5m with alternating 4.5m intervals is determined by the need for an economic parking layout at basement level, as well as by the wide unsupported spans required by the cinema and lecture rooms. A waffle slab, with a minimum depth of 85mm and a maximum depth of 510mm, is used to accommodate the wide spans. Where columns are removed in the cinema and lecture rooms, a 1m deep concrete beam is introduced.

Figure 164: Structural model of the lecture room.

- 230 x 460mm Reinforced concrete column
- 1m Deep reinforced concrete beam where column has been removed
- 510mm Deep reinforced concrete waffle slab
- Lecture room steps down into basement
- Reinforced concrete beam

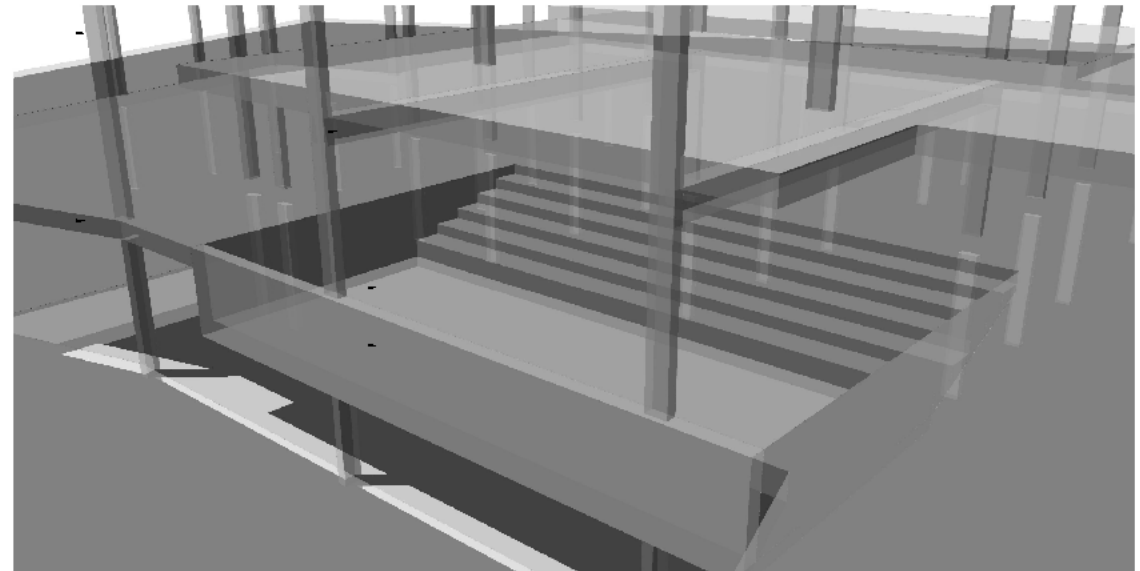
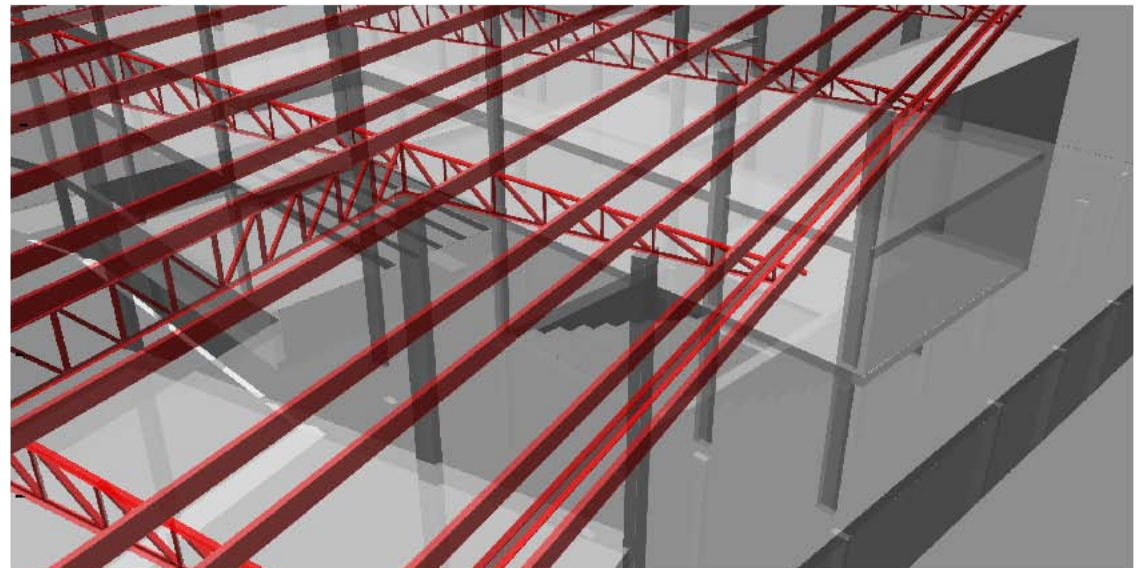


Figure 165: Structural model of the steel roof assembly.

- 300 x 75 x 2 x 3mm cold-formed lipped channel purlin @ 1800 c.c.
- Steel bracing to eng. specification
- Steel truss to eng. detail



A vertical service core concentrates the building's utilities along the western façade. According to Dr. Ken Yeang's principles, core functions should be located on the warmer, western side of the building to act as a thermal buffer protecting the climate controlled eastern side from the sun (Walczak, 1998). These services include an elevator, staircase and lavatories. Telephone and electricity ducts are located on each floor and connected to horizontal service spines placed underneath the walkway. Suspended floors and ceilings accommodate flexible studio spaces and house cables and ducting.

The steel roof structure includes 300mm deep purlins to span the required 8.5m length between trusses. Klip-lok roof sheeting is laid on top of the purlins.

Figure 166: Structural model of the concrete frame.

- Steel truss to eng. detail
- 300 x 75 x 2 x 3mm cold-formed lipped channel purlin @ 1800 c.c.
- 406 x 140mm I beam (after H p
- 230 x 460mm Reinforced concrete column
- 300mm Reinforced concrete slab
- Open informal lecture room steps down into basement
- Reinforced concrete beam
- 510mm Deep reinforced concrete waffle slab

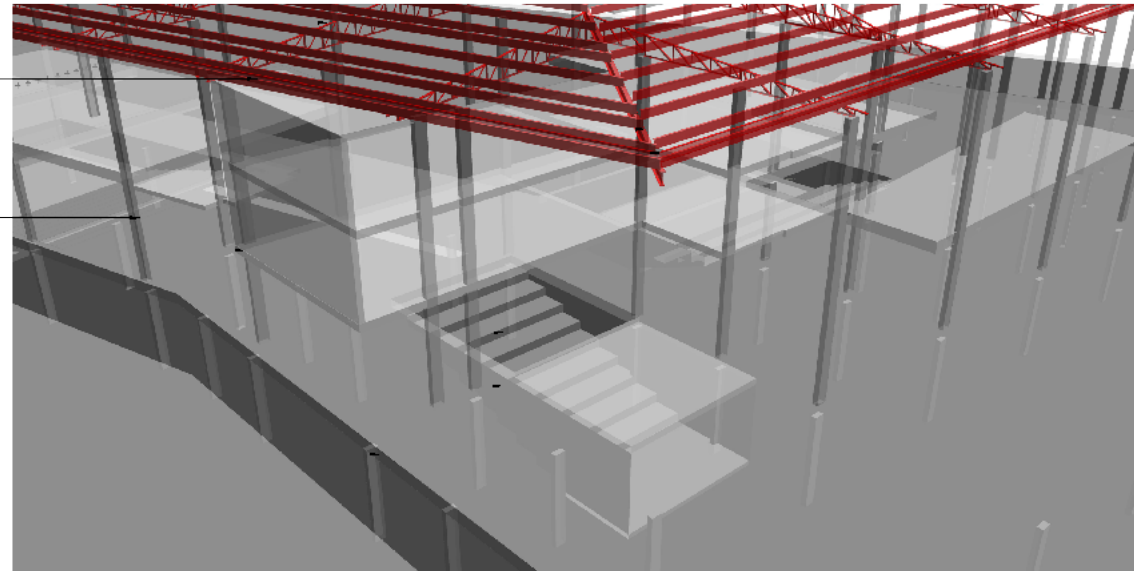
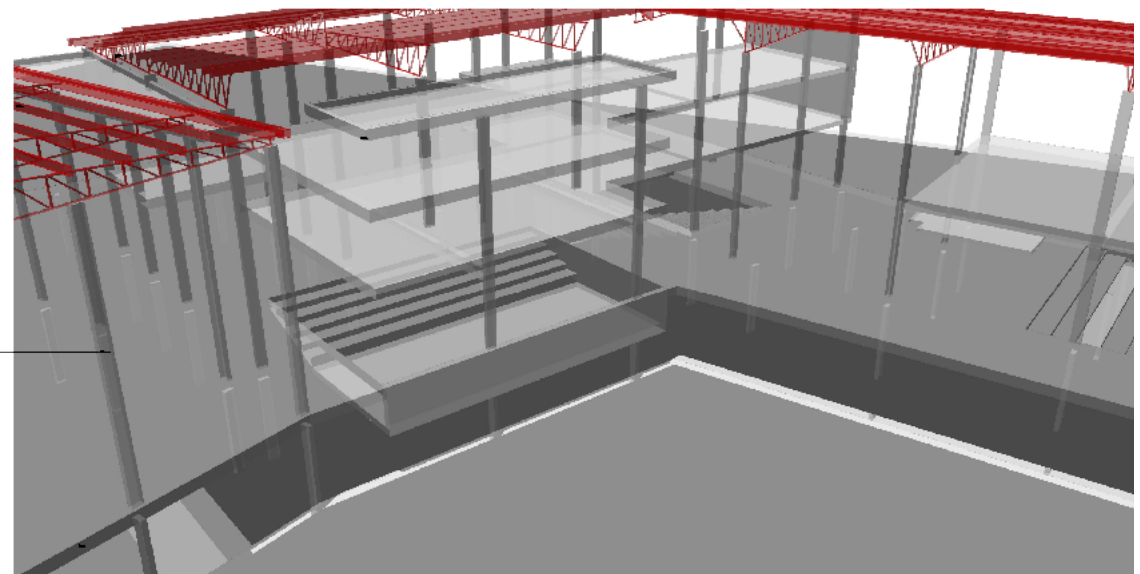


Figure 167: Structural model of the floor slabs.

- Steel truss angled to form roof light
- 300 x 75 x 2 x 3mm cold-formed lipped channel purlin @ 1800 c.c.
- 170mm Deep reinforced concrete roof slab
- 230 x 460mm Reinforced concrete column
- 510mm Deep reinforced concrete waffle slab



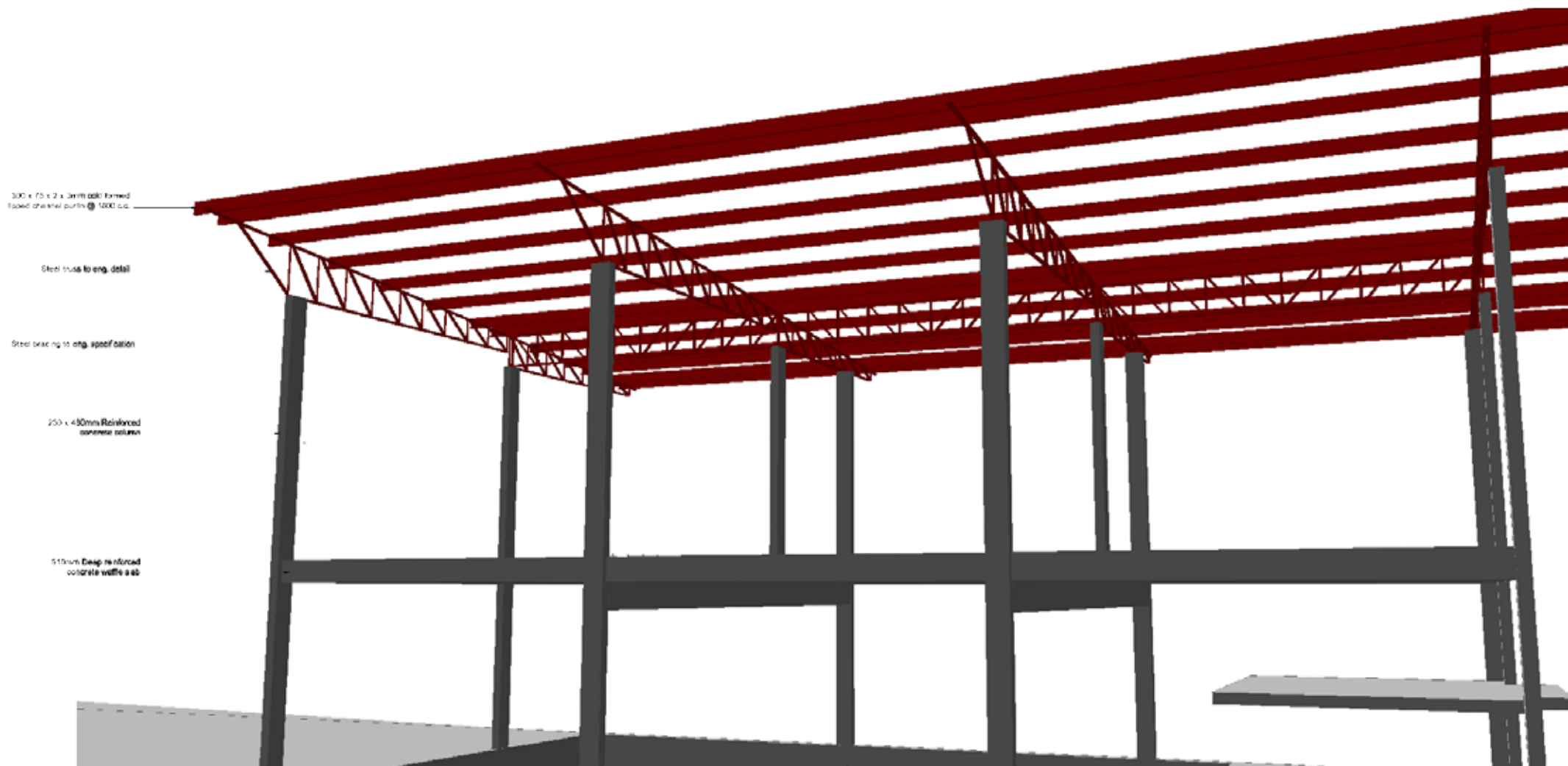


Figure 168: Structural model.



Envelope

The northern façade is designed to be interactive. Louvres are used to assist internal glare control and regulate climatic factors including lighting, ventilation, sound insulation and energy gain. By pulling the skin away from the building a cavity is created and the skin acts as a double envelope system. Double envelopes can be defined as “multiple-leaf wall assemblies” (Kwok, 2007:43) consisting of an outer glass louvre façade, an intermediate space and an inner brick and glass façade.

In summer, open louvres provide adequate solar shading while allowing wind and natural daylight to enter the building interior. These external solar shading devices prevent solar heat gain. In winter, when the louvres are closed, the enclosed air space will heat up due to the greenhouse effect. The resultant heat can be channelled through the building, reducing additional heating requirements.

The building envelope of **Eawag Forum Chriesbach** in Switzerland is composed of vertical glass louvres. This research centre was designed by Gysin and Partner BGP to act as a synergy of systems. An automatic control system adjusts louvres, operates windows and lights, and controls the flow of warm and cool air in response to environmental conditions (Wentz, 2007:30). On summer nights, when the outdoor temperature drops, windows and louvres are opened automatically to allow warm air to exit.

Louvres adjust automatically to optimize indoor temperature and lighting conditions. A control unit tracks the path of the sun and adjusts the louvres with an electric motor to allow sunlight to enter in winter and to block it in summer. On sunny winter days the louvres remain parallel to the sun’s rays to allow maximum penetration of sunlight, while on sunny summer days the louvres turn constantly to block direct sunlight. On cold, windy or overcast days the

Figure 169: Eawag Forum Chriesbach.

precedent study



Figure 170: Fire escape.



Figure 171: Louvre façade.

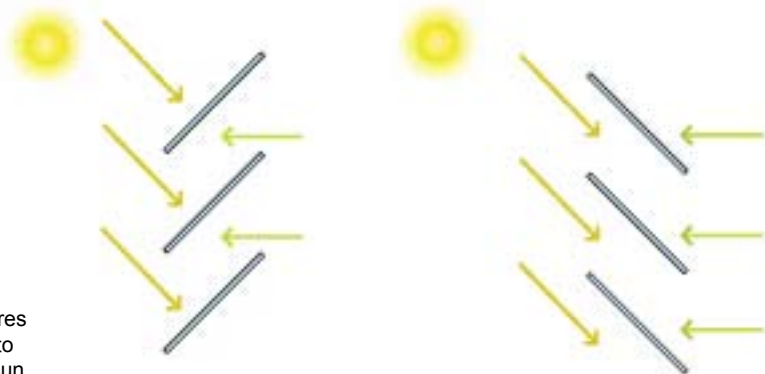


Figure 172: Louvres rotate according to the angle of the sun.

louvres remain perpendicular to the façade. As the façade goes into motion, the appearance of the building and the views to the inside change.

Each glass louvre pane is 2,8m high, 1m wide and 24mm thick. Two sheets of glass, one printed on the inside with a dotted pattern, are laminated together. Empa, the research institute for material science and technology, conducted tests using a 1:1 scale model of the façade assembly to determine the density and colour of the silk-screened pattern. A light blue pattern with 75% opacity (created by transparent voids) was selected for optimal daylighting and transparency while limiting thermal solar gain.

A similar dot pattern was used on the ETFE skin of the Olympic Games Aquatic Centre or **Water Cube** in Beijing. Peddle Thorp Walker Architects (PTW) designed the building as a greenhouse. Diffused light enters through the main structure into an air cavity. The ETFE (ethylene-tetrafluoro-ethylene) skin allows high levels of natural daylight to enter the building. Variations in the shading of the envelope are achieved by patterning the various layers of the façade with a translucent painted 'frit' (Wealth Creation, 2007). The pattern and position of these translucent elements respond to the functions adjacent to the façade.

precedent study



Figure 175: Water Cube.



Figure 173: Installation of ETFE panels.



Figure 174: Water Cube façade prototype.

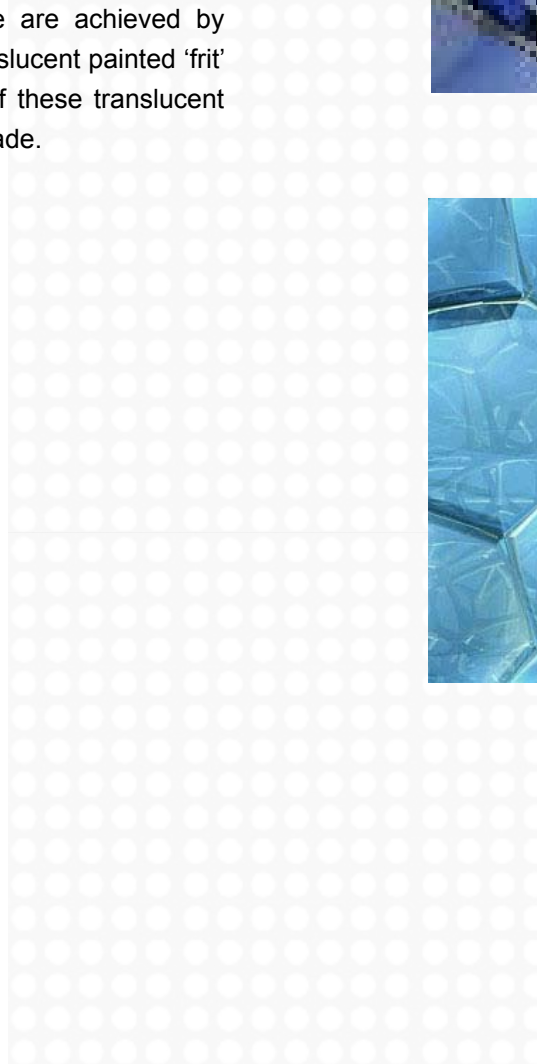


Figure 176: Broadfield House Glass Museum.



The **Broadfield House Glass Museum** in Dudley, by Design Antenna, is an exploration of modern glass technology with an all-transparent structure. The French company Saint Gobain developed “Neutral KN 169”, a special coated glass with a microscopic deposit of silver layered into its surface to inhibit solar gain (Richards, 2006:67). The glazing remains highly transparent allowing 61% natural daylight and only 45% solar energy to penetrate the façade. The roof panels were screen printed with a white fritted grid pattern. The density of this pattern varies to reduce the solar energy entering the building to less than 37%, creating an U value of 1.7w/m².



Figure 177: Green vertical louvres.

Hermann, Valentiny and Partners designed the **Commerzbank** building in Luxembourg in association with Colt Shadowglass. Strict criteria of visual permeability and natural daylight fashioned the building skin. Concrete framed glass louvres encounter the urban environment with openness and transparency, yet ensure security. The louvres are composed of 8mm green and 15mm clear glass laminated together (Colt Germany, 2008). An electric motor integrated with a sun tracking system controls the movement of the louvres.

From an investigation of the above projects a skin, composed of vertical glass louvres, was designed for the northern façade of the proposed building. A light blue foil with a transparent dotted pattern, with 75% transparency, is laid on top or laminated into the louvre to ensure that the amount of solar radiation entering the building is regulated.



Figure 178: Commerzbank.

Sun tracking louvres

Colt International has developed an intelligent solar shading control system. The Colt ICS 4-Link processor continuously calculates the position of the sun and receives internal temperature and lighting data from sensors (Gardner, 2008). The system adjusts the louvres accordingly to create optimal environmental conditions. Therefore, the building reacts to its immediate weather conditions. The building management system also allows manual user control.

The building skin creates a climatically responsive layer. From certain angles the louvres allow views and reveal people, the details of life and the process of film making. The view is fragmented, simultaneously focusing close by or further away, or composing a spatial sequence as a series of partial glimpses. The skin becomes articulated and acts as a mediator between inside and out. Tension is created between opacity and transparency. The building constantly changes according to the point of observation, the time of day, the seasons and the weather.



Figure 179: Colt processor.

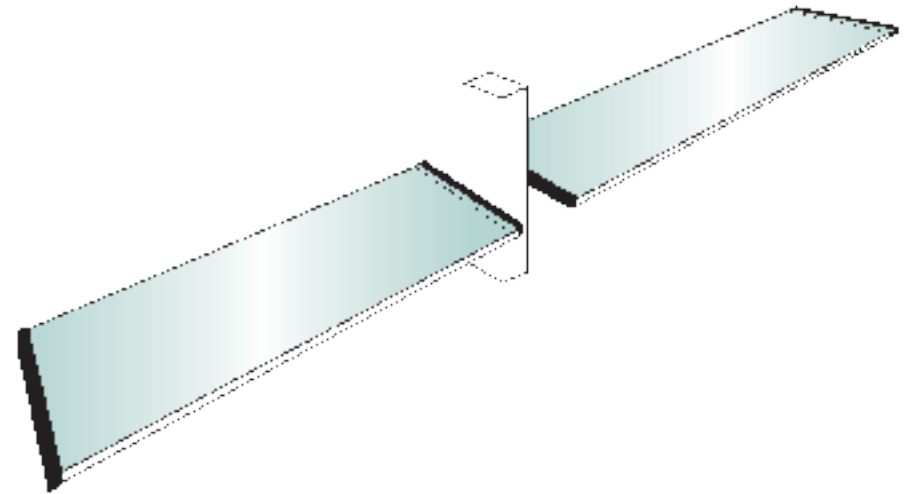


Figure 180: Colt Carrier System 5, horizontal and vertical application possible.

building systems

Ventilation

Passive ventilation is encouraged where possible. Along the northern façade a heating and cooling strategy is proposed.

In summer, the building management system rotates the glass louvres to provide optimum solar shading. The prevailing wind direction in Pretoria during the summer months is north-west. Deciduous trees along Lynnwood Road offer shade to cool the paved surfaces. A water pond provides evaporative cooling to further cool the air before it reaches the building. Cool air moves through the open louvres and ventilation ducts to the building interior. Cross ventilation is encouraged by placing windows on the windward and leeward side. Warm and cold air ducts are located

in wall and ceiling cavities to regulate air movement through the building. During the early morning and at night when the outside temperature drops, the building management system automatically opens all louvres to flush hot air out of the structure.

The water pond is supplied by on-site water collection. Overflow water flows into a basement storage tank through a series of underground pipes. The temperature of the subsoil remains cool during warmer days, cooling the water in the pipes. An evaporative cooling unit uses this water to change warm, dry air to cool, moist air. Cold air is distributed in cold-air ducts and introduced at floor level, while hot air is removed at ceiling level. Whirlybird ventilators assist in creating suction to extract stale air from warm-air ducts.

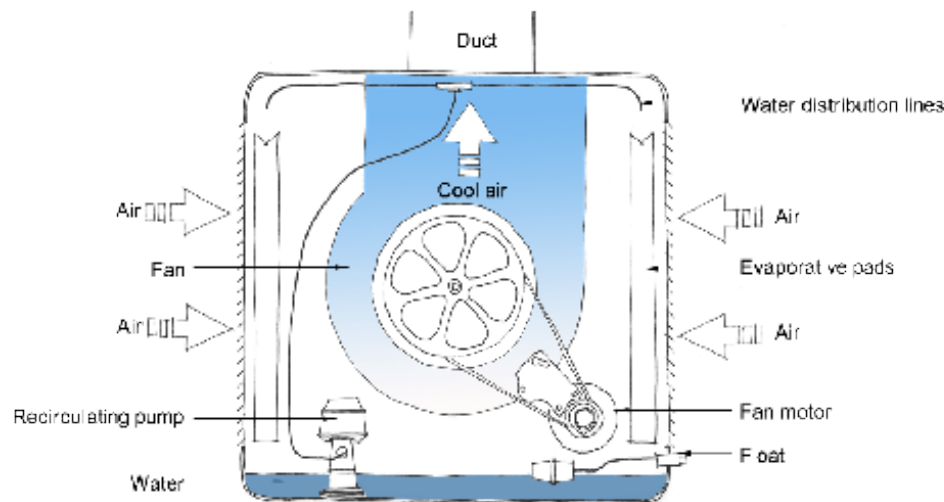


Figure 181: Evaporative cooling unit.

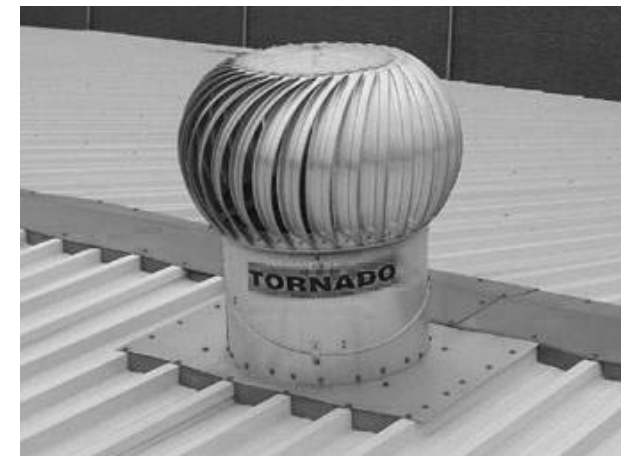
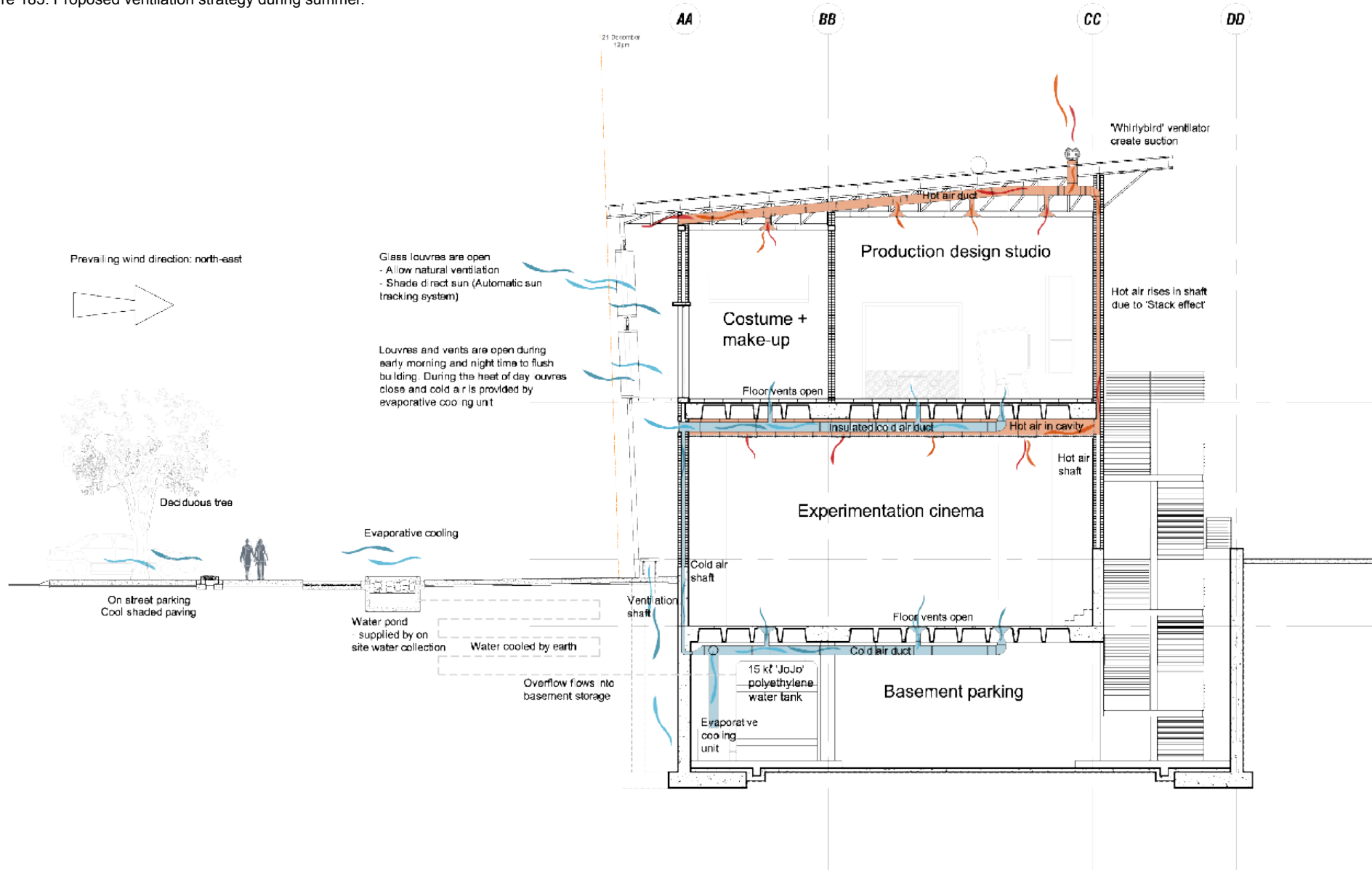


Figure 182: Whirlybird ventilator.

Figure 183: Proposed ventilation strategy during summer.



In winter, glass louvres are closed and solar heat gain is allowed. The air space behind the louvres heats up due to the Greenhouse Effect. Heat can then be channelled through the building. Additional hot-water radiators, containing water heated by solar water heaters, introduce heat at floor level. Extraction of stale air will continue through the hot-air ducts located in the ceiling cavity.

A supplementary mechanical ventilation system, operated by a basement plant room, is provided to create comfortable environmental conditions for the cinema, lecture rooms and sound recording rooms which can not be ventilated naturally.

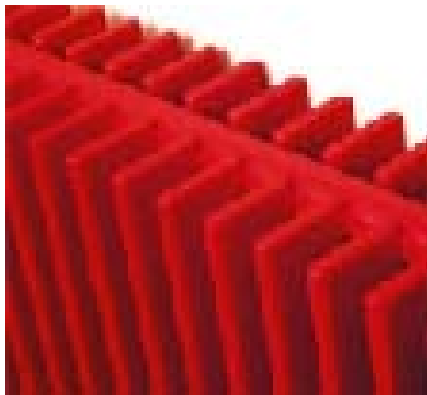
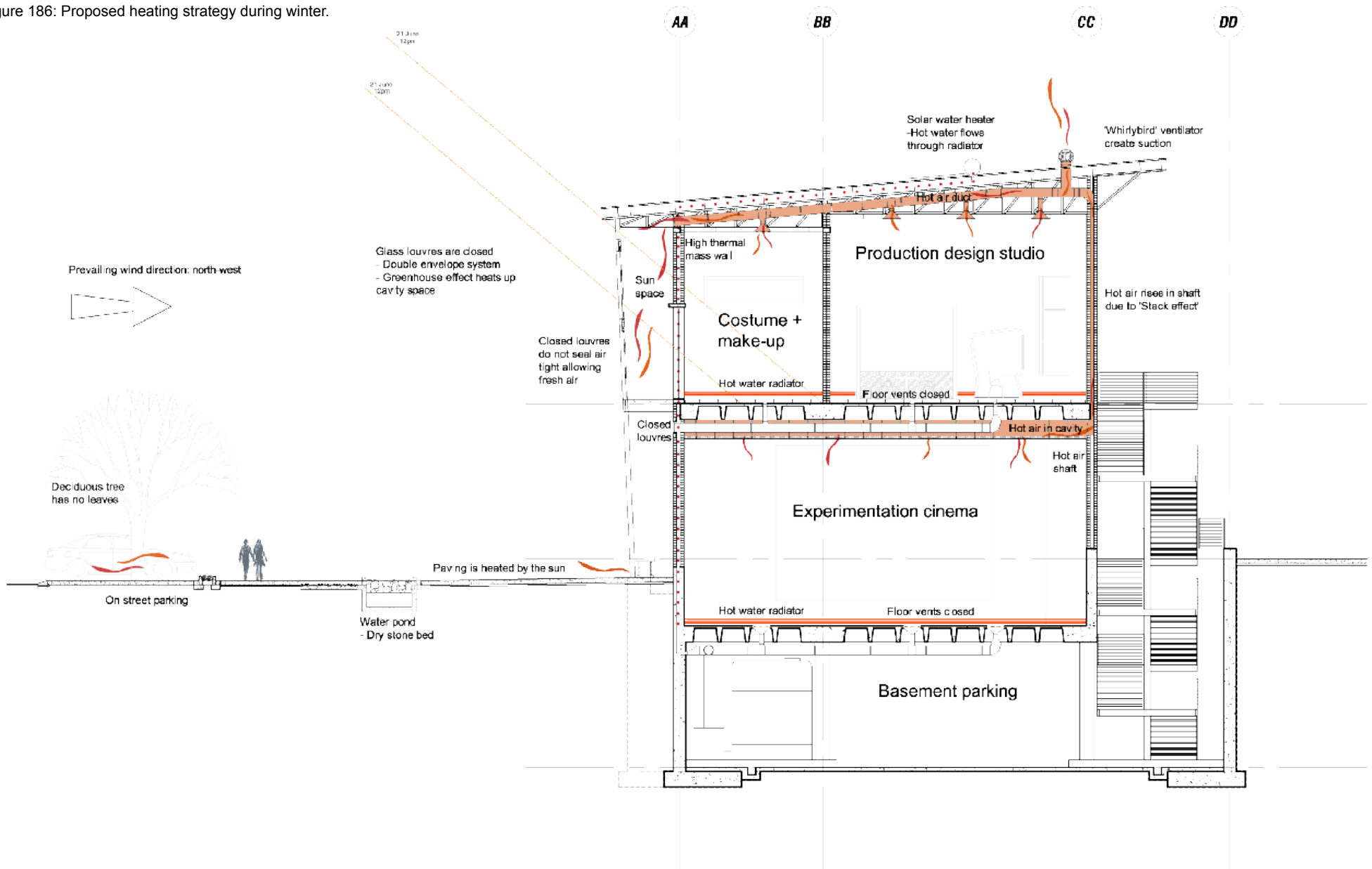


Figure 184: Hot water radiator.



Figure 185: Solar water heater.

Figure 186: Proposed heating strategy during winter.



Natural daylight

As stated in the NBR requirements for natural daylight, the total area of openings should not be less than 10% of the total floor area of the room (SABS 0400:1999, 1996:102). Natural daylight is calculated accordingly for every room (see Appendix C). Light shelves, sky lights and light shafts assist in maintaining sufficient daylight in interior spaces. Light shelves are positioned to ensure uniform distribution of daylight in interior spaces. On entering the building, light bounces off the reflective shelf surface and then off the ceiling. High windows allow daylight to infiltrate deeper into the building (Kwok, 2007:81-82). In certain spaces, including the lecture hall, a daylight diffuser is placed inside the room, below a light shelf. The diffuser illuminates the ceiling and allows soft diffused light into the space below.

The **Velocity Films** office building in Johannesburg, designed by Noero Wolff Architects, is organised along a double-volume internal street. The roof form was shaped by the path of the sun in order to maximise solar gain (Noero Wolff Architects, n.d.). Skylights are placed along the length of the street. Offices facing the internal street contain windows with light shelves that allow light to enter.

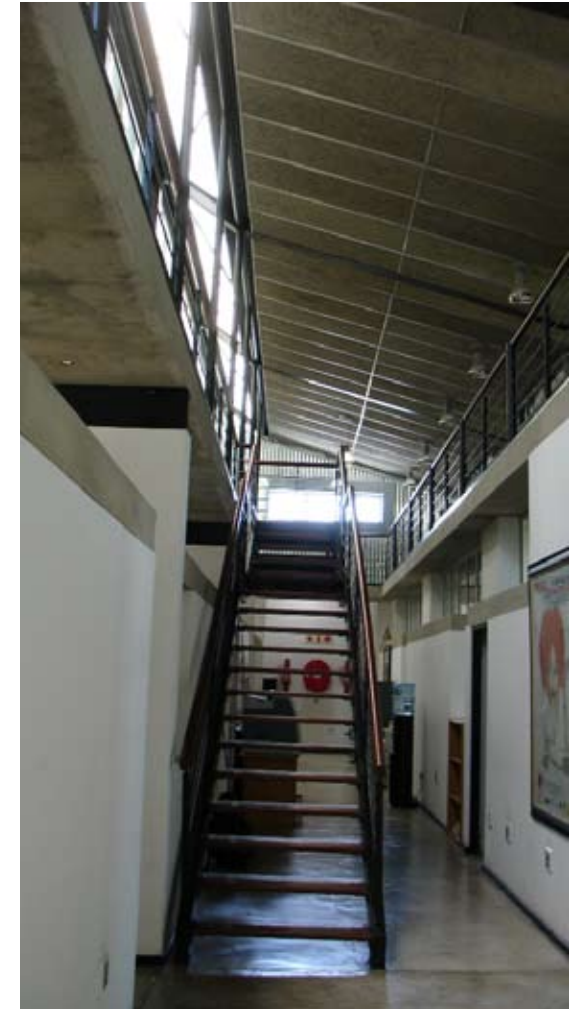
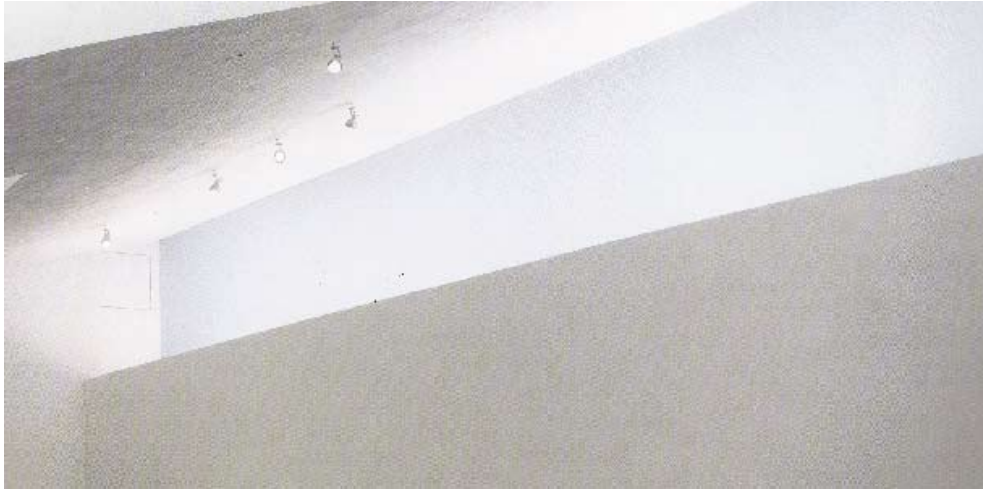


Figure 187: Velocity Films.

Figure 188: Internal light shelf.

precedent study



Another excellent example where this technique is used is the **Kiasma Museum of Contemporary Art** in Helsinki. Steven Holl used light shelves and skylights with translucent glass to create evenly distributed light throughout the room. The experience of light is controlled (Richards, 2006:42).



Atelier Peter Zumthor designed the **Kunsthaus Bregenz** in Austria with a ceiling space of 2m deep. This void above the ceiling acts as a plenum for air and light. Diffused light pours in through the frosted skin and down via the frosted glass ceiling (Richards, 2006:24).



Figure 190: Kunsthaus Bregenz.

Figure 189: Kiasma Museum of Contemporary Art.

Where glass is used on the western façade of the proposed building, translucent Nanogel® insulation is applied. The translucent appearance of the glass allows high quality diffused light to illuminate the interior while inhibiting solar heat gain. Nanogel® is a Cabot Aerogel insulating material containing 95% air and 5% solid content (Cabot Corp, 2008). The small pore size of Nanogel® contributes to its good thermal insulating properties.

Insulating values of existing building insulating products

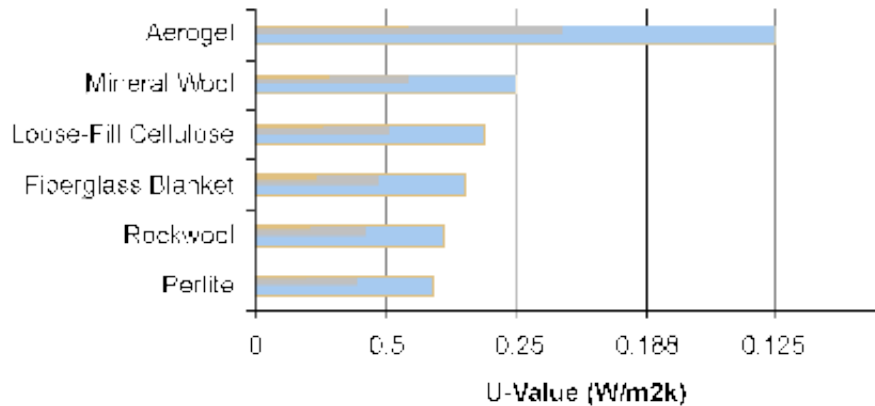
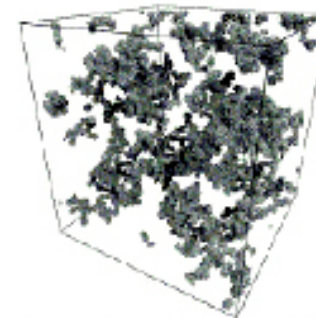


Figure 193: Comparison between Nanogel® and other insulating products.



Aerogel particle: 95% air, 5% solid

Figure 192: Nanogel® particles.



Figure 191: Nanogel® used in glass roof.

Nanogel thickness	Light transmission	Solar heat gain coefficient	U-Value
19mm	73%	0.73	0.25
25mm	63%	0.63	0.125
31mm	48%	0.48	0.1
38mm	30%	0.30	0.08
60mm	28%	0.28	0.06
64mm	21%	0.21	0.05

Figure 194: Nanogel® thickness vs solar gain.

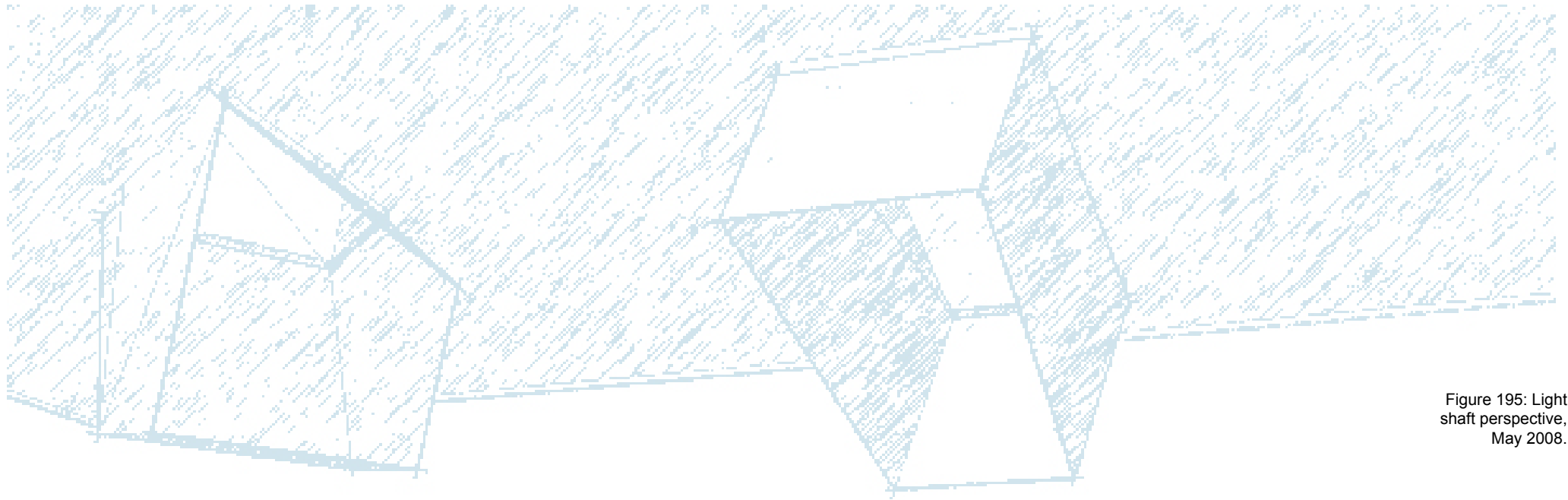


Figure 195: Light shaft perspective, May 2008.

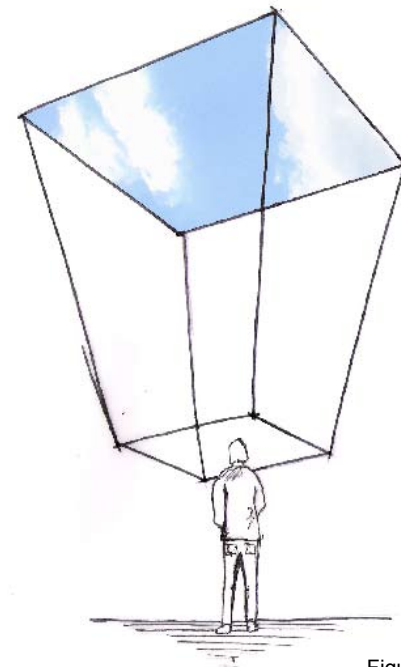


Figure 196: Concept sketch of a sky view, April 2008.

Water harvesting

A water strategy for the entire site was developed in conjunction with landscape architecture student Elmie Erasmus. The hydrological system consists of three parts:

- The wetland on the eastern corner of the site.
- A formal open water system running in an east-west direction for the length of the site.
- Infiltration trenches in Lynnwood Road.

Water from the existing storm water channel, located on the southern border of the site, is channelled into a proposed wetland system. The wetland is primarily designed to illustrate the cleaning of storm water run-off in an urban environment.

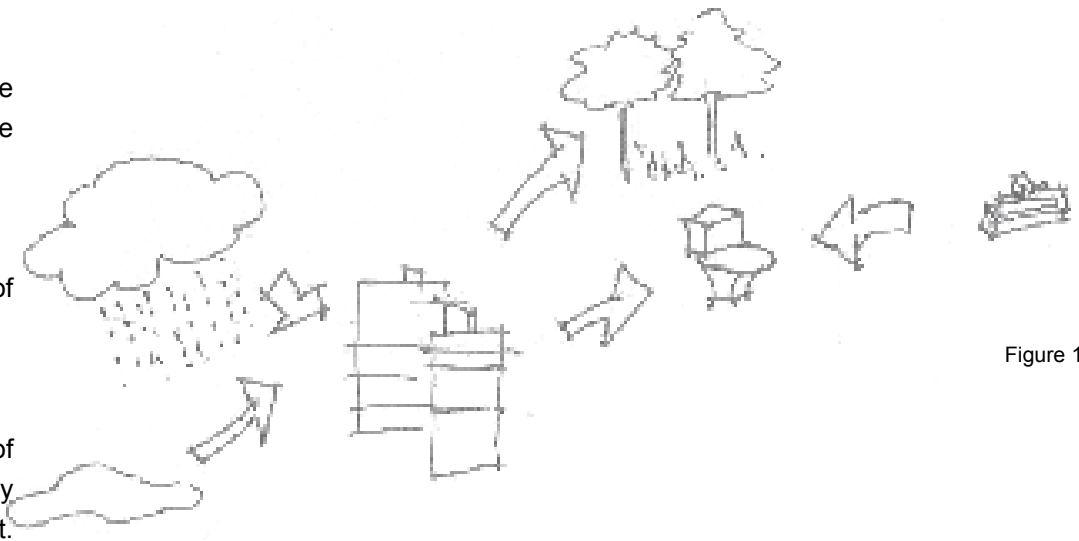


Figure 197

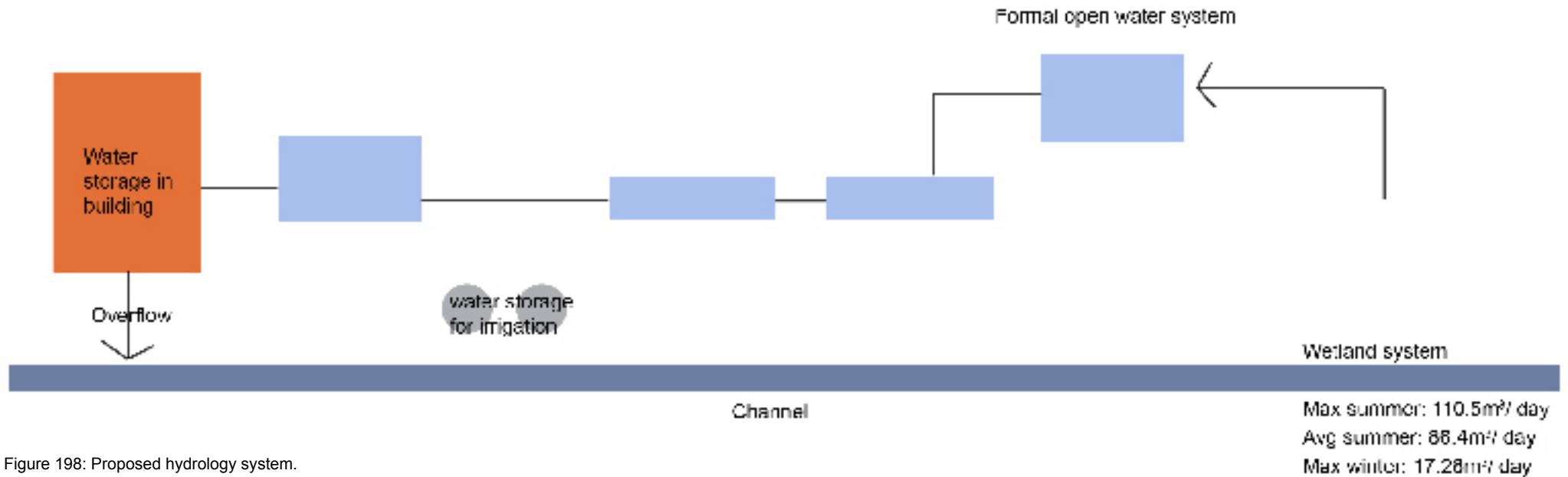


Figure 198: Proposed hydrology system.

Water output from the wetland flows through the site via a formal open water system, introducing water utilisation principles at various points. Subsequently, the water is piped into the basement of the proposed building for storage. This grey water is used for the flushing of toilets and for on site irrigation. No additional harvesting of roof water is necessary since the wetland produces enough water throughout the year to provide for the building's water demands (see Appendix D).

Storm water run-off from Lynnwood Road is distributed between a series of infiltration trenches. Treated water is then collected in a water pond which forms part of the natural ventilation system. Overflow from the pond is piped to the building's basement.



precedent study

Figure 199: Networked sidewalk storm water system, Portland Bureau of Environmental Services.

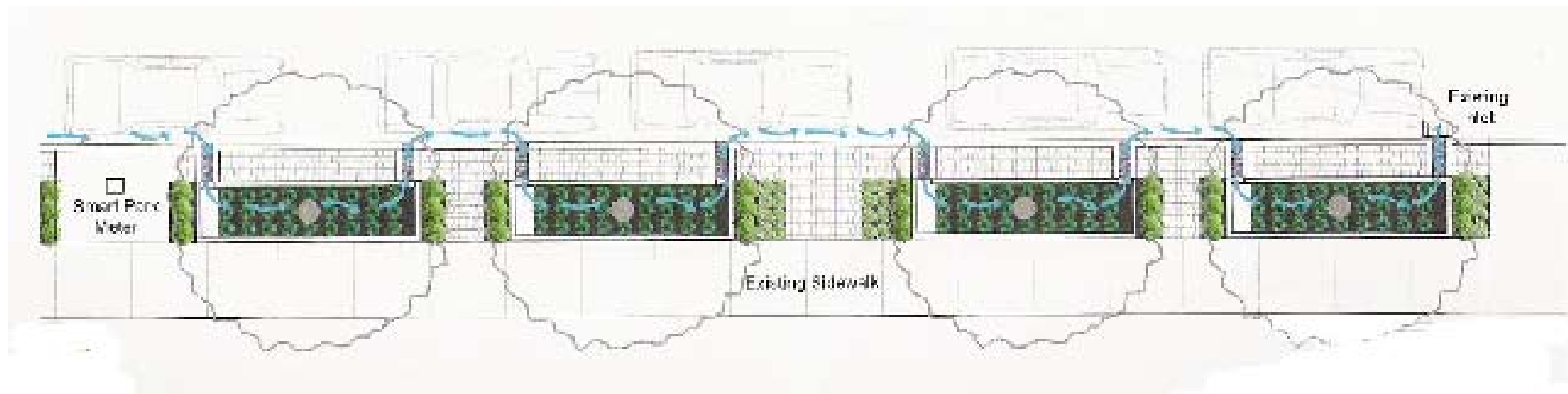


Figure 200: Sequence of infiltration trenches forms part of the streetscape.

The vertical garden

Site and contextual forces are introduced to the building skin. Along the eastern façade the landscape continues from the horizontal plane onto the vertical, blurring the boundaries between landscape architecture and built form.

Green Green Screen in Tokyo by Klein Dytham Architecture is a living, growing green wall. A mix of grass, creeper plants and graphic screens forms a long hoarding wall which surrounds a mixed-use development. Felt pockets, attached to an aluminium frame, are filled with earth to provide a growth medium for plants. A hosepipe along the top drips water into the pockets, keeping the plants moist, and a gutter along the bottom drains water from the pavement (Gaventa, 2006:172). Curiosity is aroused and people passing by are tempted to touch the plants. Additional greenery is introduced to the city environment, transforming the edge of the street.



Figure 201: Green Green Screen.



Figure 202: Musée du Quai Branly.

Another precedent for the use of a green wall is Jean Nouvel's **Musée du Quai Branly** in Paris. A living wall forms part of the exterior of the museum. Approximately fifteen thousand plants of 150 different species form part of the 800m² wall. Two layers of polyamide felt are hooked onto slabs of expanded PVC and anchored to a metal structure. The felt provides a cushion of air to act as insulation, and a soil base in which the roots of the plants can grow (Badia, 2007).

The use of veld grass forms part of the vegetation strategy adjacent to the eastern façade of the proposed building. Therefore, the vertical garden contains similar grass species, planted in galvanised steel channels. The grass is cut annually to reduce the risk of a fire hazard. The steel channels are mounted onto a galvanised steel frame which contains an irrigation pipe at the top, and is perforated at the bottom for drainage.



Figure 203: Detail of vertical garden.

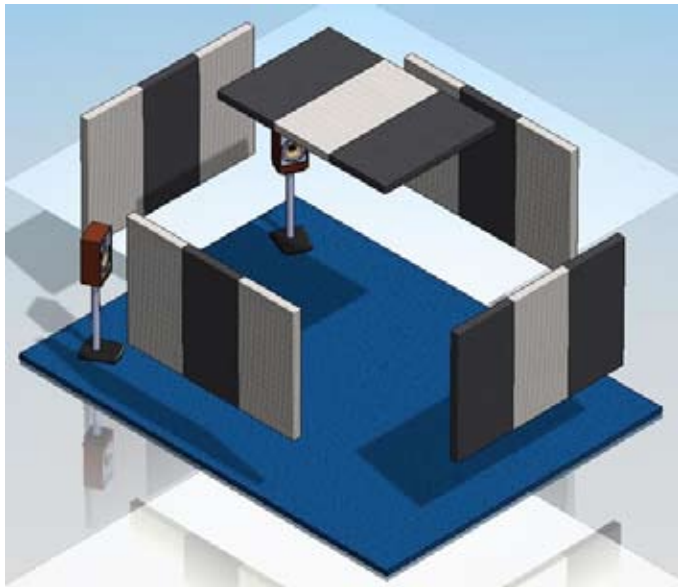


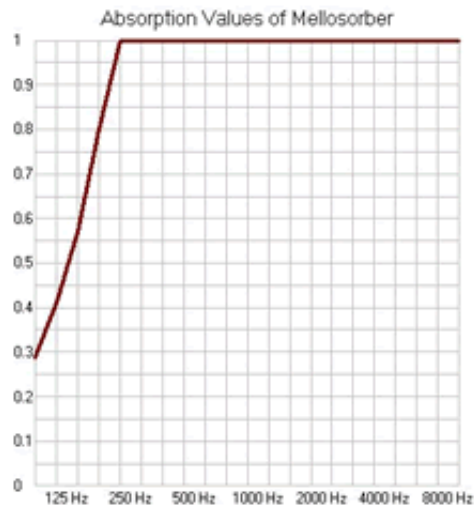
Figure 204: Mellozorber acoustic panels.

acoustics

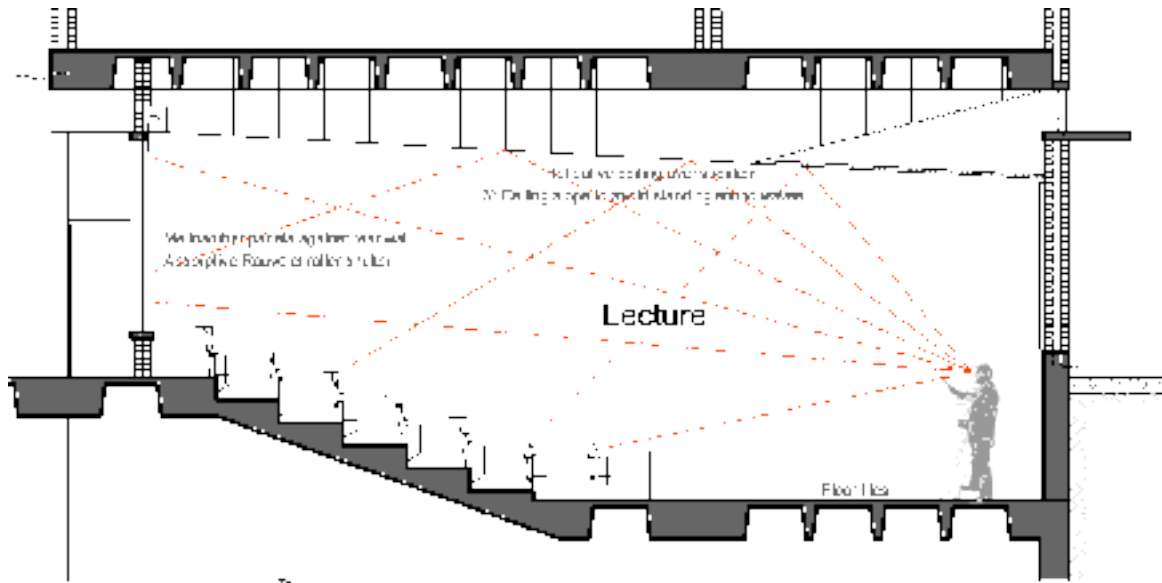
The acoustic investigation strategy involves isolation, absorption and speech propagation for critical spaces throughout the building. These spaces include the sound recording, voice booth, dubbing, cinema, lecture and open lecture rooms.

Absorption

Adequate sound absorption is necessary for reverberation control, echo control and internal noise reduction. Room absorption is calculated and designed to meet the preferred reverberation time required by each function (see Appendix E). Egan (1988:170) explains that a “long reverberation time is desirable for music so that successive notes blend together; however, for speech the reverberation time should be short so that persistence of one syllable does not blur or mask subsequent syllables”. Where necessary, Mellozorber acoustic panels, developed by the South African company Subsonic Acoustics, are installed to achieve adequate absorption.



In modern cinemas with good quality surround sound, reflective surfaces are unnecessary, therefore the maximum practical room absorption should be achieved. Proposed seating is well upholstered and all surface finishes are absorbent. According to Lord (1986:81) good absorptive walls, floors and ceilings will “permit clarity of sound and soak up local popcorn noises”. Sound lobbies with absorbing finishes are provided at each entrance door.



In the lecture rooms 50% of the ceilings are treated with absorptive panels to reduce reverberation times, while the central areas remain reflective to help distribute sound from the lecturer to the back of the room. To prevent standing waves, the ceilings are angled towards the classrooms. The rear walls contain sound absorbing Mellosorber panels to avoid echoes. Viewing windows in rear walls can be closed by means of Rauvolet roller shutters. Rauvolet Acoustic Line is a perforated metal shutter containing absorptive material. An NRC number of 0.8 is achieved by this product (Rehau, 2007).

The walls of the voice booths are designed to be non-parallel to prevent the formation of standing waves.

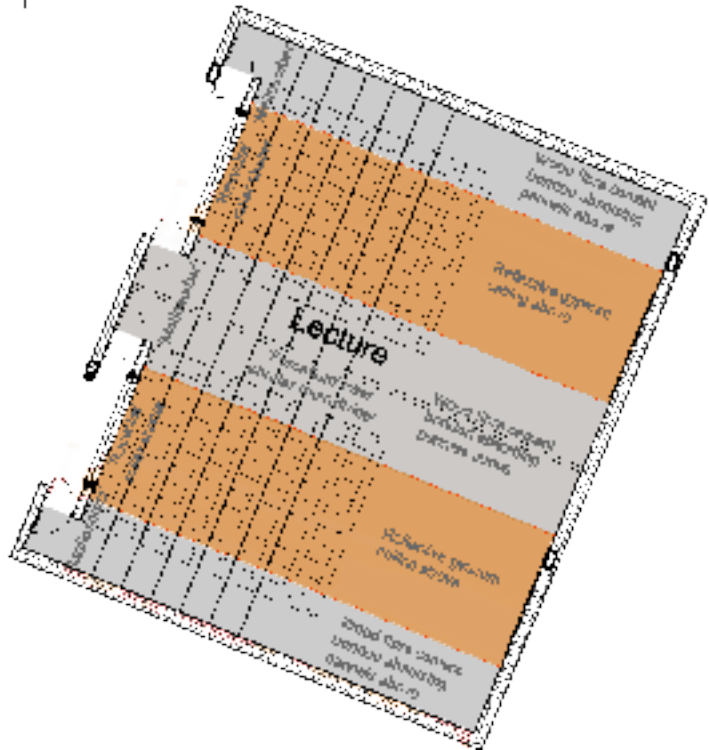


Figure 205: Sound absorption and reflection in lecture room.

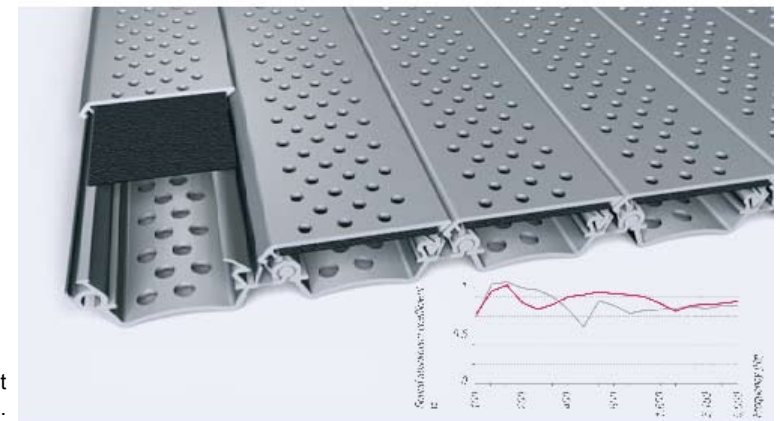
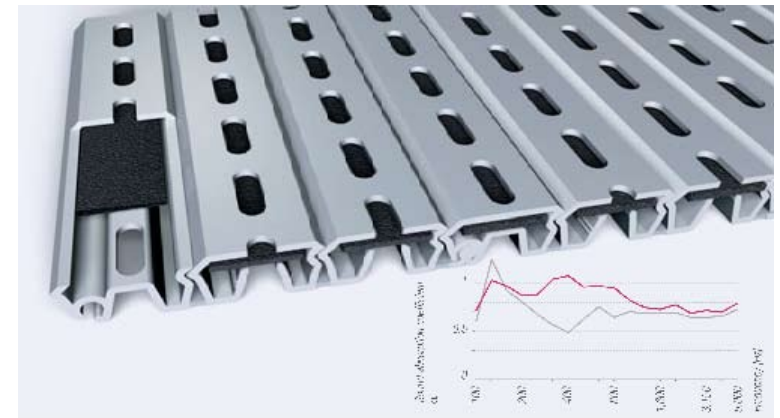


Figure 206: Rauvolet Acoustic Line.

Voice booth isolation

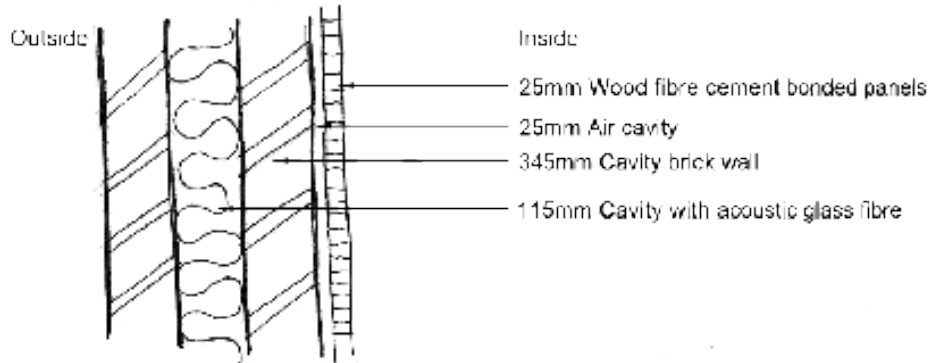


Figure 207: Section voice booth through walls.

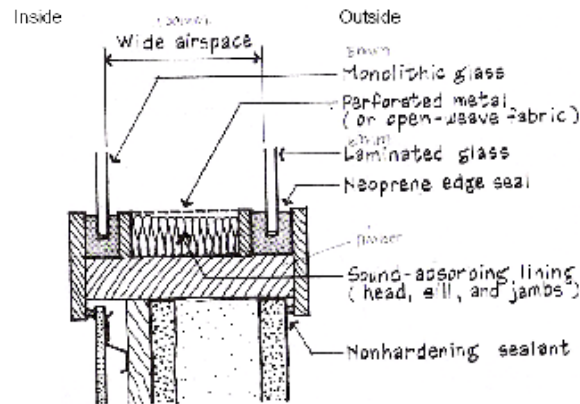


Figure 208: Section through double pane windows.

Isolation

As the site is located next to a busy road, traffic noise must be investigated. The traffic noise level “depends on the density and speed of vehicles” (Lord & Templeton, 1986:19). The faster the traffic flows, the more noise it creates. Traffic slows down at the site due to the traffic light located at the junction. Because of the slower traffic rate the site is not as noisy as the current architecture building further along Lynnwood Road, where traffic is flowing much faster. The calculated traffic noise level at the site is 65dB (see Appendix F).

The courtyard faces away from the traffic and is therefore shielded from traffic noise. When the glass louvres along Lynnwood Road are closed, the double envelope system provides excellent sound isolation for the building. When the louvres are opened they can be angled to achieve a compromise between air circulation, shading and noise reflection. Even in their open state will the louvres behave like sound diffusers.

Isolation calculations are done for the different necessary functions in the building (see Appendix G). Sound recording rooms require the best possible



Figure 209: Section through voice booth floor.



Figure 210: Section through voice booth ceiling.

Cinema isolation



Figure 211: Section through cinema ceiling.

isolation from external noise. These spaces are designed as a 'box in a box' by separating and isolating the walls, floors and ceilings from the building structure. The air cavity created between the two brick layers is filled with acoustic glass fibre. In the cinema however, double cavity walls with acoustic glass fibre provide sound isolation to prevent motion picture noise from reaching the rest of the building.

To ensure acoustic isolation and noise reduction, a dedicated air-conditioning duct is supplied for the sound recording rooms. Appropriate noise reduction devices are placed in the air duct. These include sound-attenuating mufflers, silencers, diffusers, filters and lining of the inside of the duct with acoustic glass fibre (Egan, 1988:293; Lord 1986:30).

An acoustic roller shutter is used to create a separating wall between the two lecture rooms. Flexibility of space allows variations in classroom size according to the daily needs of the department. Force Shield roller shutters were designed to keep traffic noise out of European apartments and has an Ia-Value of 39dB (Rollashield, n.d.). By using double Force Shield roller shutters with a 50mm air cavity, a sufficient Ia-Value of 44dB is achieved.

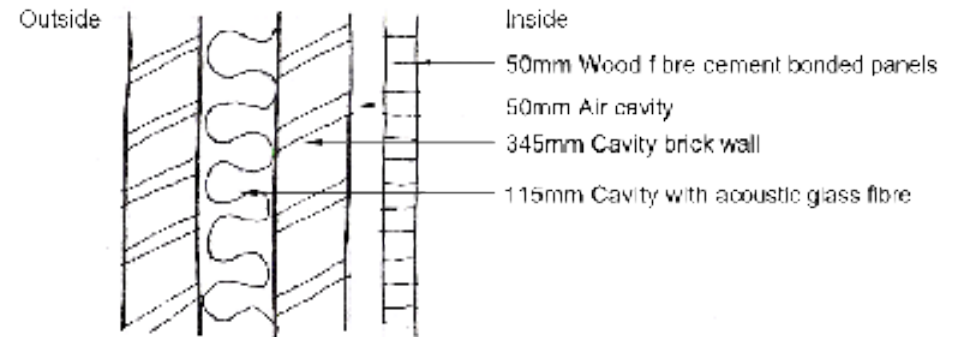


Figure 212: Section through cinema walls.



Figure 213: Force Shield roller shutter.

proposed materials

The selection of materials is influenced by various components on site. The use of brick and concrete respects the surrounding historic buildings while introducing permanence. Steel and glass represents the new and creates a contrast. Thus the contrast between tangible and intangible, solid and void is emphasized.

Concrete

All visible concrete is to be fair-faced concrete, cast in situ with smooth formwork. The formwork creates a negative imprint and essentially determines the texture of the surface (Peck, 2006:88). A smooth, non-absorbent formwork panel is proposed. The smooth skin of the concrete box on the northern façade contrasts with the textured steel and glass skin. The concrete box breaks free of the façade, creating a large frame within which the library is visible. A consistent arrangement of the formwork panels during construction ensures that the formwork tie holes are regularly spaced over the entire façade wall. Expansion joints should coincide with formwork joints. The formwork joints are subtle repeats of the rhythm of the glass-louvered façade.

Brick

Red face brick is used to relate to the adjacent historic buildings. Brick creates a solid, tangible envelope. Bricks are to be laid in stretcher bond with flush joints.



Figure 214: Crematorium Berlin, Axel Schultes Architekten.



Figure 216: Fair-faced concrete.



Figure 215: Parish Centre, Thalmassing, Meck Architekten.

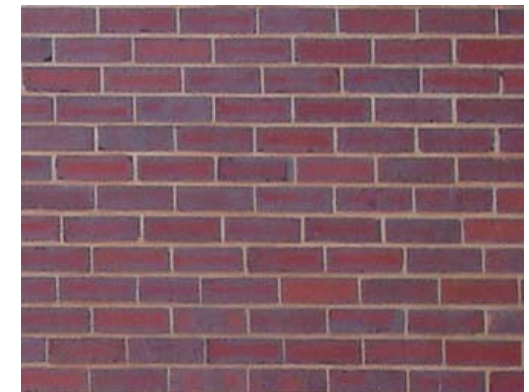


Figure 217: Red brick.

Steel

Steel is introduced in the roof structure and as structural members of the glass façade. Steel stairs and walkways include galvanised steel chequered plate steps to establish a lightweight industrial appearance. As an alternative to “vastraplaat” or chequered plate sheet metal, a fine rib pattern is used.

Glass

Glass represents “the void” or the intangible aspect of the design. Transparent and translucent types of glass are used respectively, according to the orientation and climatic demands of the building. Movement behind translucent glass generates shadows, animating the exterior surfaces. Where projections are screened onto the glass, these shadows interfere with the motion picture and the user becomes entwined with the images. On the northern façade light blue glass with a transparent dotted pattern is applied to the vertical glass louvres to reduce solar heat gain. The laminated glass louvres are 10mm thick to withstand wind pressure. On the solid façades small windows are placed at significant points to frame specific views to the outside. For example, a slender horizontal slice of city is viewed through the western stairway wall. These windows are framed by concrete elements, incorporating window sills and lintels. In the interior, simple glass balustrades and glass partitions in meeting rooms suggest transparency of function. Safety glass is to be used on all balustrades.



Figure 219: Ribbed sheet metal.



Figure 218: “Vastraplaat”.



Figure 220: Glass louvres design.



Figure 221: Transparent dot pattern of the blue film.



Figure 222: Glass balustrade design.

technology

HoloPro™ transparent surface projections

The HoloPro™ Company specialises in the manufacture of transparent projection surfaces capable of showing video projections with daylight brightness (Ritter, 2007:36). HoloPro™ allows rear or front projection onto a glass surface under any light conditions while maintaining transparency (Gatehouse Design, 2008). A sharp image with high contrast is generated. The image or motion picture becomes a component of the space and the transparency of the projection surface allows innovative presentation possibilities.

The patented HoloPro™ technology contains holographic elements beamed with a laser onto a highly transparent film. The film is then embedded between two layers of glass (Pronova, n.d.). A beam of light from the projector hits the glass at a certain angle and the light is then redirected to the viewer.

HoloPro™ comes in an interactive touch-screen format which allows the viewer to interact with the information through computer software. Therefore the HoloPro™ film applied to the glass partition walls of meeting rooms allows multimedia presentations to be projected onto the glass. The room becomes part of the presentation and the image becomes part of the room.



Figure 223: HoloPro™ in exhibitions.



Figure 224: HoloPro™ on a building façade.



Figure 225: HoloPro™ with interactive software.

At the **Deutsche Forschungsgemeinschaft** in Bonn, Michael Bleyenbergh applied a HoloPro™ façade. A fixed motif is used as a living advertising screen while the windows remain transparent.

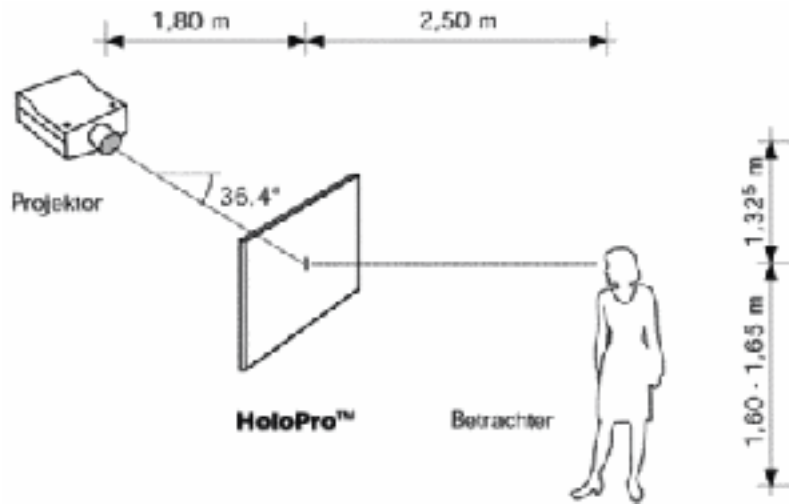


Figure 226: HaloPro™ specifications.

Figure 227



Figure 228: Deutsche Forschungsgemeinschaft.

Figure 229: Eystep.

Interactive surfaces

An interactive system, developed by Mindstorm as iSurface™, projects digital effects on walls, floors and other surfaces. Full body interaction is achieved as intuitive human motion stimulates a reaction from the wall or floor display.

For example, a fish pond can be projected onto a floor surface. When someone walks over the water they see ripples forming, hear the sound of their footsteps and see fish swimming away from their feet. A similar application was introduced in **Brooklyn Mall**, Pretoria. The display causes people to stop and children to chase the fish around.

An infrared motion tracking kit detects motion and transmits it to a software program on a computer. The software processes the movement and changes the image accordingly (Luminvision, 2007). The interactive software can easily be adapted to display any custom image or motion picture.



Figure 230: iSurface™.

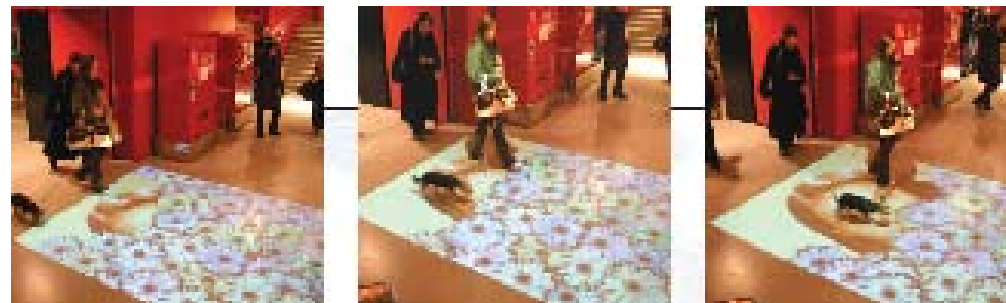


Figure 231: Eystep interactive floor.

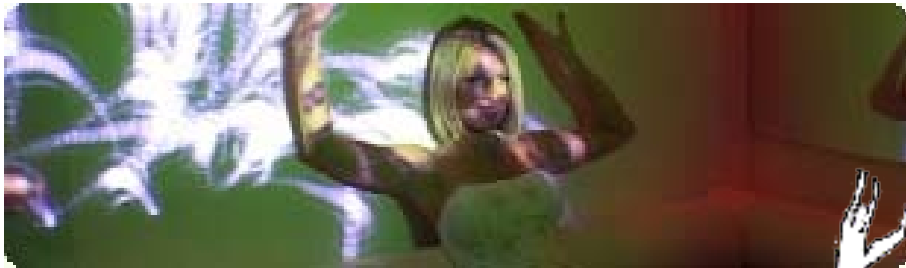
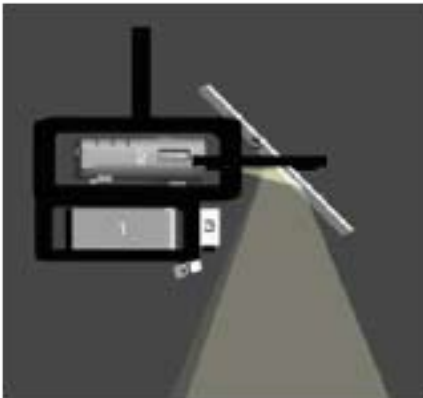


Figure 232: iWall™.



For floor projection the projector and tracking kit are mounted above the floor, projecting down. The computer can either be mounted with the projector or placed in another location. Both front and rear projections onto walls are possible (Mindstorm, 2007).

Figure 233: Floor projection specifications.



1. Computer with software
2. Projector
3. Tracking kit camera
4. Tracking kit IR illuminator
5. First surface mirror



Figure 234

The digital displays throughout the proposed building interact with passers-by and stimulate user participation. When someone walks along the interactive wall, projected silhouettes of people follow them, jumping and running along the wall.



Figure 236: Brooklyn Mall ceiling.

Figure 235: Brooklyn Mall floor, interactive fish pond.





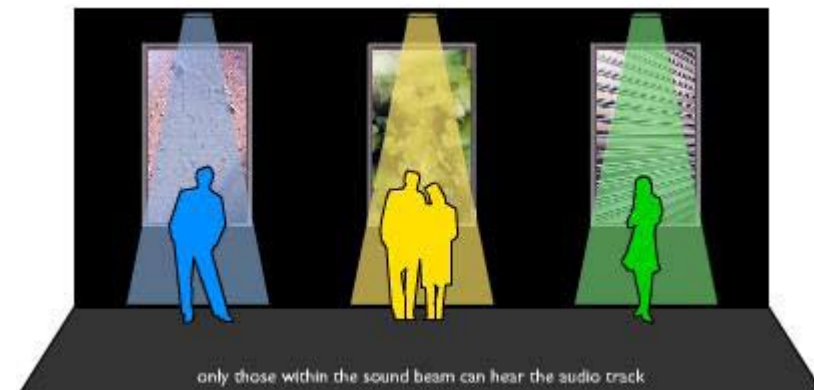
Figure 237: A & E Billboard.

Audio Spotlight®

Holosonic Research Labs developed the Audio Spotlight® system which directs sound to a specific area. By using only ultrasound, a narrow beam of sound is generated. Ultrasound contains frequencies outside the human range of hearing. However, as the ultrasound beam travels through the air, the properties of the air cause the ultrasound to distort. The distortion generates frequencies in the audible bandwidth (Holosonic Research Labs, 2002).

Blue Blast Media revived the traditional billboard by incorporating sound, using the Audio Spotlight® system. Mounted above the **A & E Billboard** in Manhattan, the system projects an isolated sound beam onto a targeted area of the sidewalk. People who pass by the billboard hear the sound of a woman whispering, saying “Who’s there? Who’s there? It’s not your imagination” (Holosonic Research Labs, 2002). Since the sound is targeted at a specific area, environmental noise is avoided. As the passer-by enters the beam he hears the sound immediately and clearly.

Figure 238: Directed sound.



The Audio Spotlight® system can therefore be used to project beams of sound from one area in the proposed building to another. For example, sound from the cinema can be projected to the courtyard corner, while sound from the recording room can be projected to the waiting lobby. The transparency of the building's processes creates a sensory experience, stimulating both audio and visual perceptions.



Figure 239: Audio Spotlight® system.

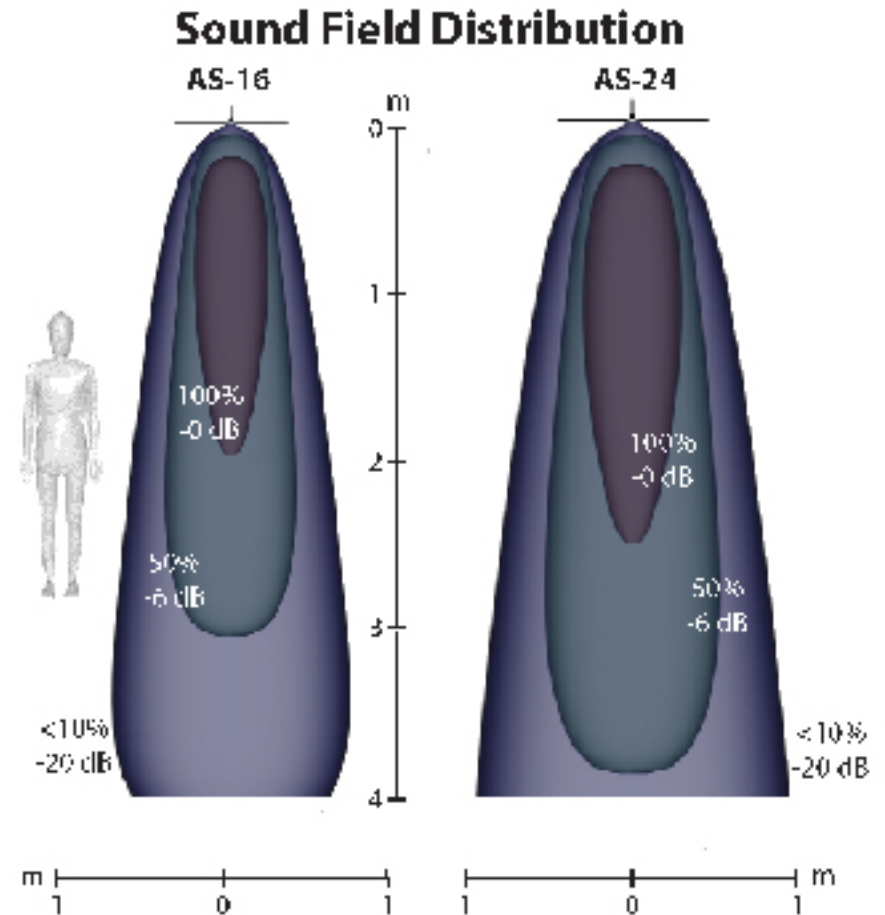


Figure 240: Audio Spotlight® specifications.

conclusion



Following an exploration of the relationship between architecture and film, as well as a study of the current technologies used in the film industry, a building was designed which incorporates the facilities necessary to teach motion picture production. The locality of the chosen site emphasizes the transition from public to private. An understanding of the site generated a building designed to act as a threshold. Therefore, the proposed building aims to achieve a visual display of identity on the South Campus. Members of the public and private users are all invited to experience the learning process and the process of motion picture production. Through the dissertation I have gained an awareness of the spatial experiences generated through movement, and the technical competence necessary to design an interactive building.

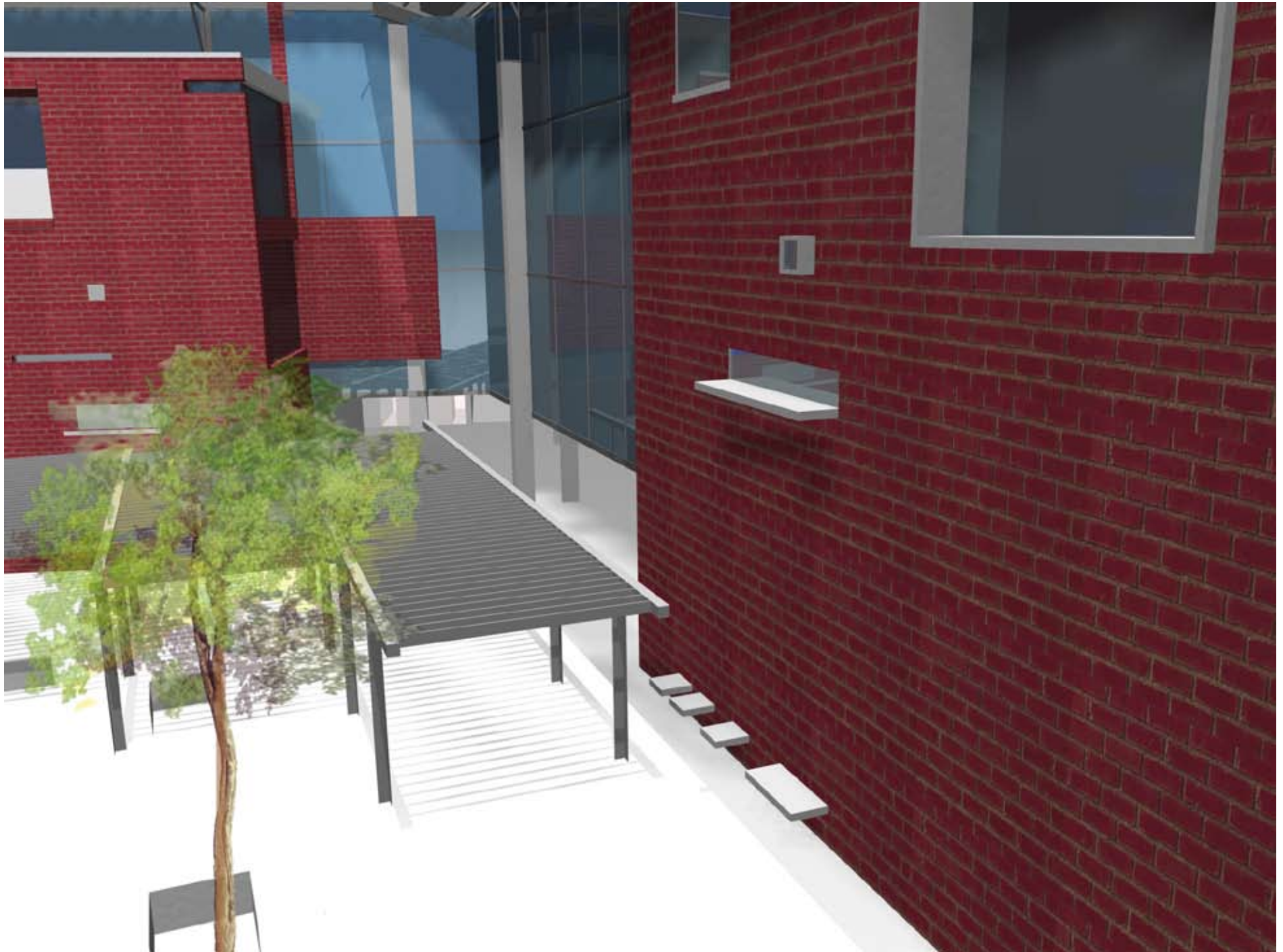


Figure 242:
Proposed
perspective view
of the internal
courtyard.

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appendix



appendix a: proposed Bus Rapid Transport route

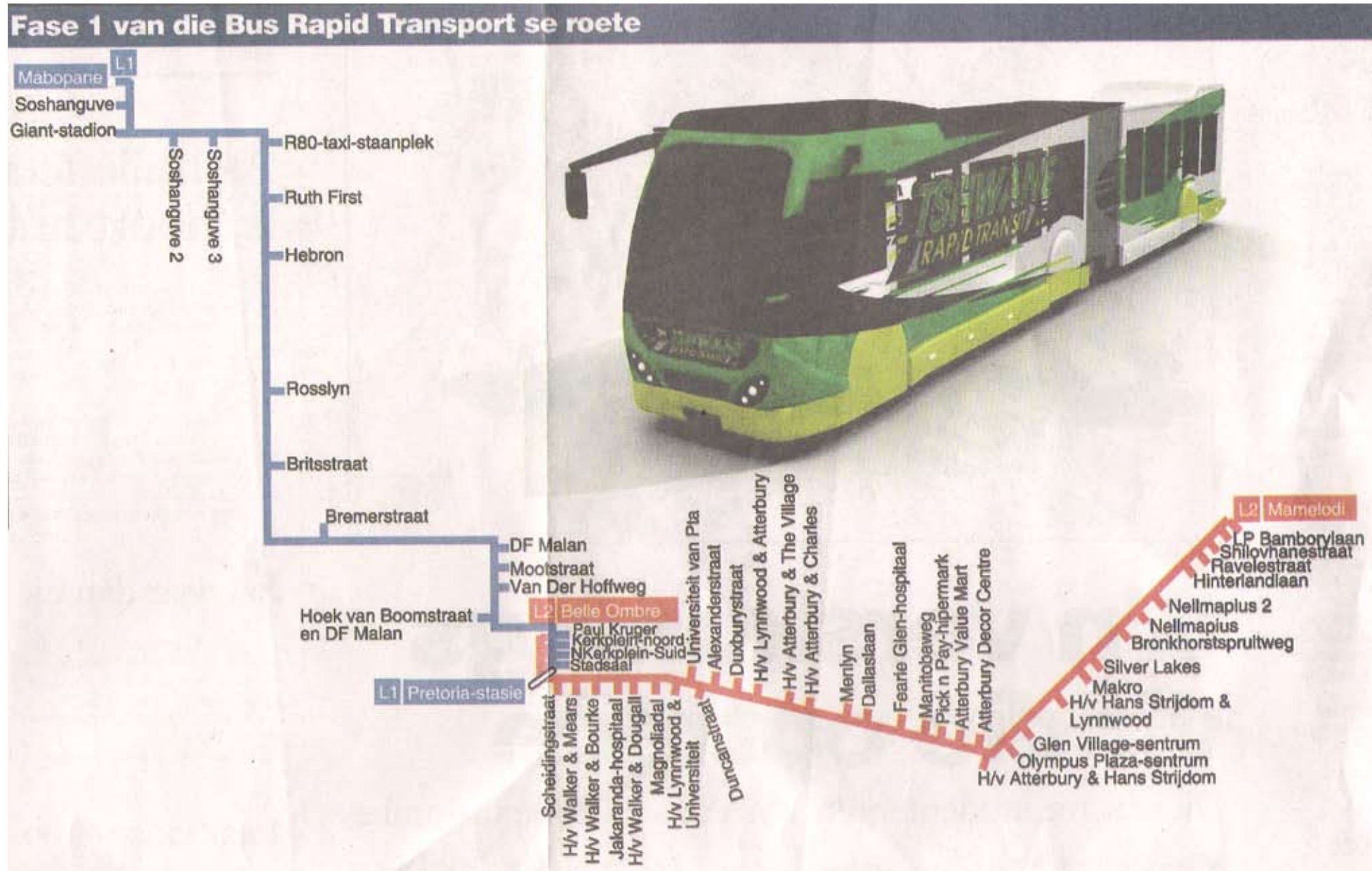


Figure 245: Newspaper article indicating proposed BRT route.

appendix b: group framework

The framework developed by the master's thesis graduate group of 2008 has the following aims: To transform the University of Pretoria and the Hatfield precinct into a **UNIVERSITY CITY**, an integrated, networked city of innovation and social cohesion, where the public sector interfaces with the private sector and the academic sector; to remove physical, social and virtual boundaries that are constraining the growth of both the university and the Hatfield precincts, and create a social amalgam that celebrates and empowers the uniqueness, vitality, potential and culture of South Africa's premier academic community.

This transformation entails a two-phased proposal with a single vision as driving force: it consists of the transformation of the university into a "University City" and concurrently the transformation of Hatfield into a diverse, vibrant and regenerative social hub that facilitates the conception of this University City.

University village

The University of the Future is the University of Pretoria is a City of Knowledge. The UP as a village is the first step in achieving the vision of the university as a city: a village that is the "brain" of the "University City", a village where the urban fabric is designed at a human scale, where the buildings become nodes of human and social interaction, and exterior spaces act as outdoor rooms for academic discourse and social play; a village that has its own tangible and definable character, identity and vitality; a village that has clarity of circulation dominated by pedestrians; a village that is designed to have a vibrant and cultural night life. The university village will function as a community, working as an interrelated whole, as a symbolic relationship of allied units. The transformation of the university into a village will prepare it to continue functioning as a holistic entity when integrated with the "University City" precinct.

Social hub

The Hatfield precinct is to be developed to create a destination, a place of continual social, cultural and civic regeneration; a place that defines itself as the vibrant, multifunctional "body" of the "University City". Hatfield is to be the gateway of the "University City" precinct. Hatfield's continual transformation will be driven by the creation of interdependent nodes, including transport, mixed use, culture, commerce and political activities, allowing a dynamic interface for social expression. Hatfield must become a place for the people – for businessmen, academics, students, professionals, politicians, workers; Hatfield must be a place for all.

The University City

To achieve the University of Pretoria's strategic objective of becoming a world class research institute, two vibrant, successful, independent and isolated entities – the Hatfield "social hub" and the "university village" – need to merge into a coherent, spatially integrated community without boundaries and borders. The future is now and this brings with it the world of virtual places, virtual lectures, virtual libraries and virtual paths. Thus there is an urgent need to allow the surrounding community to enter the campus grounds to fully utilize those facilities that may become obsolete in the virtual age. The unification of these two distinct identities must not allow the dissolution of either entity's unique identity, but must rather reinforce each other's key strengths and increase opportunities to allow a true city of knowledge to be born, a "UNIVERSITY CITY" (Graduate class, 2008).



Figure 246: Aerial photograph of Hatfield indicating the group framework proposal.

appendix c: natural daylight calculations



Ground floor plan 1:500

Figure 247

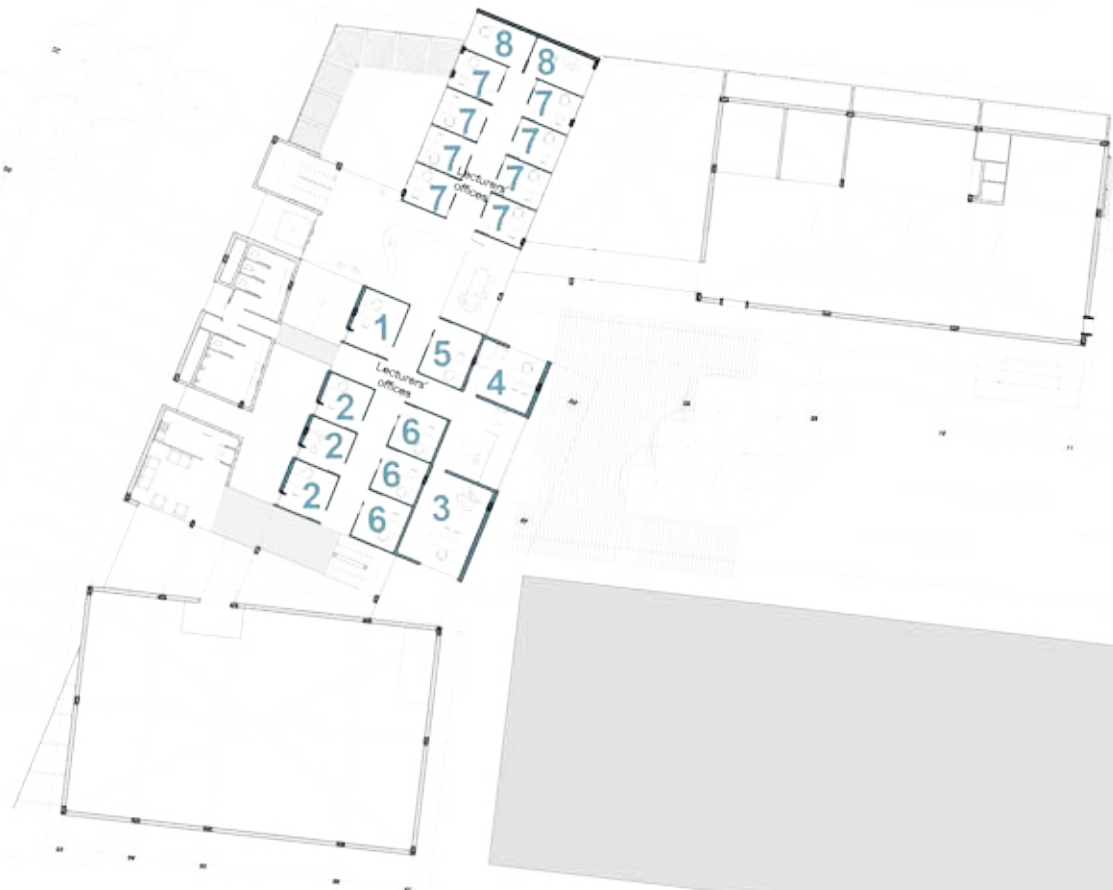
	Room	Openings (m ²)	Floor area (m ²)	% Openings
First floor				
1	Video editing	4.3	37.4	11.6%
2	Sound editing	12.6	11.8	107.1%
3	Server room	5.0	34.0	14.8%
4	Meeting room	14.4	17.6	81.8%
5	Meeting room	5.4	17.6	30.7%
6	Production design studio	63.5	288.5	22.0%



First floor plan 1:500

Figure 248

	Room	Openings (m ²)	Floor area (m ²)	% Openings
Second floor				
1	Office	2.5	11.4	21.7%
2	Office	2.5	9.0	27.4%
3	Office	7.0	26.6	26.4%
4	Office	7.0	15.7	44.6%
5	Office	1.6	11.4	13.8%
6	Office	1.2	9.0	13.3%
7	Office	6.3	7.8	80.6%
8	Office	6.3	10.0	62.5%



Second floor plan 1:500

Figure 249

appendix d: water harvesting calculations

Usage / day		Usage / day		Usage / day	
	Actual		Actual	Liters/ day	
Students	300	Toilets			
Hours in building / person	8	Liters per flush ^(Kohler, 2008)	6.0		
Staff + cleaners	25	Flushes per man per day ^(Kohler, 2008)	1.0	392.4	
Hours in building / person	8	Flushes per woman per day ^(Kohler, 2008)	3.0	1177.2	
Daily visitors (cinema)	180	Urinals			
Hours in building / person	3	Liters per flush	4.0		
Man hours occupied per day	3140	Flushes per man per day	3.0	784.8	
Effective number of people per 24h day	130.8	Bathroom sink			
% of males	50%	Liters per minute	8.0		
% of females	50%	Seconds per hand wash	15.0		
Effective number of males per day	65.4	Number of bathroom visits/ day (man)	261.6	523.2	
Effective number of females per day	65.4	Number of bathroom visits/ day (woman)	196.2	392.4	
		Kitchen / snack bar			
		Liters per dishwasher by hand	30		
		Hand washes per day	5	150.0	
		Liters per steam dishwasher	10		
		Steam washes per day	20	200.0	
		Other			
		Building washing + cleaning	200	200.0	
		Model building	50	50.0	
				<u>3870.0</u>	liters/day
				<u>3.87</u>	k/ day = m3 / day
			6.0		occupied days / week

Roof catchments

Catchments area (m ²)	1404.39
Precipitation average annual in PTA (mm)	674
Catchable	75%
Total usable precipitation (mm)	505.5
Total usable precipitation (m)	0.5055
Volume of water (m ³)	710
Liters	709,919

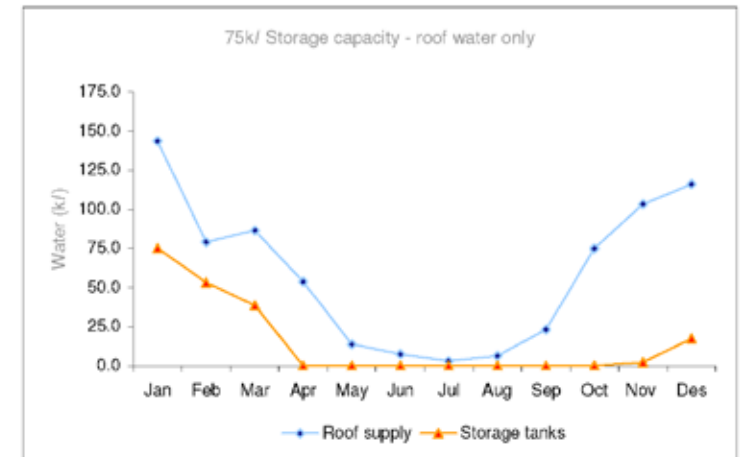
JOJO (diameter 2.6m, height 4.2m)

Storage	
JOJO volume (k/l)	15
Amount of tanks	5
Total storage (k/l)	75

Roof water only (k/l water/ month)

	mm	Rain (l)	Roof supply	Wetland	Total in	Total out	Difference	Storage tanks
Jan	136	143,248	143.2	0.0	143.2	100.9	42.4	75.0
Feb	75	78,997	79.0	0.0	79.0	100.9	-21.9	53.1
Mar	82	86,370	86.4	0.0	86.4	100.9	-14.5	38.6
Apr	51	53,718	53.7	0.0	53.7	100.9	-47.2	0.0
May	13	13,693	13.7	0.0	13.7	100.9	-87.2	0.0
Jun	7	7,373	7.4	0.0	7.4	100.9	-93.5	0.0
Jul	3	3,160	3.2	0.0	3.2	100.9	-97.7	0.0
Aug	6	6,320	6.3	0.0	6.3	100.9	-94.6	0.0
Sep	22	23,172	23.2	0.0	23.2	100.9	-77.7	0.0
Oct	71	74,784	74.8	0.0	74.8	100.9	-26.1	0.0
Nov	98	103,223	103.2	0.0	103.2	100.9	2.3	2.3
Des	110	115,862	115.9	0.0	115.9	100.9	15.0	17.3
		709,919	709.9		709.9			

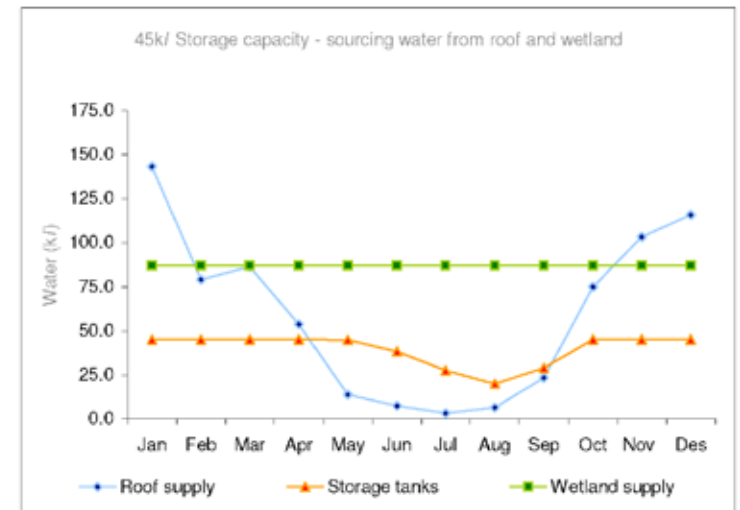
Figure 250



Roof water and wetland (k/l water/ month)

	mm	Rain (l)	Roof supply	Wetland supply (12% of minimum flow in winter)	Total in	Total out	Difference	Storage tanks
Jan	136	143,248	143.2	86.9	230.2	100.9	129.3	45.0
Feb	75	78,997	79.0	86.9	165.9	100.9	65.0	45.0
Mar	82	86,370	86.4	86.9	173.3	100.9	72.4	45.0
Apr	51	53,718	53.7	86.9	140.7	100.9	39.8	45.0
May	13	13,693	13.7	86.9	100.6	100.9	-0.3	44.7
Jun	7	7,373	7.4	86.9	94.3	100.9	-6.6	38.2
Jul	3	3,160	3.2	86.9	90.1	100.9	-10.8	27.4
Aug	6	6,320	6.3	86.9	93.3	100.9	-7.6	19.7
Sep	22	23,172	23.2	86.9	110.1	100.9	9.2	28.9
Oct	71	74,784	74.8	86.9	161.7	100.9	60.8	45.0
Nov	98	103,223	103.2	86.9	190.2	100.9	89.3	45.0
Des	110	115,862	115.9	86.9	202.8	100.9	101.9	45.0
		709,919	709.9	1043.3	1753.2	1210.8		

Figure 251



appendix e: acoustic absorption calculations

Absorption

Total room absorption = sum of all room surface areas times their respective sound absorption coefficients

$$A = \sum S \cdot \alpha$$

A: total room absorption (Sabins) {or m²}
S: surface area (m²)
 α : Sound absorption at given frequency

NRC (noise reduction coefficient) refers to a single number rating of the sound absorption coefficient of a material. Thus using NRC instead of α gives a good approximation of sound absorption over all frequencies.

Material (Reflecting / Absorbing)	NRC Number
Walls	
Brick / plaster / concrete (Zyl, 2005)	0.02
Glass (heavy, large panels, e.g. 6mm) (Egan, 1988:52)	0.05
Glass (ordinary windows, e.g. 4mm) (Egan, 1988:52)	0.15
10mm Carpet against brick wall (Zyl, 2005)	0.30
25mm Wood fibre cement bonded panel with 25mm cavity	0.46
Mellosorber Acoustic Panels 90mm	0.96
Roller shutter: RAUVOLET Acoustic Line (Rehau, 2007)	0.80
Floors	
Concrete / tiles (Egan, 1988:52)	0.01
20mm Thick plank floor on joists (Zyl, 2005)	0.10
10mm Carpet on concrete (Zyl, 2005)	0.30
10mm Carpet on wooden floor joists (Zyl, 2005)	0.35
6mm Carpet on 10mm underfelt (Zyl, 2005)	0.50

Material (Reflecting / Absorbing)	NRC Number
Ceilings	
Gypsum board (13mm) (Zyl, 2005)	0.05
25mm Wood fibre cement bonded panel with 25mm cavity	0.46
50mm Wood fibre cement bonded panel with 40mm cavity and mineral wool	0.87
Mellosorber Acoustic Panels 90mm	0.96
Seats & Audience:	
Well-upholstered seats (Egan, 1988:52)	0.59
Informally dressed students seated in table-arm chairs (Egan, 1988:52)	0.84
Audience seated in upholstered seats (Egan, 1988:52)	0.87

Reverberation time

$$T = 0.16 V/a$$

T: reverberation time in seconds
V: room volume in m³
a: room absorption in Sabins

Preferred range of reverberation time (seconds):

	Min	Ideal	Max
Recording: Voice booth (Egan, 1988:64)	0.3	0.5	0.7
Recording: Control Room (Lord & Templeton, 1986:91) (Doelle, 1972:120)		0.4	
Cinema		Max. absorption	
Lecture room (Egan, 1988:64)	0.6	0.9	1.5

Voice booth 1

Room	l (m)	b (m)	h (m)	Volume m ³ (V)	
Voice booth 1	3.50	2.55	2.56	22.85	
Surface	Area (m ²)	Material	NRC	Absorption	
<i>Floor total</i>	<i>8.93</i>				
Floor	8.93	20mm Plank floor on joist	0.10	0.89	
<i>Walls total</i>	<i>30.98</i>				
Door 2.1 x 0.8m	1.68	2x Solid wood with 200mm cavity	0.1	0.17	
Window 2.0 x 1.3m	2.60	Double pane glass	0.05	0.13	
Walls	26.70	10mm Solid wood with 25mm cavity	0.10	2.67	
<i>Ceiling total</i>	<i>8.93</i>				
Ceiling	8.93	25mm Wood fibre cement bonded panels with 25mm cavity	0.46	4.11	
Total room absorption ($A = \Sigma S \cdot \alpha$)				7.97	Sabins
Actual reverberation time ($T = 0.16 V/a$)				0.46	Seconds
<i>Min</i>				<i>0.30</i>	
<i>Ideal</i>				<i>0.50</i>	
<i>Max</i>				<i>0.70</i>	

Recording 1

Room	l (m)	b (m)	h (m)	Volume m ³ (V)	
Recording 1	5.10	3.70	2.56	48.31	
Surface	Area (m ²)	Material	NRC	Absorption	
<i>Floor total</i>	<i>18.87</i>				
Floor	18.87	10mm Carpet on concrete	0.30	5.66	
<i>Walls total</i>	<i>45.06</i>				
Door 2.1 x 0.8m	1.68	2x Solid wood with 200mm cavity	0.1	0.17	
Door 2.1 x 0.8m	1.68	Solid wood	0.1	0.17	
Window 2.0 x 1.3m	2.60	Double pane glass	0.05	0.13	
Window 2.0 x 1.3m	2.60	Double pane glass	0.05	0.13	
4x Acoustic panels	2.88	Mellosober 1.2 x 0.6m	0.96	2.76	
Walls	33.62	Plaster	0.02	0.67	
<i>Ceiling total</i>	<i>18.87</i>				
Ceiling	18.87	25mm Wood fibre cement bonded panels with 25mm cavity	0.46	8.68	
Total room absorption ($A = \sum S \cdot \alpha$)				18.37	Sabins
Actual reverberation time ($T = 0.16 V/a$)				0.42	Seconds
<i>Ideal</i>				<i>0.40</i>	

Voice booth 2

Room	l (m)	b (m)	h (m)	Volume m ³ (V)	
Voice booth 2	8.30	3.50	2.56	74.37	
Surface	Area (m ²)	Material	NRC	Absorption	
<i>Floor total</i>	<i>29.05</i>				
Floor	29.05	20mm Plank floor on joist	0.10	2.91	
<i>Walls total</i>	<i>60.42</i>				
Door 2.1 x 0.8m	1.68	2x Solid wood with 200mm cavity	0.1	0.17	
Window 4.0 x 1.3m	5.20	Double pane glass	0.05	0.26	
Window 4.0 x 1.3m	5.20	Double pane glass	0.05	0.26	
Walls	48.34	25mm Wood fibre cement bonded panels with 25mm cavity	0.46	22.23	
<i>Ceiling total</i>	<i>29.05</i>				
Ceiling	29.05	25mm Wood fibre cement bonded panels with 25mm cavity	0.46	13.36	
Total room absorption (A = Σ S.α)				39.19	Sabins
Actual reverberation time (T = 0.16 V/a)				0.30	Seconds
<i>Min</i>				<i>0.30</i>	
<i>Ideal</i>				<i>0.50</i>	

Recording 2

Room	l (m)	b (m)	h (m)	Volume m ³ (V)	
Recording 2	8.30	2.90	2.62	63.06	
Surface	Area (m ²)	Material	NRC	Absorption	
<i>Floor total</i>	<i>24.07</i>				
Floor	24.07	10mm Carpet on concrete	0.30	7.22	
<i>Walls total</i>	<i>58.69</i>				
Door 2.1 x 0.8m	1.68	2x Solid wood with 200mm cavity	0.1	0.17	
Door 2.1 x 0.8m	1.68	Solid wood	0.1	0.17	
Window 4.0 x 1.3m	5.20	Double pane glass	0.05	0.26	
Window 2.0 x 1.3m	2.60	Double pane glass	0.05	0.13	
6x Acoustic panels	4.32	Mellosober 1.2 x 0.6m	0.96	4.15	
Walls	43.21	Plaster	0.02	0.86	
<i>Ceiling total</i>	<i>24.07</i>				
Ceiling	24.07	25mm Wood fibre cement bonded panels with 25mm cavity	0.46	11.07	
Total room absorption (A = Σ S.α)				24.03	Sabins
Actual reverberation time (T = 0.16 V/a)				0.42	Seconds
<i>Ideal</i>				<i>0.40</i>	

Dubbing

Room	l (m)	b (m)	h (m)	Volume m ³ (V)	
Dubbing	8.30	5.00	2.65	109.98	
Surface	Area (m ²)	Material	NRC	Absorption	
<i>Floor total</i>	<i>41.50</i>				
Floor	41.50	10mm Carpet on concrete	0.30	12.45	
<i>Walls total</i>	<i>70.49</i>				
Door 2.1 x 0.8m	1.68	Solid wood	0.1	0.17	
Window 2.0 x 2.6m	5.20	Double pane glass	0.05	0.26	
6x Acoustic panels	4.32	Mellosober 1.2 x 0.6m	0.96	4.15	
Walls	59.29	Plaster	0.02	1.19	
<i>Ceiling total</i>	<i>41.50</i>				
Ceiling	41.50	25mm Wood fibre cement bonded panels with 25mm cavity	0.46	19.09	
Total room absorption (A = Σ S.α)				37.30	Sabins
Actual reverberation time (T = 0.16 V/a)				0.47	Seconds
<i>Ideal</i>				<i>0.40</i>	

Cinema

Room	l (m)	b (m)	h (m)	Volume m ³ (V)	
Cinema	21.50	13.00	5.16	1443.00	
Surface	Area (m ²)	Material	NRC	Absorption	
<i>Floor total</i>	<i>279.50</i>				
Seats	94.50	Well upholstered seats with audience	0.87	82.22	
Floor	185.00	6mm Carpet on 10mm under felt	0.50	92.50	
<i>Walls total</i>	<i>350.70</i>				
2x Door 2.1 x 1.7m	7.14	Solid wood	0.10	0.71	
Behind screen 13 x 6m	78.00	50mm Wood fibre cement bonded panels with 50mm cavity	0.61	47.58	
Back wall 6.5 x 3.9m	25.35	50mm Wood fibre cement bonded panels with 50mm cavity	0.61	15.46	
Side Walls + Other	240.21	Carpet on concrete/brick	0.30	72.06	
<i>Ceiling total</i>	<i>279.50</i>				
Ceiling	279.50	50mm Wood fibre cement bonded panels with mineral wool in 40mm cavity	0.87	243.17	
Total room absorption ($A = \Sigma S_i \alpha_i$)				553.70	Sabins
Actual reverberation time ($T = 0.16 V/a$)				0.42	Seconds
<i>Ideal</i>				<i>Acoustically dead</i>	

Lecture room

Room	l (m)	b (m)	h (m)	Volume m ³ (V)	
Lecture room	11.80	15.00	4.47	790.50	
Surface	Area (m ²)	Material	NRC	Absorption	
<i>Floor total</i>	<i>177.00</i>				
Seats	67.00	Informally dressed students in table-arm chairs	0.84	56.28	
Floor	110.00	Tiles	0.01	1.10	
<i>Walls total</i>	<i>225.40</i>				
10x Acoustic panels	10.80	Mellosober 1.8 x 0.6m	0.96	10.37	
Acoustic roller shutter	15.00	Rauvolet shutters	0.80	12.00	
Walls	199.60	Plaster	0.02	3.99	
<i>Ceiling total</i>	<i>177.00</i>				
Ceiling - reflective	88.50	Gypsum	0.05	4.43	
Ceiling - absorptive	88.50	25mm Wood fibre cement bonded panels with 25mm cavity	0.46	40.71	
Total room absorption ($A = \sum S \cdot \alpha$)				128.88	Sabins
Actual reverberation time ($T = 0.16 V/a$)				0.98	Seconds
<i>Min</i>				<i>0.60</i>	
<i>Ideal</i>				<i>0.90</i>	
<i>Max</i>				<i>1.50</i>	

appendix f: traffic noise calculations

A traffic noise calculator was used to determine the noise levels generated by traffic (XS4All, 1998).

Inputs

- 1800 cars per hour
- 10 motorcycles per hour
- 10 heavy trucks per hour
- Speed of cars & trucks 60km/h
- Road surface: smooth asphalt
- Distance from centre of road: 25m
- Height of observer: 3m (1m landscape + 2m person)
- Assuming the ground absorbs none of the noise
- Assuming there is no reflection from the other side of the road
- Distance from intersection: 45m

Output

- **Calculated noise level = 65dB**

appendix g: acoustic isolation calculations

Construction	Ia Index (dB)
Walls	
115mm brick + 115mm cavity with glass fibre insulation + 115mm brick (Egan, 1988:204)	59
150mm solid concrete (Egan, 1988:204)	53
Floor / Ceiling	
150mm reinforced concrete (Egan, 1988:204)	55
Doors	
45mm solid core wood door (with gasket and drop seal) (Egan, 1988:204)	43
VK105 from AluGlass (AluGlass, 2007)	48
Roller Shutter	
Force Shield Roller Shutter (Rollashield, n.d.)	39

Noise design criteria:

Space	Recommended maximum background noise (dB)
Broadcast studios (Ramsey & Sleeper, 1981:43)	15-25
Movie theatres (Ramsey & Sleeper, 1981:43)	25-30
Lecture room (Farren, 2003)	< 35

Voice booth

Internal sound level ≈ External Noise Level – STC
 ≈ 70 dB (“loud”) - 59 dB (double brick + fibre glass cavity)
 ≈ 11 dB (“just audible”)

Cinema

Internal sound level ≈ External Noise Level (> traffic 65dB) – STC
 ≈ 70 dB (“loud”) - 45 dB (115mm single wall)
 ≈ 25 dB

Thus a single wall is good enough to eliminate traffic noise.

External sound level ≈ Internal Noise Level (war scene in movie) – STC
 ≈ 100 dB (“very loud”) - 59 dB (double brick + fibre glass cavity)
 ≈ 41 dB (“quiet”)

Thus a double wall is needed to eliminate internal noise from the lecture room and library.

Lecture room

Recommended noise level inside the lecture room < 35 dB

Internal sound level ≈ External Noise Level (room next door) – STC
 ≈ 70 dB (“loud”) - 39 dB (Single Force Shield roller shutter)
 ≈ 31 dB (“very quiet”)

technical drawings





Basement plan 1:500



Ground floor plan 1:500



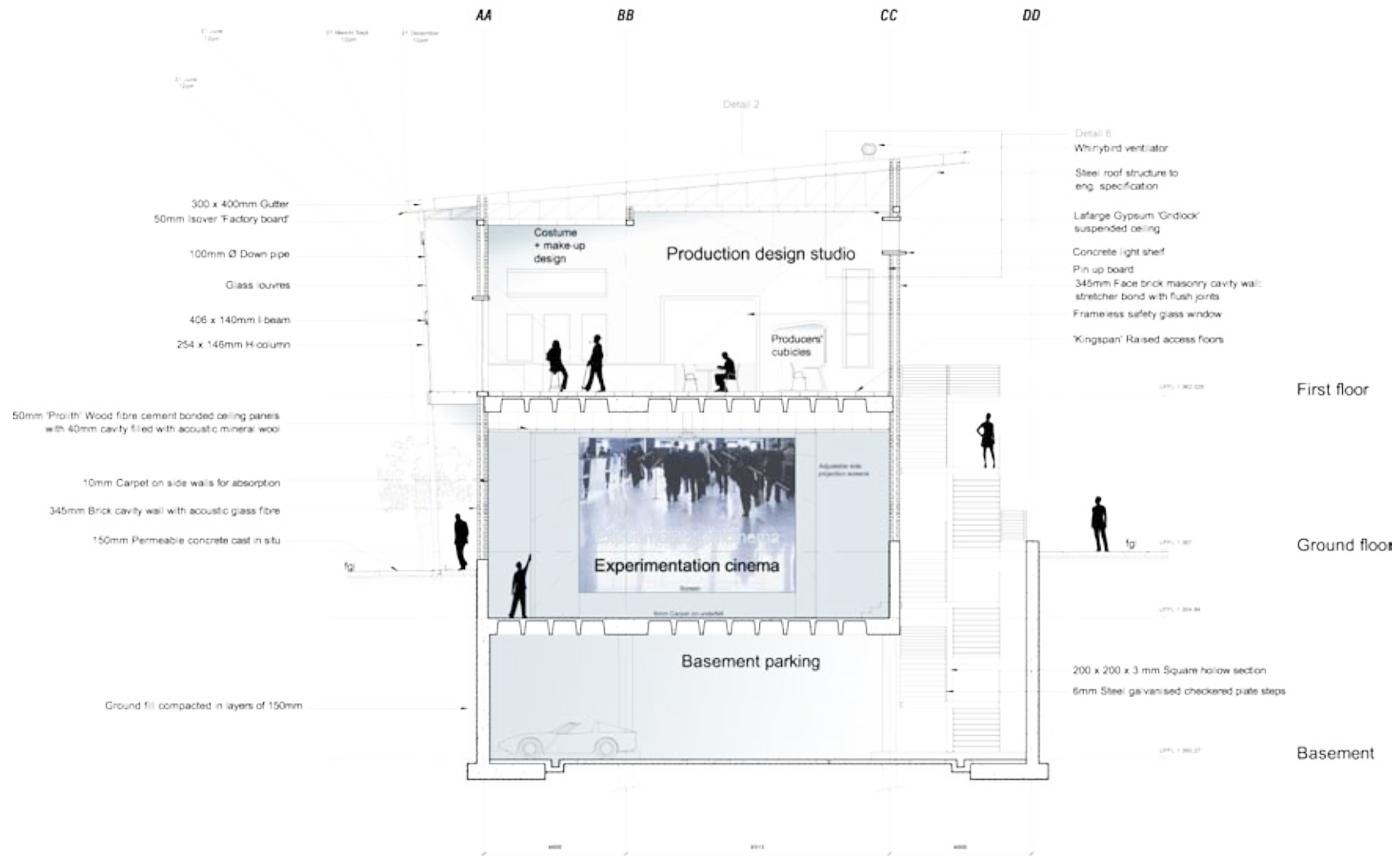
First floor plan 1:500



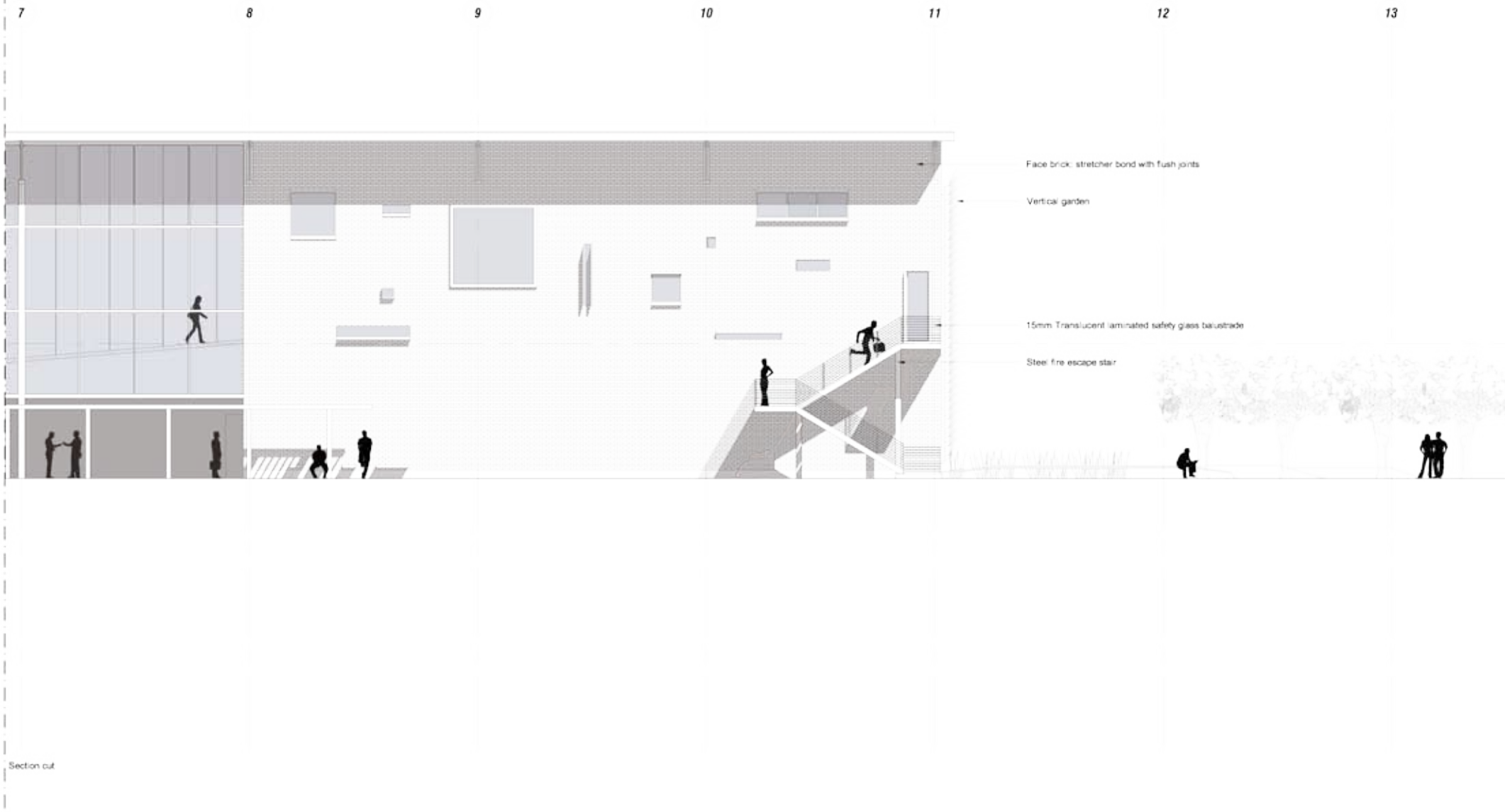
Second floor plan 1:500



Section AA 1:200



Section BB 1:200

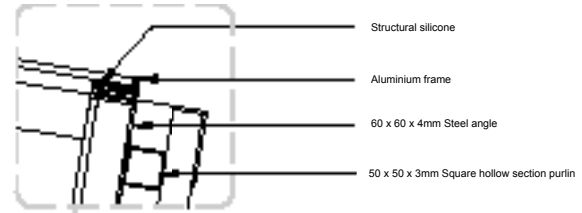


South elevation 1:200

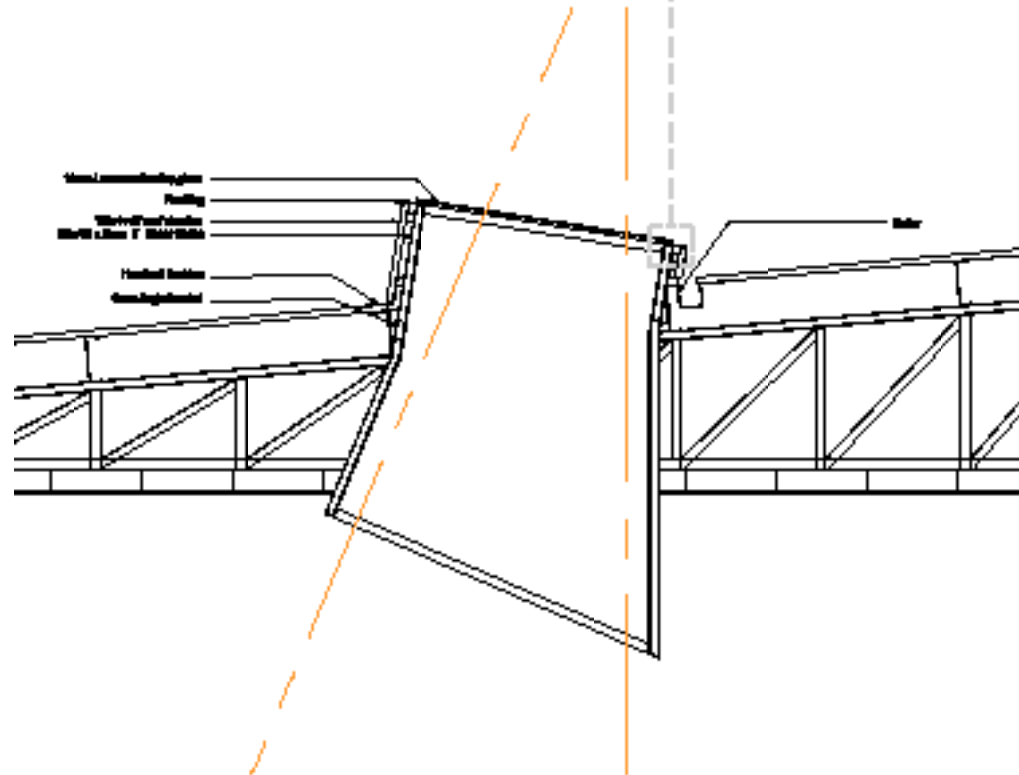


Detail 1 1:20

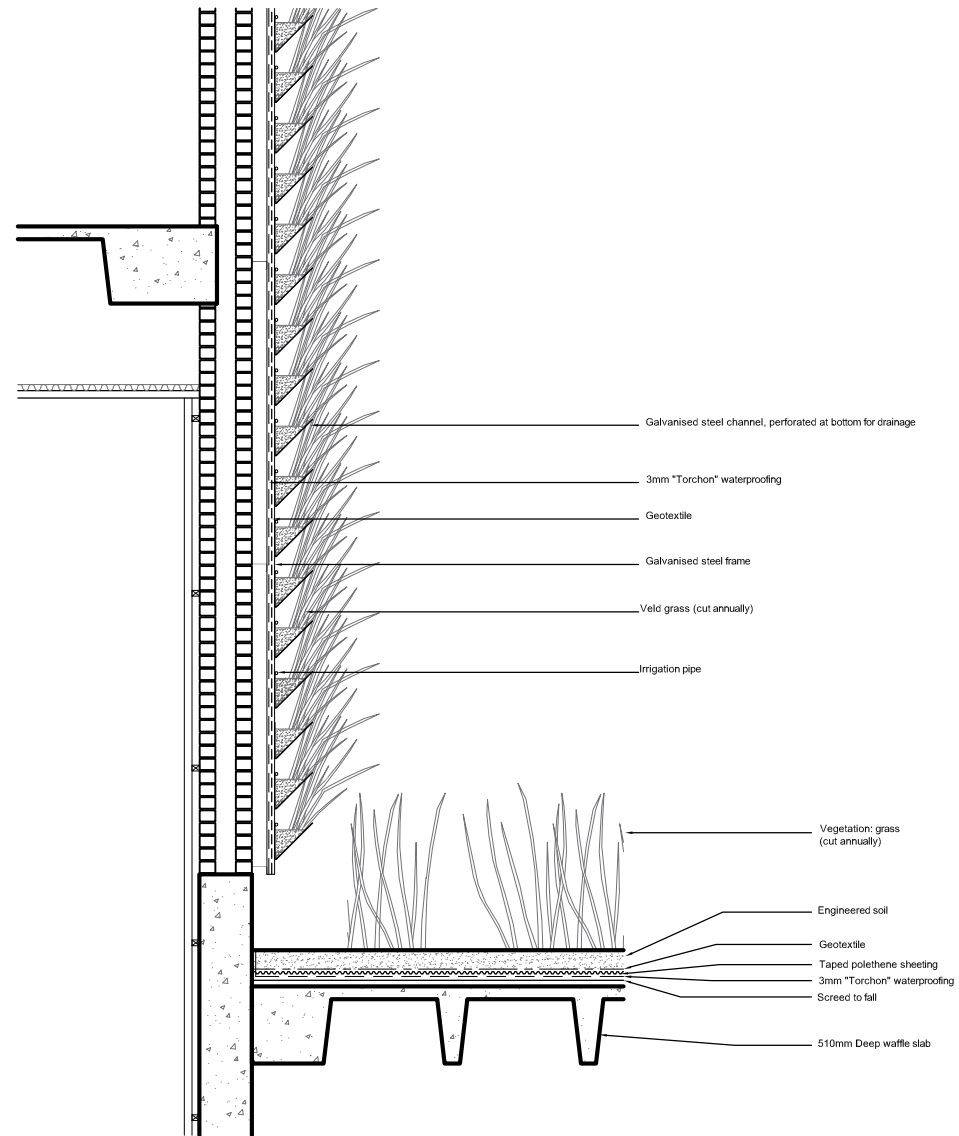
Glass louvre



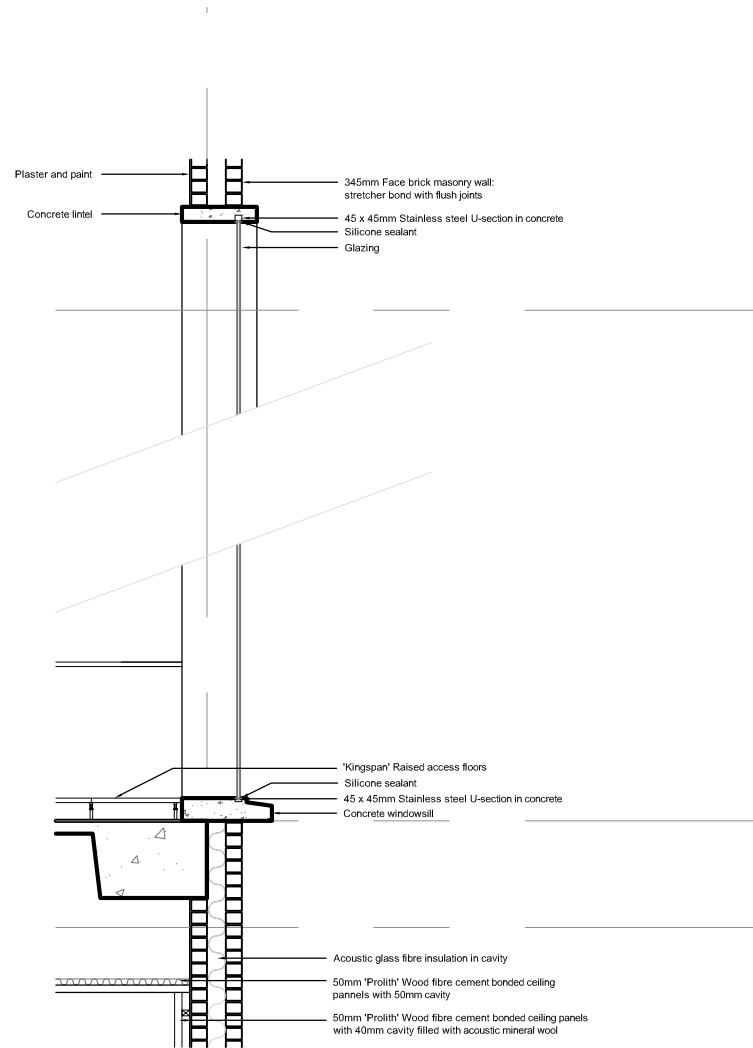
Detail 1:10



Detail 2 1:20 Light shaft

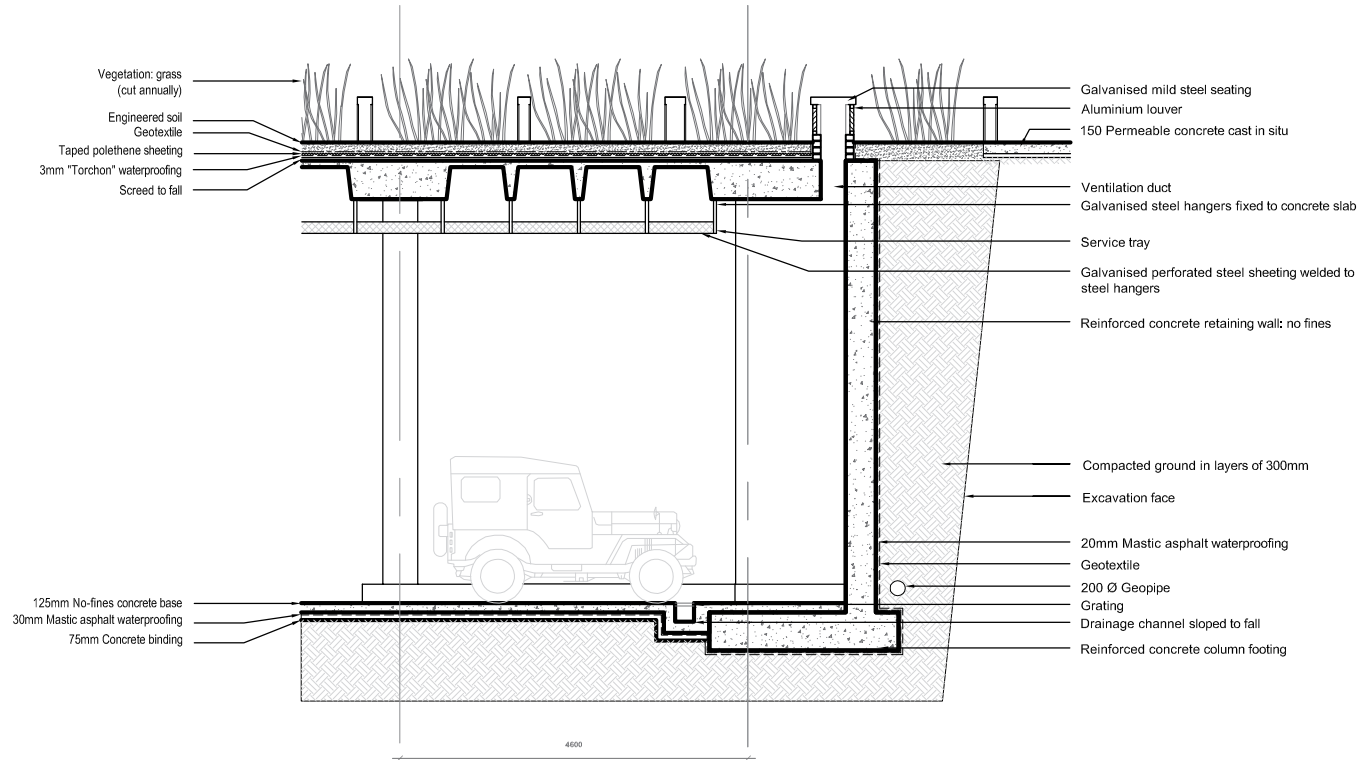


Detail 3 1:50 Vertical garden



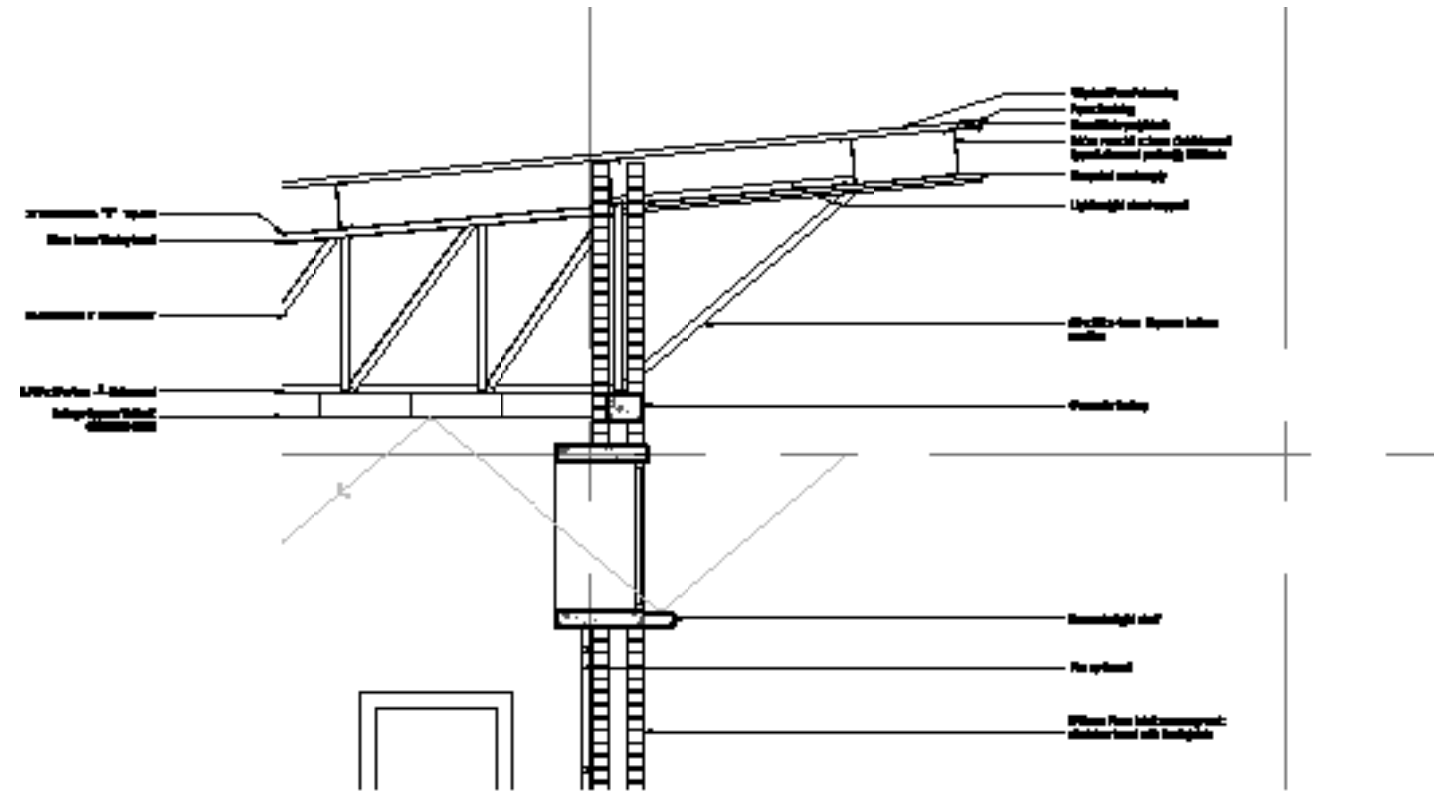
Detail 4 1:50

Frameless window



Detail 5 1:100

Basement tanking

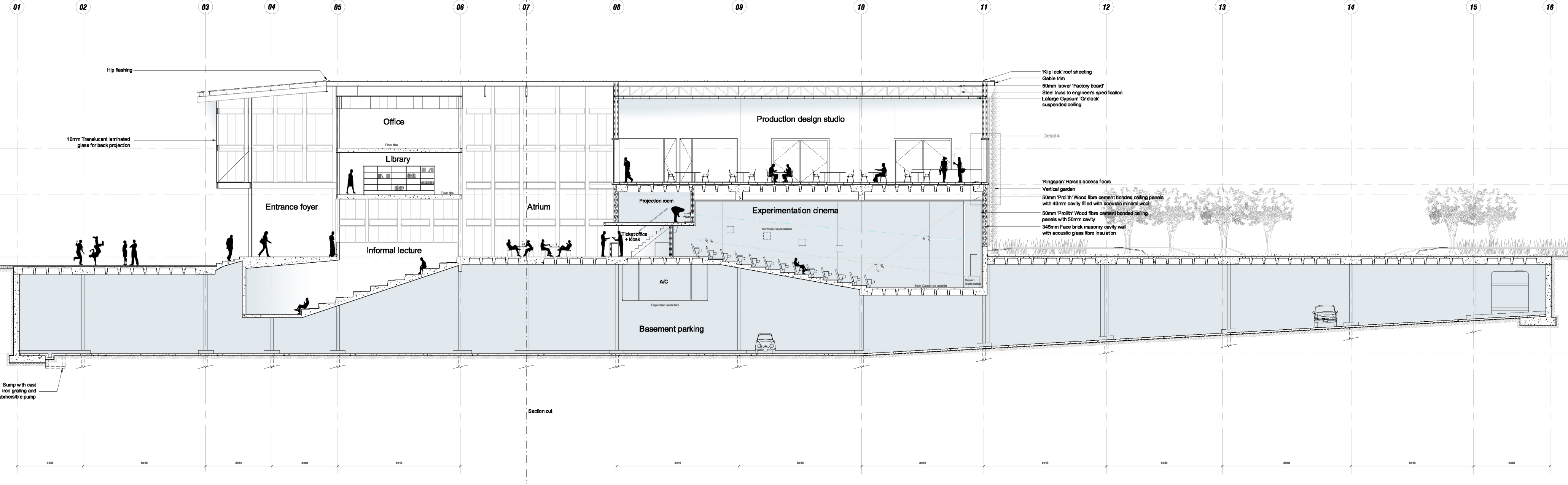


Detail 6 1:50 Edge of roof

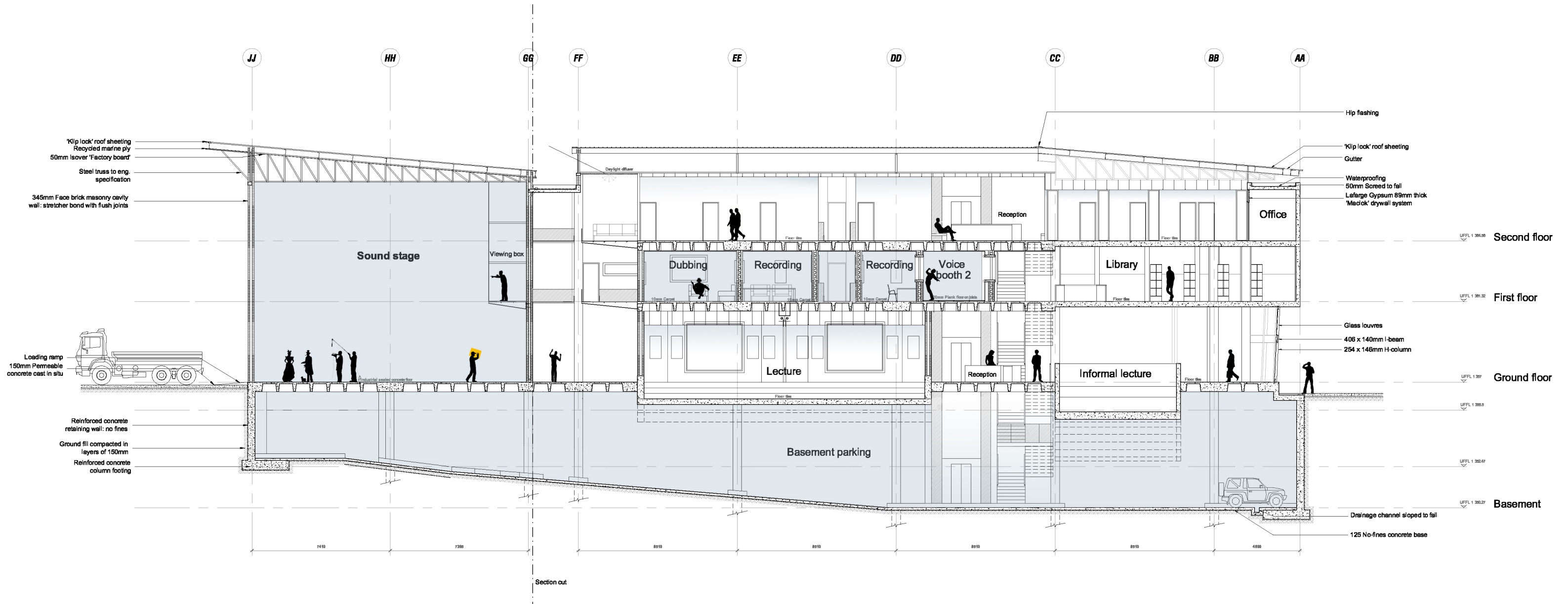


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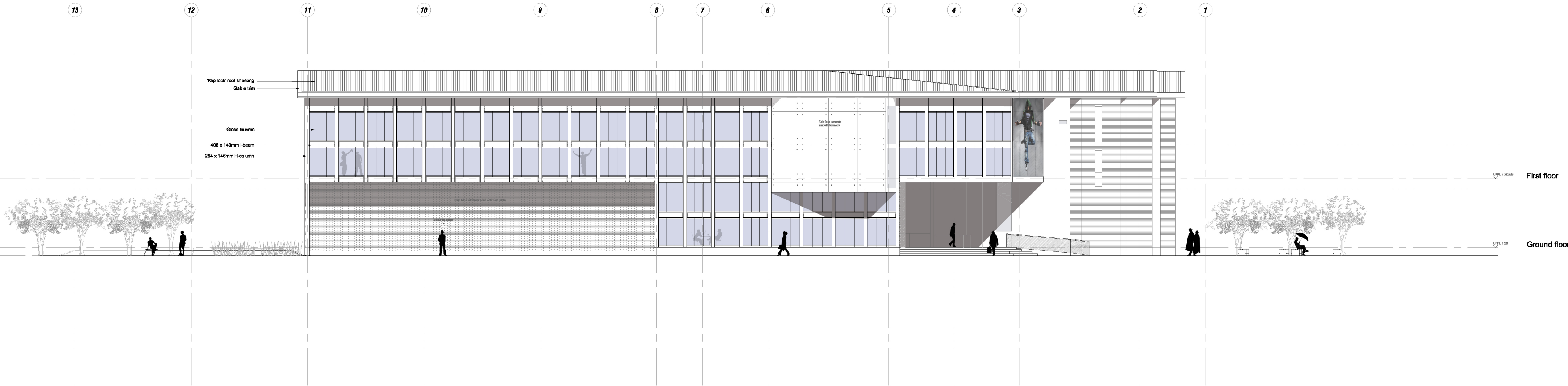
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Section CC 1:200



Section DD 1:200



North elevation 1:200