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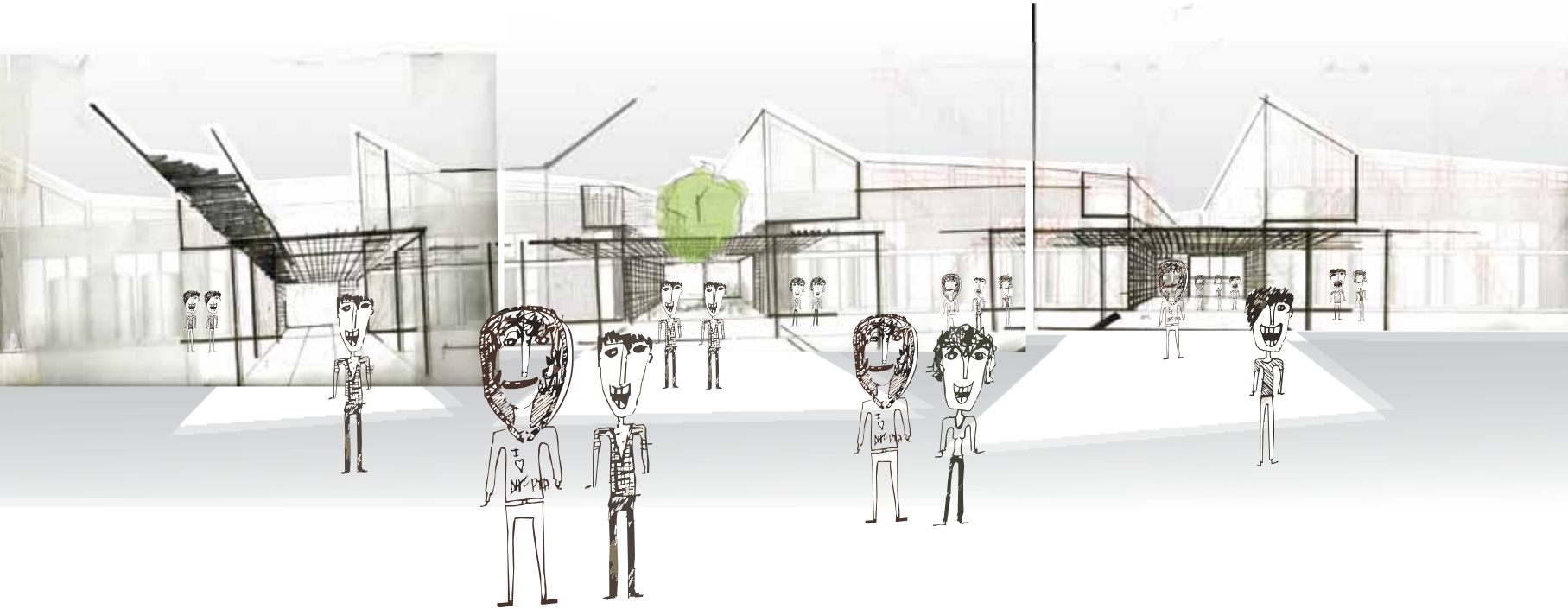
P R O D U C T I O N B E Y O N D P R O D U C T

PRETORIA WEST BIO-DIESEL PLANT - by Mias Claassens

Buitenkant Street, Pretoria West Industrial area, City of Tshwane.

Submitted in fulfilment of the requirements for the degree of Masters in Architecture (Professional) in the Faculty of Engineering, Built Environment and Information Technology, University of Pretoria, South Africa. November 2010.

Study leaders: Derick de Bruyn and Ida Breed.



*Figure 1. Visionary image of the Pretoria West Bio-diesel plant: Buitenkant Street, Pretoria West Power Station, Pretoria West Industrial area, City of Tshwane:
Author 2010.*



In 1991 a landfill just outside of New York City surpassed the Great Wall of China as the largest human-made structure on earth.

Freshkills Park will be almost three times the size of Central Park and the largest park developed in New York City in over 100 years. The transformation of what was formerly the world's largest landfill into a productive and beautiful cultural destination will make the park a symbol of renewal and an expression of how our society can restore balance to its landscape (New York City Department of Parks and Recreation, 2010).

Human demand for resources has reached unprecedented levels.

The case for an architecture that is regenerative and environmentally sustainable has never been stronger.



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In the late eighteenth century Industrial cities came to life after the development of Industrial Capitalism. The historical city that evolved around agricultural produce and a site's defensibility changed to a city focussed on production and capital accumulation. A substantial substitution of market for administrative or political location choices may perhaps be the most important difference between urban development before and after industrialization (Meyer, 2000:7). The industrial city is an urban form that evolved very quickly from the late eighteenth to the early twentieth century and just as quickly grew obsolete (Widner, 1986: 47). In this process of being obsolete it became discarded from the rest of the urban fabric, with very little or no connection, resulting in a defragmented urban fabric and urban decay.

The street plan of the Pretoria study area; Pretoria West (fig: 3) was laid out in 1892 as an extension of Pretoria Central. It was the first urban extension to the west of the city followed shortly after Arcadia, Sunnyside and Muckleneuk. Although conceived as a compensation measure for Boere Burghers, it was also indicative of the expansion and relative

wealth of Pretoria during the 1890's, following the development of gold mining on the Witwatersrand. By 1910 the area was largely developed with single-storey middle class and workers' houses. The development of the iron industry in the 1930s resulted in major factories being developed along Mitchell Street (PWIF, 2004). Today Mitchell Street is an industrial cluster that is predominantly car-related (fig: 4), mixed with the occasional concentration of commercial activities. The Pretoria West Power Station (fig: 3) and steel producer ArcelorMittal (previously known as ISCOR) are also located in the study area and are currently severely under-utilised and offering immense potential for urban regeneration. The termination of the Pretoria West Power Station in the near future, and closing-down of ArcelorMittal are considered advantageous as it, to a certain extent creates opportunities for various other types of new developments that will contribute to the diversity and densification of the area. This presents a unique opportunity for the regeneration of the area (PWIF, 2004).

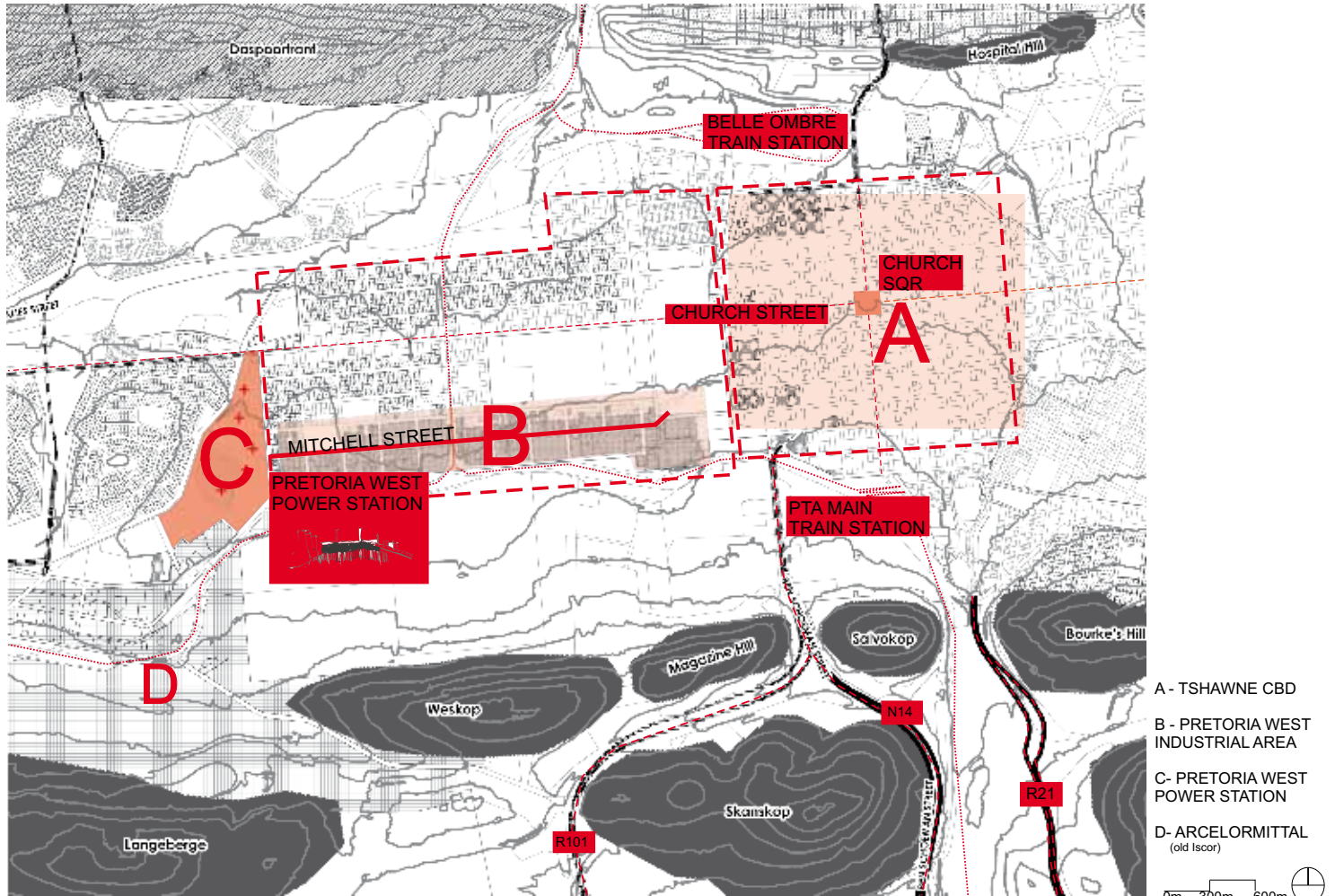


Figure 3. Pretoria West Industrial Area in context with the City of Tshwane CBD. From: City of Tshwane Municipality, edited by Author 2010.

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Vehicle dealers: Mitchell Street



Vacant Commercial building : Mitchell Street



Panel Beater: Mitchell Street

Figure 4. Photo collage of existing urban fabric in Pretoria West Industrial area (Mitchelle Street) showing the deterioration of the area due to the homogenous vehicle related industrial activities: Author 2010.

PRETORIA WEST
POWER STATION

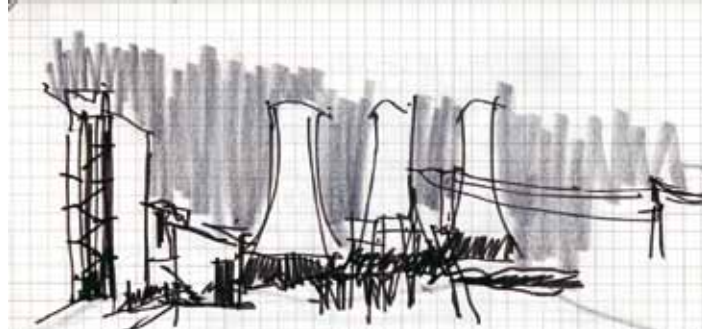


Figure 6. Sketch by author to capture the atmospheric and iconic qualities of the Pretoria West Power Station.



Figure 5. Pretoria West Power Station showing the landmark qualities of the site: Author 2010.



Figure 7. The natural and industrial landscape of the Pretoria West Power Station site: Author 2010.

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Urban regeneration is a process whereby an area is rehabilitated or improved through the creation of a sustainable ecology between economic and ecological networks. The ongoing processes of adaption and change presuppose both development and decline – with the former often dependent on the latter happening before reinvestment and renewal can occur (Carmona, 2003: 258). From a development perspective there is very little vacant land available in the Pretoria West Industrial area which implies that future development in this area will focus on brownfields developments and urban regeneration (PWIF, 2004).

Jane Jacobs (1961: 255) argues that urban regeneration is based on diversity and that city districts will be economic and social congenial places for diversity to generate itself and improve its potential. If the districts possess good mixtures of primary uses, frequented streets, a close-grained mingling of different ages in their building and a high concentration of people. Urban regeneration means various things to different people; for the municipal worker it is the more effective execution of services, for the single mother it is the prospect of a safer environment for her children to grow up in, to the developer it is an opportunity for economic gain, and for the city it is the adaptive re-use of discarded space that will contribute to the reintegration of the city as a whole.

The city of Tshwane, to an extent, has been built up with layers of interdependent urban-cells¹ that feed upon and support one another. The industrial area of Pretoria West could be considered as a discarded urban-cell because of its industrial functions that are becoming obsolete. Historically, this area was a residential suburb (1892), but over the years the character of the area has changed to mono-functional industrial developments (predominantly car related), businesses, flats and single residential areas that became neglected and isolated from the rest of the surrounding urban fabric.

...individual cells have no fixed identity until they are in relationship. This gives the quantum system maximum flexibility to define itself as it goes along. It co-creates with its environment. All of nature's complex systems are at their most creative when they are delicately poised between fixedness and unfixeness - poised at the edge of chaos (Zohar, 1997: 50).

The tradition of equating furniture and buildings with living beings can be traced back to the Roman author Vitruvius, who paired each of the three principal classical orders with a human or divine archetype from Greek mythology (de Botton, 2007: 87). Similarly the city could be defined as a living organism composed of urban-cells, either planned or ones that have spontaneously evolved.

Each urban-cell has its own character and function and the interactions between these cells form a matrix of dynamic relationships in the urban fabric.

The discarded industrial urban-cell of Pretoria West (fig: 8) holds the potential to be reintegrated (fig: 9) into the urban fabric through a process of functional redefinition. The Pretoria West urban-cell, through a process of careful intervention, could once again connect and support the central business district of the City of Tshwane, re-establish its importance within the greater urban fabric and as such become a model for sustainable urban growth in South Africa.

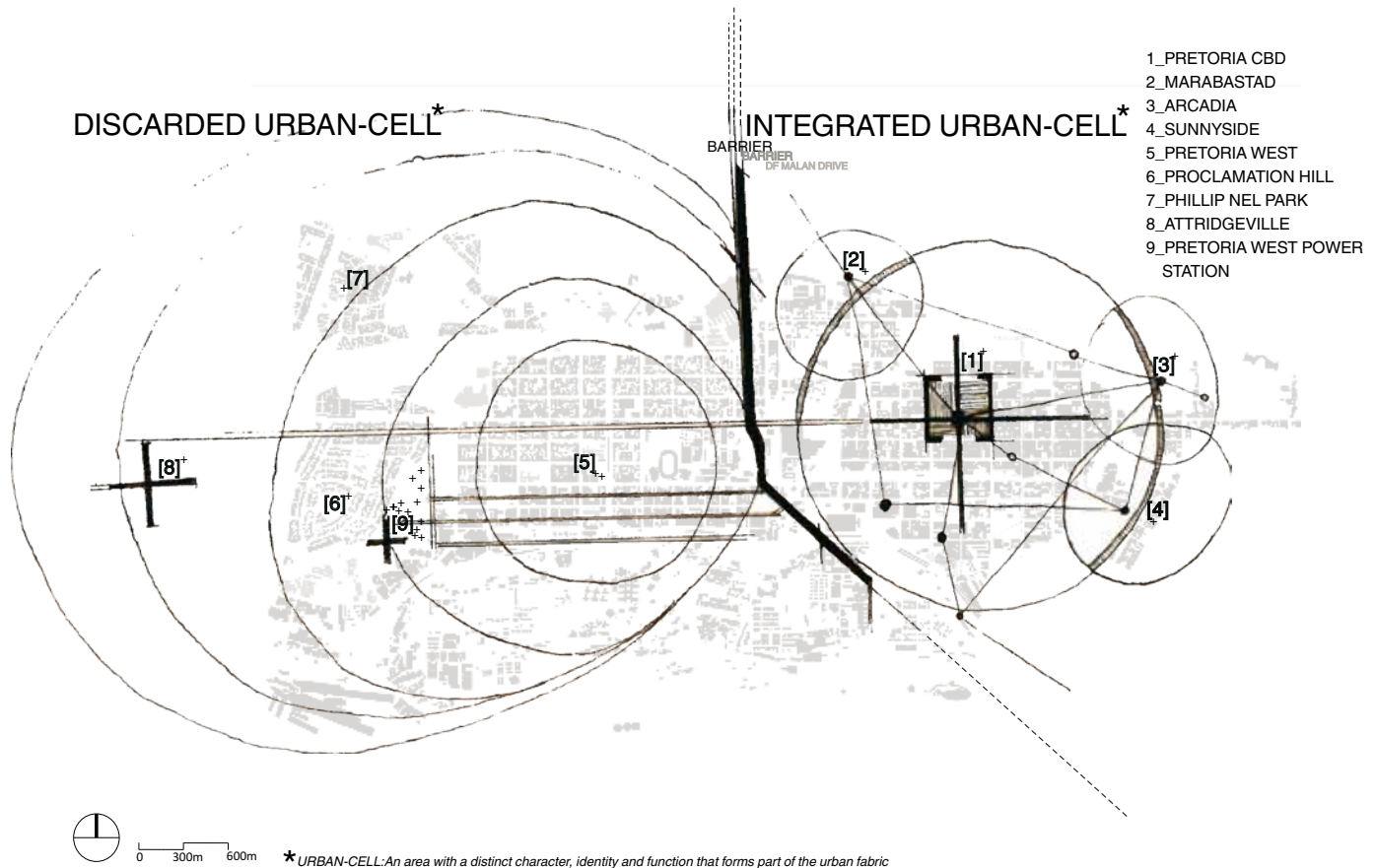


Figure 8. Abstract representation of the discarded Pretoria West Industrial Area in context to the City of Tshwane. The discarded Pretoria West Industrial urban-cell holds the potential to be reintegrated into the urban fabric; to become a sub-support to the City of Tshwane CBD. From: Author 2010.

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INTEGRATED _ URBAN-CELL _sub support to CBD

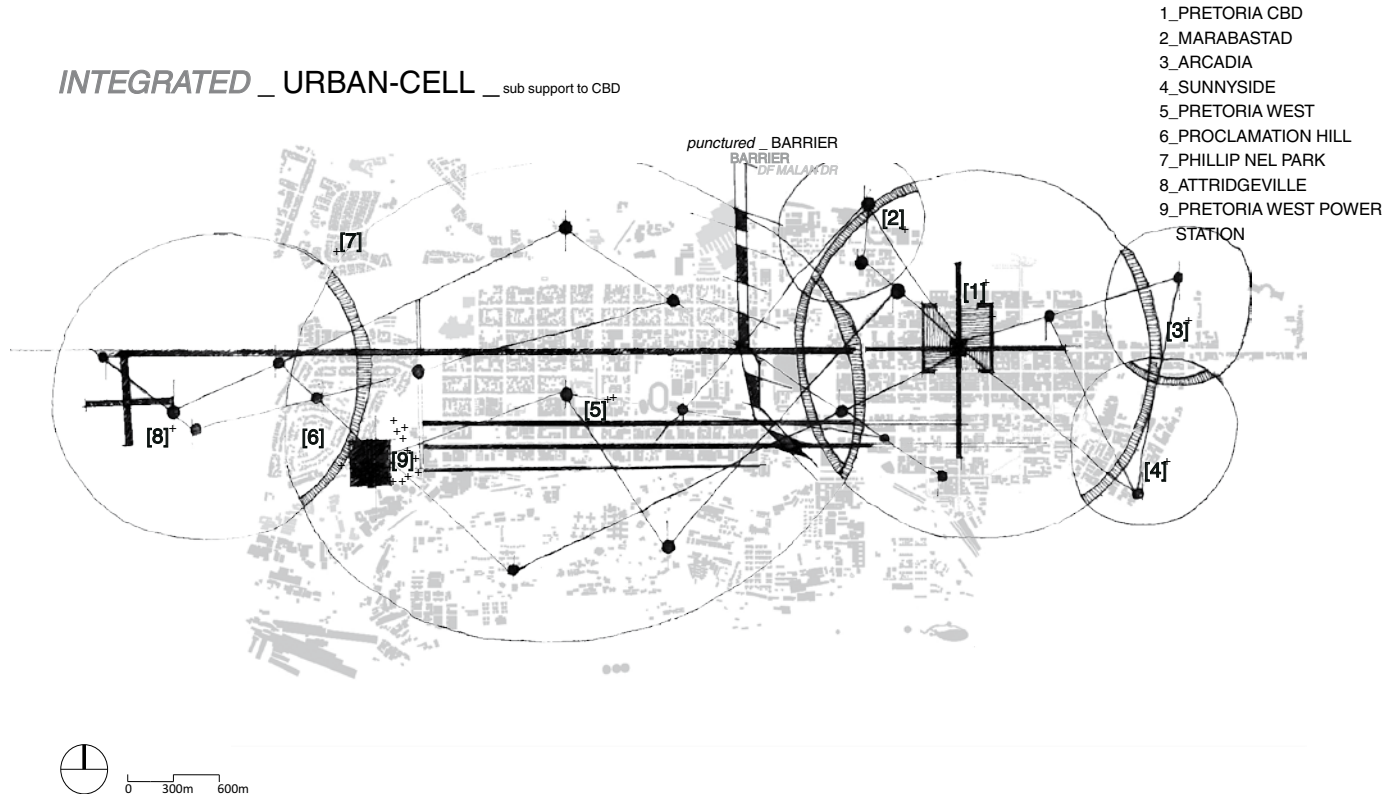
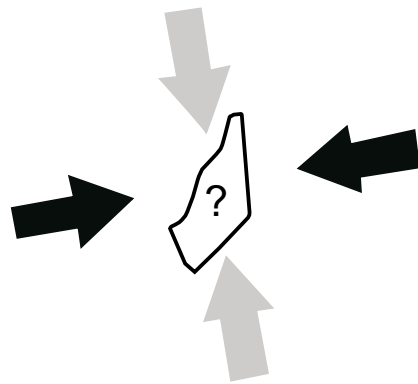
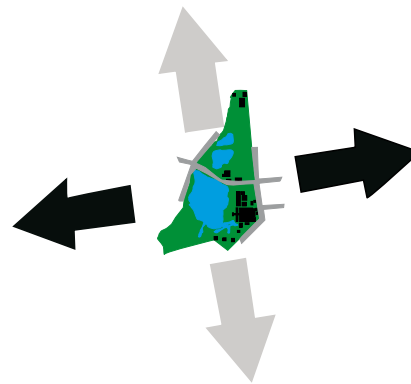


Figure 9. Abstract representation of connections between the Pretoria West Industrial Area and the City of Tshwane. The aim is to establish supporting connections between the various urban-cells to yield an integrated urban environment and stronger supporting structure to the CBD. The Pretoria West urban-cell could once again connect to and support the CBD of the City of Tshwane and re-establish its importance within the greater urban fabric. From: Author 2010.



Pretoria West Power Station _ an enclosed [discarded] industrial area.



Pretoria West Power Station_ intervention node for urban regeneration.



Pretoria West Power Station_ intervention node to connect with adjacent urban fabric.

Figure 10. The Pretoria West Power Station is chosen as the intervention node for urban regeneration in the Pretoria West Industrial Area. The site is a discarded industrial landmark and holds the potential for a diverse and versatile adaptive re-use interpretation, in working with the scale, location and industrial ethos of the site. From: Author 2010.

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Problem statement

How can architecture facilitate the adaptive re-use of a discarded space to enable urban regeneration that will contribute to sustainable urban growth?

Hypothesis

Adaptive re-use of discarded spaces are inspired by emergent/reconnecting functions and relationships that are process- and not product- orientated. When considered and applied to architecture it can foster urban regeneration and improve the sustainability of urban development.

Sub problems:

1. What is discarded space? How is it formed? Why is Pretoria West Industrial area discarded?
2. What is adaptive re-use?
3. What are emergent functions?
4. How can emergent functions be applied to architecture?
5. What emergent functions and relationships exist in the Pretoria West Industrial Area?
6. How do these emergent functions relate to sustainability and urban regeneration to the Pretoria West Industrial area?

Aim of study

The aim of this study is to investigate the role of architecture in facilitating emergent functions through adaptive re-use in discarded spaces (fig: 10) that will promote low energy architecture, energy production and social integration.

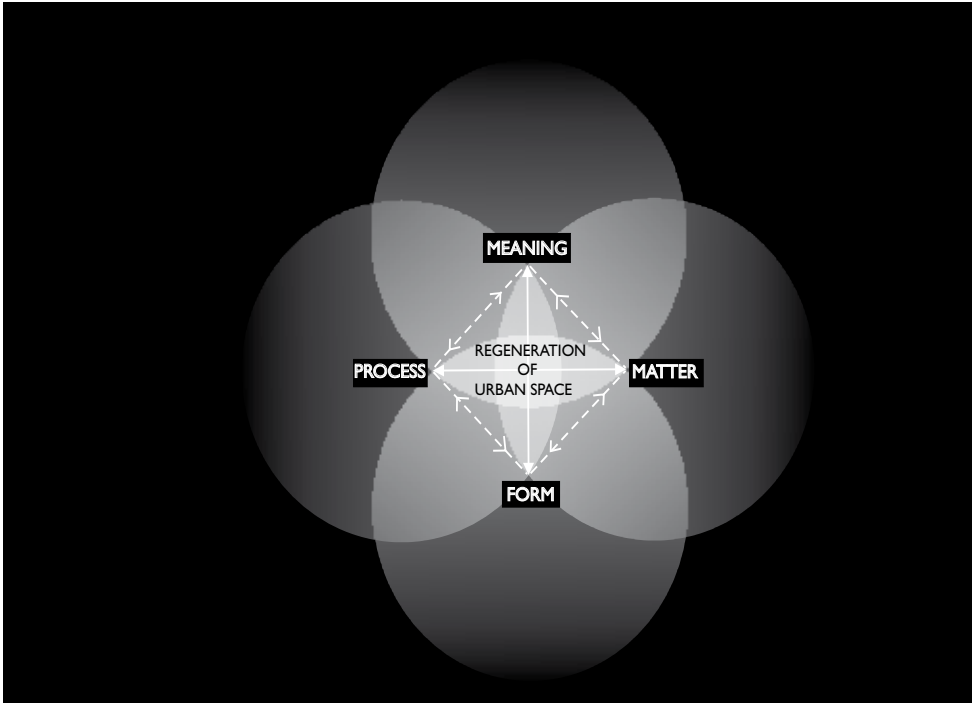


Figure 11. Conceptual understanding of methodology: Author 2010 (visual interpretation).



Figure 12. Hamdi's (2004) backward approach to design: Author 2010.

Methodology

The two approaches that I will use in my methodology include Capra's (2002) framework on the perspective of life (fig:11) and Nabeel Hamdi's (2004) backwards approach to design (fig: 12).

Perspectives on matter: interdependence, relationships and the role of context

Capra's (2002) framework adopts a systemic approach to the critical issues of our time. In terms of the analysis in this study the critical issue is the regeneration of discarded industrial spaces through emergent functions. The analysis focuses on four interconnected perspectives: form, matter, process and meaning, making it possible to apply a unified understanding of life to phenomena in the realm of matter, as well as phenomena in the realm of meaning (Capra, 2002: 261).

In an urban context, a phenomena is understood as emergence and is explained by Nabeel Hamdi's backward approach to design. Wigley (1995) defines matter and meaning as the material and immaterial. His argument is that the material and the immaterial are inseparable components and that the one is not superior to the other.

Western discourse depends on the binary opposition of terms – one superior, the other inferior – that are assumed to be

separate and distinct, such as immaterial philosophy and material architecture. But such terms are in fact interdependent and inseparable, undermining dualistic discourse. Architecture is built into philosophy and material architecture, whether in spatial metaphors such as interior and exterior or in references to philosophical discourse as a sound edifice built on solid foundations (Wigley, 1995: 14).

Hill (2006: 74) refers to material as architectural objects, spaces and users and the immaterial as the relationships between them.

- Form: this refers to the current and historical networks that define the context.
- Meaning: Capra (2002: 84) argues that one will only understand the meaning of anything if one can relate it to other things in its environment, in its past, or in its future, therefore meaning always relates to context.
- Matter: this refers to physical components.
- Process: this refers to a response to physical components.

Backward approach to design

The second approach that will be applied

in the methodology is Nabeel Hamdi's (2004: 130) backwards approach to design i.e. working to plan/analysis/survey in progressive cycles. The aim is not to determine the components for example in housing (type, affordability or even style, according to some housing department). But rather what does a house equals? The opportunities are immense both in terms of process and product and are more qualitative such as wellbeing, dignity, self-respect, security, skills, privacy and so forth. Hamdi explains his design process through examples of different interventions where the emergent intervention is simple and site-specific. Emergence results in the creation of novelty and is often qualitatively different from the phenomena out of which it emerged. This can readily be illustrated with a well-known chemistry example: when the structure and properties of sugar; including carbon, oxygen and hydrogen atoms, bond in a certain way to form sugar, the resulting compound has a sweet taste. The sweetness resides neither in the carbon, nor in the oxygen, nor in the hydrogen, it resides in the pattern that emerges from the interaction (Capra, 2002: 71). When we apply this concept to urban regeneration; the focus should not be on the various components (housing, commercial areas, green spaces etc.) that are needed to regenerate an area, but on the pattern or process of implementation. The pattern or process will determine the components that are needed in the next phase and allows for much more emergence and novelty.

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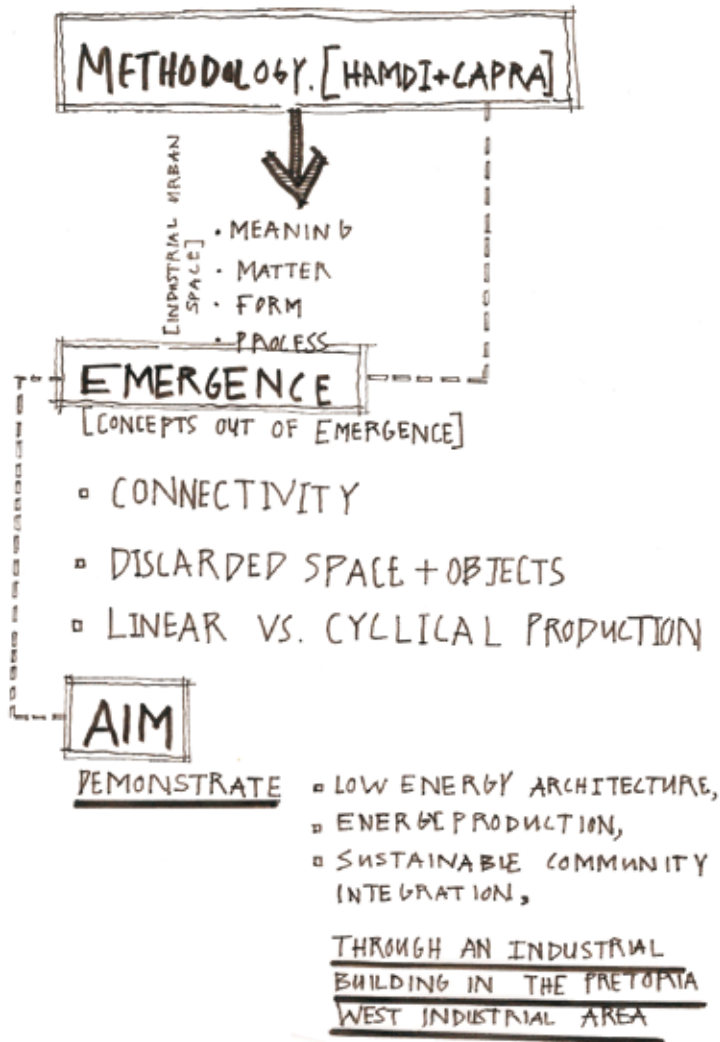


Figure 13. Design process that is guided by the methodology. From: Author 2010.

The design process evolved from a theoretical basis; where the methodology started defined the concepts and aims of the study. The following thinking pattern was employed (fig: 13):

Regeneration of discarded industrial space:

In the applied methodology Capra and Hamdi consider the regeneration of urban space to have four components:

- meaning
- matter
- form
- process

Through a process of emergence these components will contribute to the regeneration of the discarded Pretoria West Industrial Area.

Emergence can be considered as self-organised and holistic thinking. Emergent structures provide novelty, creativity and flexibility, where as design structures provide stability. The issue is not one of discarding design structures in favour of emergent ones. We need both.

EMERGENCE CAN THUS BE DEFINED AS THE INTEGRATED URBAN FABRIC THAT WILL SUSTAIN THE GROWTH AND EVOLUTION OF A COMMUNITY.

Definition of production in terms of emergence:

- Production that emphasizes the community over the individual
- Production that moves away from the concept of being a linear process that is only focused on the product, to that of a cyclical process that respects the material and immaterial components. It is through the interaction of the material and immaterial that emerging opportunities will arise.
- Production that works with existing energy.
- production that establishes emerging opportunities through connectivity between the production process and the local urban fabric.

Concepts flowing out of emergence:

- Connectivity /movement.
- Discarded objects and space (existing energy and activities).
- Production that moves away from a linear process to a cyclical process.

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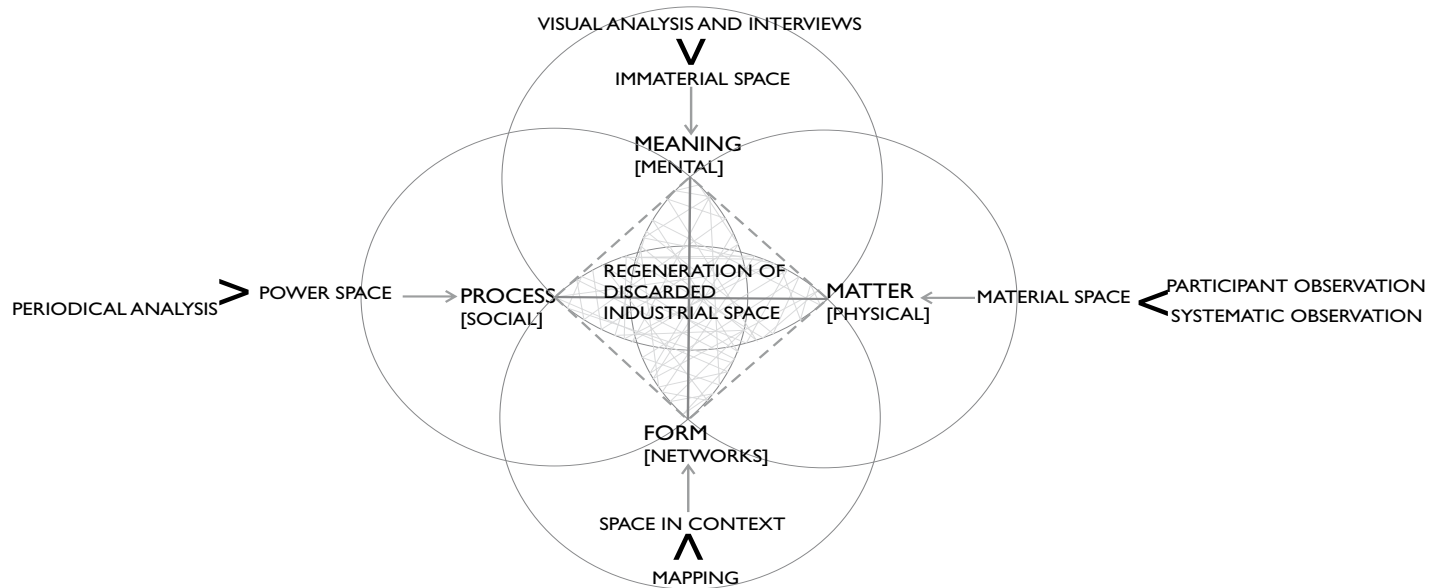


Figure 14. Visual interpretation of the methods applied to obtain the required information that is stipulated by the methodology. From: Author 2010 (visual interpretation).

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The following data-collection methods (fig: 14) will be implemented to define Capra's framework in gaining understanding of the critical issue under investigation: emergent functions in the Pretoria West Industrial Area.

Mapping:

Mapping is an act of; recording and translating the quantitative with the qualitative. The spirit of analysis with attitude engendered mapping of a whole range of diverse subjects [cognitive maps: Kevin Lynch), mapping of the everyday (Robert Venturi), psychogeographical maps :the Situationist] resulting in the visualisation of information previously thought of as either intangible or irrelevant (Porter, 2004: 114). The aim is to layer relating patterns to gain an understanding of the context and future emergence, based on the prevailing energies in the Pretoria West Industrial Area.

Systematic observation:

Systematic observation is time-and-space specific. The researcher will identify the different role-players (space, actors, activities, objects, time etc.) and through observation and memory; analyse how people use the space, and thereby identify the social patterns. Furthermore, where designers are sometimes over-familiar

with areas of study, a de-familiarisation process seems to be required, where one is again made, aware of the well-known phenomena of the everyday environment that one has grown to become ignorant of due to its familiarity (Breed, 2010: 13).

Periodic analysis:

Periodic observation is the notion of using representative media to analyse an area. The researcher will use the local newspaper to determine the main themes of the area. It is important to analyse the underlying structure of the newspaper; its aims and intentions, political agenda and target audience.

The aim of the local newspaper analysis is to determine the themes that are currently prevailing in this area. This will guide the researcher in identifying emerging opportunities in the Pretoria West Industrial Area (Rekord, Pretoria West, Jan - Apr 2010).

Visual analysis and interview:

A collage is used to heighten the visual engagement in the presentation of an idea and, more importantly, to release hidden associations in the issues of a design project (Porter, 2004: 27). The author will use the photo collage to participate in conversation and not ask direct questions, to determine the themes, values, beliefs and perceptions that are not familiar to him.

Participant observation:

In participant observation there are two objectives – one is to get involved in activities and the other to observe these activities, the people and the physical aspects of the situation (Breed, 2010: 13). An important point with participant observation is to analyse objectively and to be able to discern what information must be included and what not.

De Certeau's discussion of imagining the city is based on activity and movement, thus being involved. The concept of flaneur that was made popular by Walter Benjamin essentially involves standing back and observing at one's surroundings objectively rather than being drawn into the sensory excitement of active participation (Porter, 2004: 79).

Conclusion:

These data-collecting methods are applied to obtain the required information that is stipulated by the methodology in understanding the critical issue under investigation: emergent functions in the Pretoria West Industrial Area, and to ultimately guide the researcher in the design response.

These methods and their application will be further described under the site analysis section.



Figure 15. Pretoria West Power Station in context with the City Of Tshwane CBD. From: City of Tshwane Municipality, edited by Author 2010.

Site introduction

The study area comprises the Pretoria West Power Station (fig: 15) situated between Church, Buitenkant, Rogger Dyason and Quagga Streets and includes the contextual surrounding industrial, business and residential precincts in the Pretoria West area between D.F Malan Drive, Church, Carl and Quagga Streets (fig: 16).

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Potential:

The Pretoria West Power Station is a timepiece and emergent structure of the Industrial Revolution and holds the potential for a diverse and versatile adaptive re-use interpretation. Through its scale and location it will have an effect on the surrounding areas. This massive space invites imagination and will attract an eclectic mix of visionaries (artists, business community) that hold the potential to change the current urban decay and degradation of the area

Bio-diesel plant location:

The location of the bio-diesel plant is on the east side of the site on Buitenkant Street (fig: 17), with existing structures (fig:18) that includes the ash bunkers, workshop and boiler maintenance workshop. Due to the location of the workshops at the back of the site, these will be demolished and some of the material (masonry and window frames) re-used in the bio-diesel plant . The masonry work will mainly be re-used as a paver.



Figure 16. Pretoria West Power Station and Pretoria West Industrial Area; City of Tshwane. From: City of Tshwane Municipality, edited by author 2010.

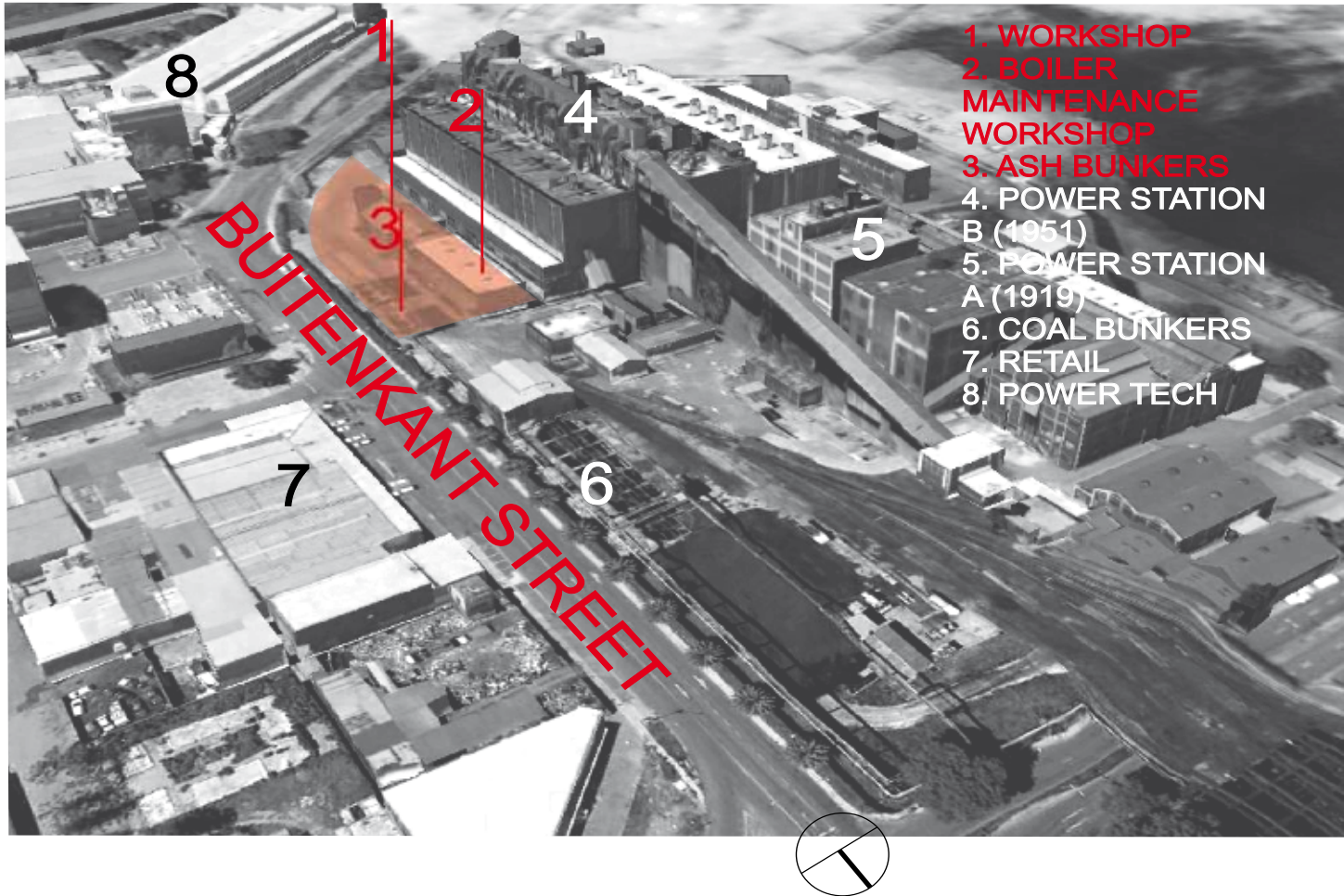


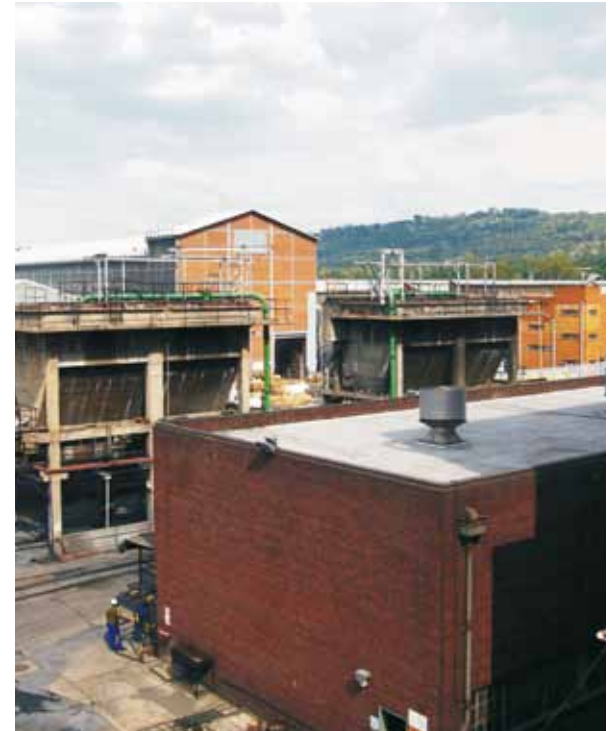
Figure 17. Bio-diesel plant on the Pretoria West Power Station site. Image from Google Earth, edited by Author 2010.

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Ash bunkers



Boiler maintenance workshop (to be demolished)



Workshop (to be demolished)

Figure 18. Photo collage of existing structures on site. By Author 2010.

Heritage

Heritage is a dynamic process and integrated into the present as much as it is a representation of the past. Lipman (2003) argues that history should be a process that is applied (analysed and interrogated) and not mimicked.

The revivalist industry is coupled with cultural stagnation. A society whose spokesmen and women – its intelligentsia – are obsessed with representing the present as a sanitised, a-social, historical version of the past is one whose leading members are incapable of confronting their social futures. Their revivals are focused on lifting themes from the past, on treating heritages as warehouses for readily re-captured meanings. For them the past is scenography. History, to the contrary, is an analytic, critical activity. Its practitioners interrogate and interpret rather than appropriate the past (Lipman, 2003: 61).

The heritage approach to the development of the bio-diesel plant on the Pretoria West Power Station site is guided by the Unesco paper 9 and the Burra charter to handle the intervention on a broad urban framework and the influence it will have on the social context of the area.

Statement of significance

The Pretoria West Power Station can be classified as a heritage site (building and site older than sixty years), and has additional heritage considerations. Its landscape features are unique to the City of Tshwane (the cooling dam, ash ponds, dramatic vegetated landscape, valuable building stock that has landmark qualities). Currently the site functions as an isolated unit in relation to the city. Yet it has potential to retain its industrial character and still be integrated into the urban environment. The framework proposes a productive environment as a heritage principle, but aims to use the site as a catalyst for urban rejuvenation.

The proposed intervention to the Power Station site and dam, with its landmark cooling towers, an extensive body of water and its close proximity to the City of Tshwane CBD, renders it a significant environmental and cultural heritage site.

UNESCO paper 9

The UNESCO paper 9 focuses on heritage as being a process of social integration and not a dead object from the past. Heritage should not be only about the buildings or structures but about integrating it into the city as a whole and making it a catalyst for the bigger urban framework of the city.

The idea that cities or historical centres of cities should be looked at as a whole rather than just as separate relevant sites led to the avant garde approach of emphasising the intricate links between heritage, conservation and harmonious development. That heritage and development are inseparable is a foreshadowing of the concept of 'sustainability' – preserving our heritage for the benefit of future generations. Culture is the bridge between the two, the vital ingredient for kneading a harmonious balance between past, present and future (UNESCO paper 9, 2002: 10).

The World Heritage Centre strongly believes that a city's identity can be a springboard for sustainable development. Achievement of this rests on eight pillars (UNESCO paper 9, 2002: 13):

1. The territorial dimension: understanding the broader picture; historical areas are linked to a greater area.

The development of the Pretoria West Power Station aim to act as a catalyst for the development of the greater Pretoria West Industrial Area to generate a much-needed diverse and integrated urban environment as a sub-support area to the City of Tshwane CBD.

2. Social development: referring to the diversity of the environment.

The Pretoria West Industrial Area predominantly comprises car related industries and the proposed Bio-diesel plant in conjunction with the other proposed light-industries in the framework, aims to ad diversity to this industrial area.

3. Empowering citizens: making people aware of the heritage in their area, even the children.

The regeneration of the Pretoria West Power Station will create the opportunity for interaction and integration of existing structures and buildings for development in the area. Awareness of the heritage value will be achieved through new programs to be accommodated in the structures and buildings (housing, train station, commercial and light industrial industries).

4. Economic development: reinforcing mixed use and creating jobs.

Mixed use is proposed for the site: housing, train station, commercial activities and light industrial industries.

5. Protecting the environment: providing public transport in relevant areas as well as providing a modern service.

A passenger and freight train station is proposed for the site that will service the surrounding housing and industrial components of the area.

6. Capacity building: strengthening of frameworks to promote conservation and development.

The proposed interventions will strengthen and add to the diversity of the area to generate development and integration (opportunities for connection) to the adjacent areas. The current mono function of the area is related to car industries, making this area obsolete and isolated to the rest of the City of Tshwane urban fabric.

7. Training: preserving craft/building methods, digital mapping, archaeological and urban planning.

The proposed intervention will be sympathetic to the existing architecture and urban fabric, where the new architecture will relate harmoniously to the existing structures and architecture.

8. Fostering international co-operation: UNESCO's strategy rests on building partnerships with the aim of forging a common vision amongst the city's numerous stakeholders.

The clear and common goal of the regeneration of the area is to add diversity that will present opportunities for connections to the adjacent urban fabric. The diversity refers to housing, light and commercial industrial industries and transport nodes.

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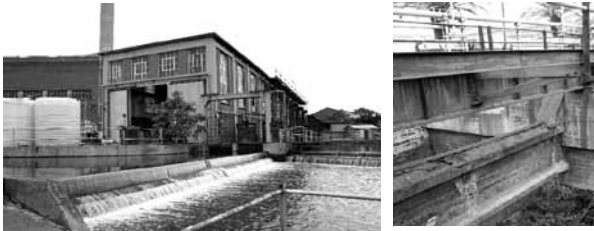


Figure 19. Photo collage of Pretoria West Power Station showing the landmark and tectonics qualities of the study area . From: Author 2010.

BURRA charter

The aim of the Burra charter is to:

- 1) ENRICH people's lives.
- 2) CONNECT the community landscape to past experiences.
- 3) CONSERVE historical records.
- 4) REFLECT on the diversity of our communities.
- 5) Highlight the fact that RESOURCES are irreplaceable and precious.

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These points refer to a dynamic and integrated approach to heritage, relating it to the social development of a community and a contributing influence to the broader development framework of a city.

Design response

The proposed bio-diesel plant will respond to and incorporate the heritage of the site by taking into account the guidelines stipulated by UNESCO Paper 9 and the BURRA charter, as discussed above. The industrial ethos of the site will be retained through references to material, proportions and connections in the proposed bio-diesel plant.

Conclusion

Heritage is a dynamic and integrated process that has relationship with the past and the future. The important concept that Morris emphasises is that heritage is about hope for the future and that it does not try to represent hope from the past.

William Morris depicted more than a century ago: what history can there be in a building daubed with ornament, which cannot at best be anything but a hopeless and lifeless imitation of the hope and vigour of the earlier world? Let us leave the dead alone and, ourselves living, build for the living and those that shall live (Lipman, 2003: 61).

The role of the regeneration of the Pretoria West Power Station within its context is to introduce mixed use developments that will complement the existing uses and establish a development destination. The site's unique features, its close proximity to City of Tshwane CBD and strategic connections present an opportunity to establish it as a hub for retail, commercial, light industry, transport and recreational activities. It will serve as a drawing card attract the aforementioned activities and to densify the area.



Figure 20. Pretoria West Power Station showing the landmark qualities of the cooling towers . From: Author 2010.

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Client

Architectural premise: regenerating of discarded industrial space.

Type: bio-diesel plant

Client: private investor

Location: Pretoria West Industrial Area, City of Tshwane

Brief:

Human demand for resources has reached unprecedented levels. The case for an architecture that is environmentally sustainable has never been stronger.

All ecologies have waste, but those wastes are actually part of a cycle. They are part of the flows of energy and the material within the ecology of the biome, and they are essential to the health and the sustainability of the biome, because these wastes are essential to and connected to the development and health of the system, they supply and power the system's development (Williams, 2007: 5).

It is time for architecture to become part of the ecology.

Purpose:

To advance the principles of sustainable living through production (industrial processes) and urban integration. The emphasis must be on the process of production and not the product in order to change our mindset of a linear production process to a cyclical one.

Aim:

The aim is to design a lucrative bio-diesel plant that will demonstrate low energy architecture, energy production and sustainable community integration

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Pretoria West is a neighbourhood that lies directly west of the City of Tshwane CBD, to the west of D.F. Malan Drive. This area is a former low density residential area that has over the years undergone a gradual transition in character. Although large sections of the area are still exclusively residential, there was an influx of industrial developments into the area, mainly as a result of the close proximity to the railway and the economical opportunities associated with ISCOR, as it was known (ICDS: 2008). ISCOR relocated its operations to Vanderbilj Park and is now known as Arcelomittal.

The rationale for considering Pretoria West as a strategic densification area is found in three characteristics of the area:

- its proximity to a major employment and activity centre, namely the City of Tshwane CBD
- its proximity to major public transport opportunities; and
- the decaying character of the area which makes it ripe for urban renewal and development intervention (ICDS: 2008).

The main feature of industrial areas lies in the relatively homogenous nature of businesses in the area. The revitalisation

of this precinct (Pretoria West Industrial Area) can be engineered by actively re-generating delapidated areas into new developments that link closely with the established industry.

Aim

The aim of the framework is to explore existing emerging energies in the Pretoria West Industrial Area that hold the opportunity to re-connect to the City of Tshwane CBD and its surrounding areas. The framework is based on a vision for the area, rather than on identifying all the challenges and trying to correct that. This approach will allow the framework to deliver on a much bigger scale and to integrate the Pretoria West Industrial Area into the rest of the city fabric, to enable the area to become a sub support system to the City of Tshwane CBD.

The framework further aims to enhance the integration into the City of Tshwane CBD and improve access to employment opportunities. The proposed development and regeneration of the Pretoria West Power Station is considered a catalyst for this aim.

The general principle is to improve the transportation links through increased access and linkages, to increase and diversify low risk industries and to densify the area through housing.

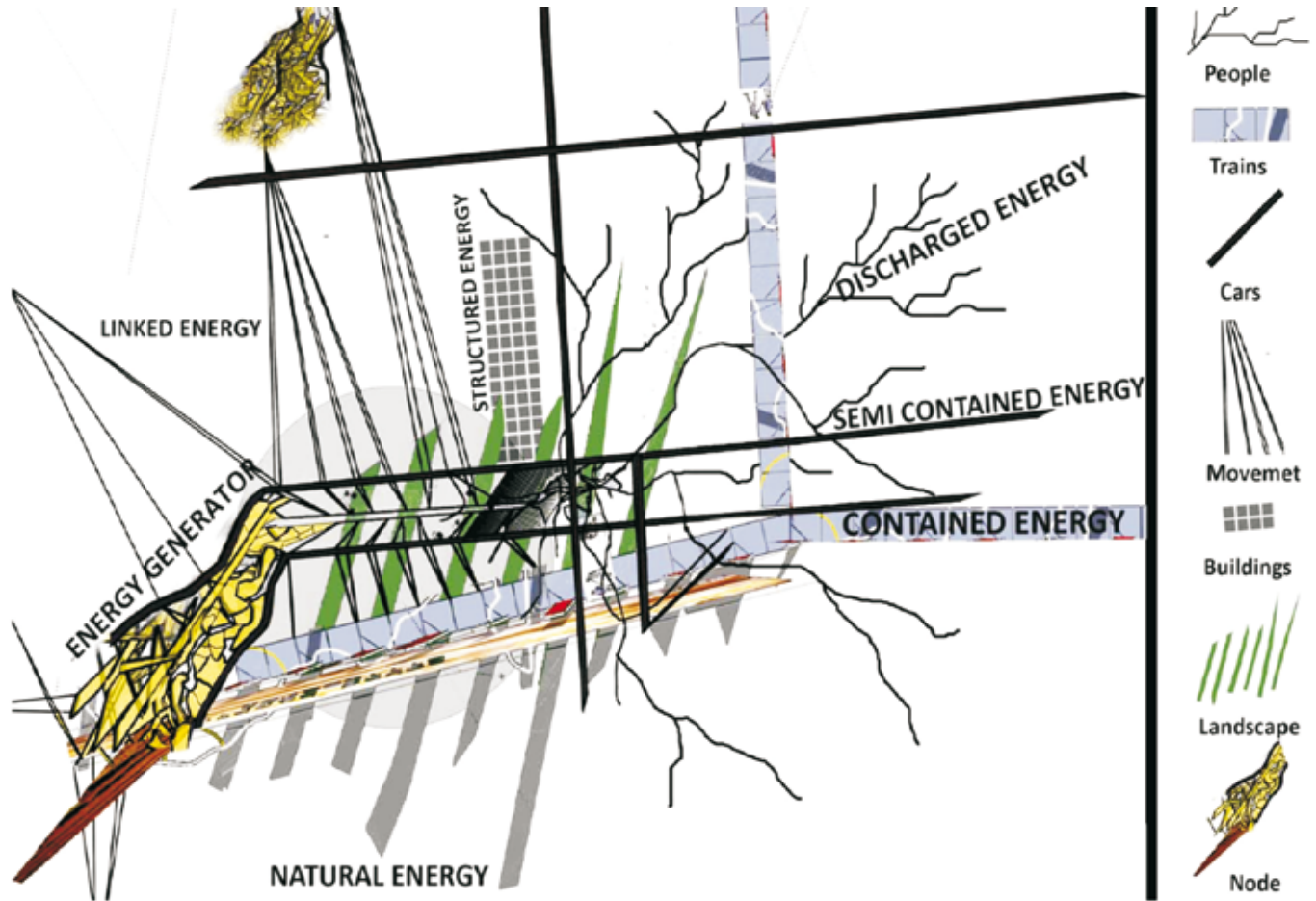


Figure 21. Existing energies in the study area that will be used to integrate the Pretoria West Industrial Area with the City of Tshwane CBD: Pretoria West Group Framework 2010.

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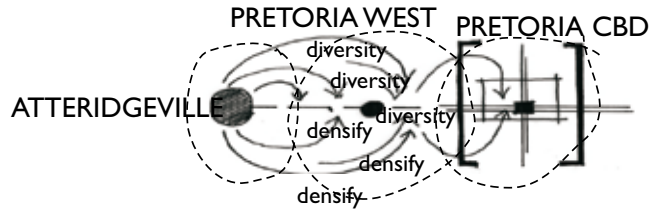
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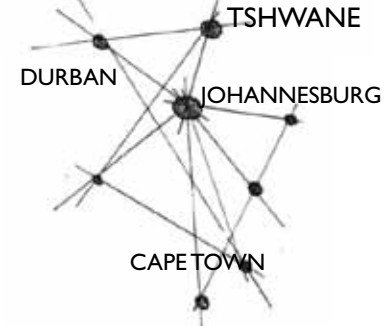


Figure 22. Walking distances to show close proximity of the Pretoria West Industrial Area to the City of Tshwane CBD :
Pretoria West Group Framework 2010, edited by Author.

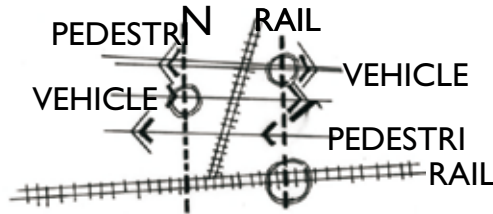
SUB SUPPORT TO CBD



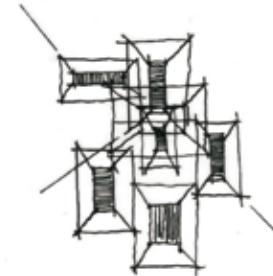
REGIONAL PRODUCTION CONNECTION



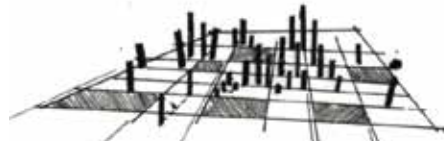
CONNECTED INFRASTRUCTURE



+ PERCEPTION



DIVERSITY AND DENSIFICATION



INDUSTRIAL HERITAGE = LIVING HERITAGE



Figure 23. Vision for the Pretoria West Industrial area. The aim of the proposed interventions is to discourage further sprawling to the west (Atteridgeville), and to focus on existing emerging and discarded energies as opportunities to re-connect the area to the City of Tshwane CBD and its surrounding areas: Pretoria West Group Framework 2010.

Vision for Pretoria West

(see fig: 23)

Creating a sub-support system for the City of Tshwane CBD:

The aim of the proposed interventions is to discourage further sprawling to the west (Atteridgeville), and focus on existing emerging and discarded energies as opportunities to re-connect the area to the City of Tshwane CBD and its surrounding areas.

Capitalising on in-place infrastructure:

Identifying existing urban and natural conditions as opportunities for reconnection. In the Pretoria West Industrial Area the urban conditions refer to the existing railway, vehicular connections and the discarded industrial space. The natural conditions refer to the storm water channels and flood lines that must be incorporated into the urban framework as opportunities to connect and diversify space. The storm water channel along Zeller Street for example could be opened up and used as a walkway and much-needed social space.

Diversifying and densifying:

Diversification and densification will sustain emerging energies and opportunities. The aim is to open up the industrial processes to the surrounding urban environment

and to encourage diversification and densification through these emerging connections

Diversity refers to creating a mix of uses within a local area. By combining residential and commercial uses into a single area, the number of trips and the length of travel are both reduced. People are able to meet most of their daily needs by walking, cycling, or making use of public transport (ICDS: 2008).

Higher densities create adequate transit ridership to justify frequent and efficient public transport services, and provide the necessary population thresholds to support viable commercial activities and community facilities within convenient walking distance of homes and places of work (ICDS: 2008).

Establishing a regional production connection:

A railway linkage to the rest of the country yields a comparative advantage to the Pretoria West Industrial Area.

Diluting perceptions of potential:

The broader Pretoria West area is characterised by a sense of decay and decline (ICDS: 2008). Once a thriving industrial hub, most of the buildings in the area are now vacant.

Emerging opportunities in the Pretoria West Industrial Area would break the negative perceptions currently associated with the area. Diverse industrial and commercial activities that steer away from the homogenous vehicle industries in the area would stimulate a new perception associated with emerging opportunities generated by the scope of a variety of industries.

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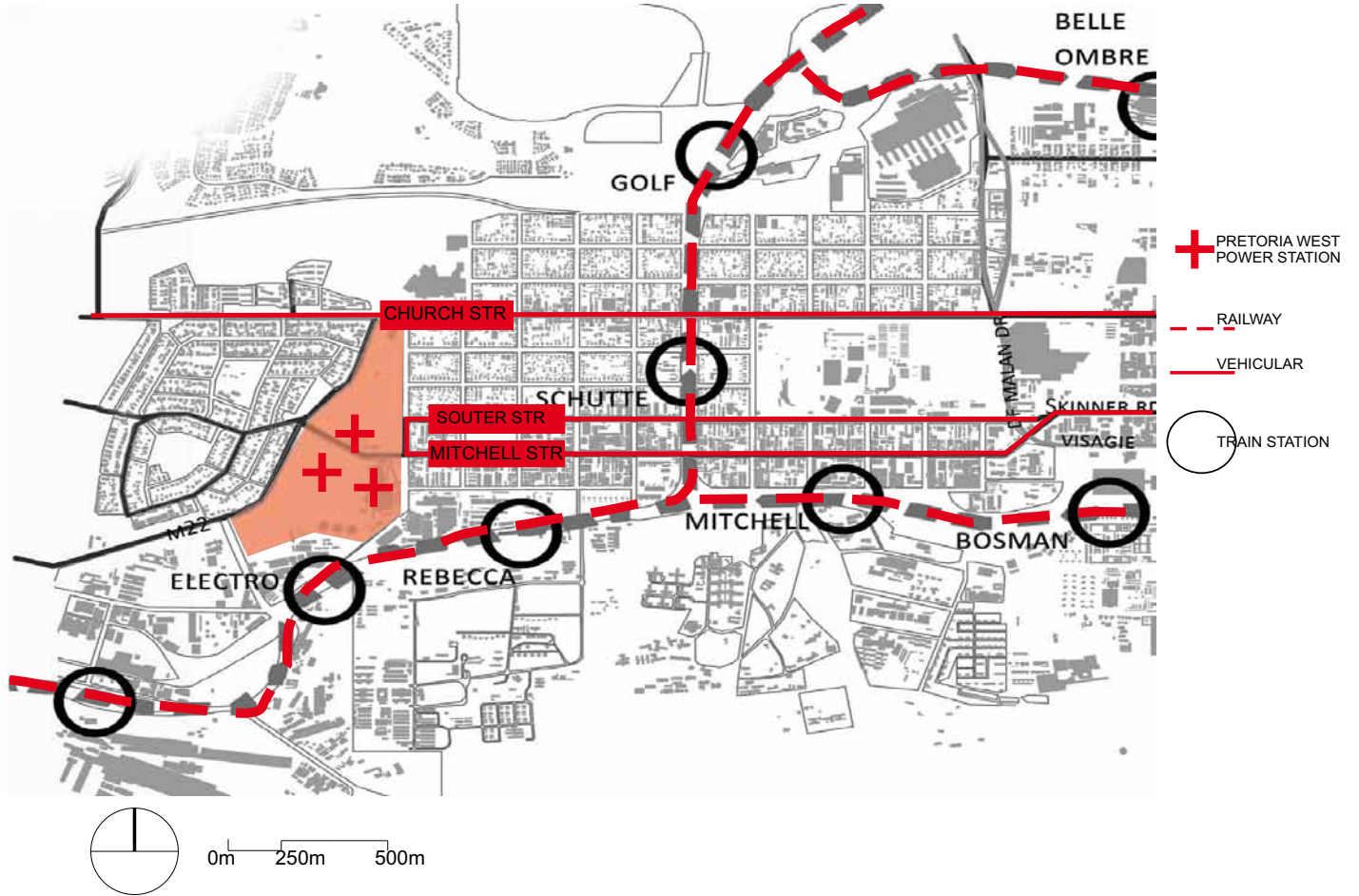


Figure 24. Pretoria West transport nodes, showing how existing infrastructure relate to the Pretoria West Power Station: Pretoria West Group Framework, edited by Author 2010.

Industrial heritage:

The area of study is an established built-up area that was established in 1892. The existing discarded industrial space holds the opportunity to reconnect to the City of Tshwane CBD and its surrounding areas, with the existing building stock defining the character and integrity of the area as a rustic industrial space.

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Conclusion:

The advancement and development of Pretoria West Industrial Area as an integral part of the City of Tshwane city structure is a necessity. In many ways the Pretoria West is perceived and subconsciously treated as a foster child that has to fight for its own survival.

Though blessed with a resilient economy, careful measures must be introduced to ensure that this segment of the city develops as a balanced environment. This requires the provision of adequate and quality housing, ensuring that the industry develops efficiently (without degrading the environment as naturally tends to happen) and connecting it to its immediate region.

By effectively freeing Pretoria West from its relative isolation, it would undoubtedly grow into an area that would relate with the city as a whole and the region in an efficient and effective manner. It would bring the area back into the spotlight, promising it renewed attention it deserves and putting into motion a snowball effect of much-needed development and renewal (PWIF, 2004).

The Vision for the Pretoria West Industrial area:

- Function as a productive cell (fig: 25)
- Connect to existing energies (fig: 26)
- Accomodate regenerative production industries (fig: 27)
- Connect to the urban the fabric that would demonstrate sustainable social integration (fig: 28)



Figure 25. Vision for Pretoria West Industrial Area : The area must function as a productive cell, and keep its ethos as an industrial urban-cell: Pretoria West Group Framework 2010.

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Figure 26. Vision for Pretoria West Industrial Area : The area must connect to existing energies .The existing energies (people, transport nodes, industrial building stock and natural landscape) must be applied to regenerate the area: Pretoria West Group Framework 2010.

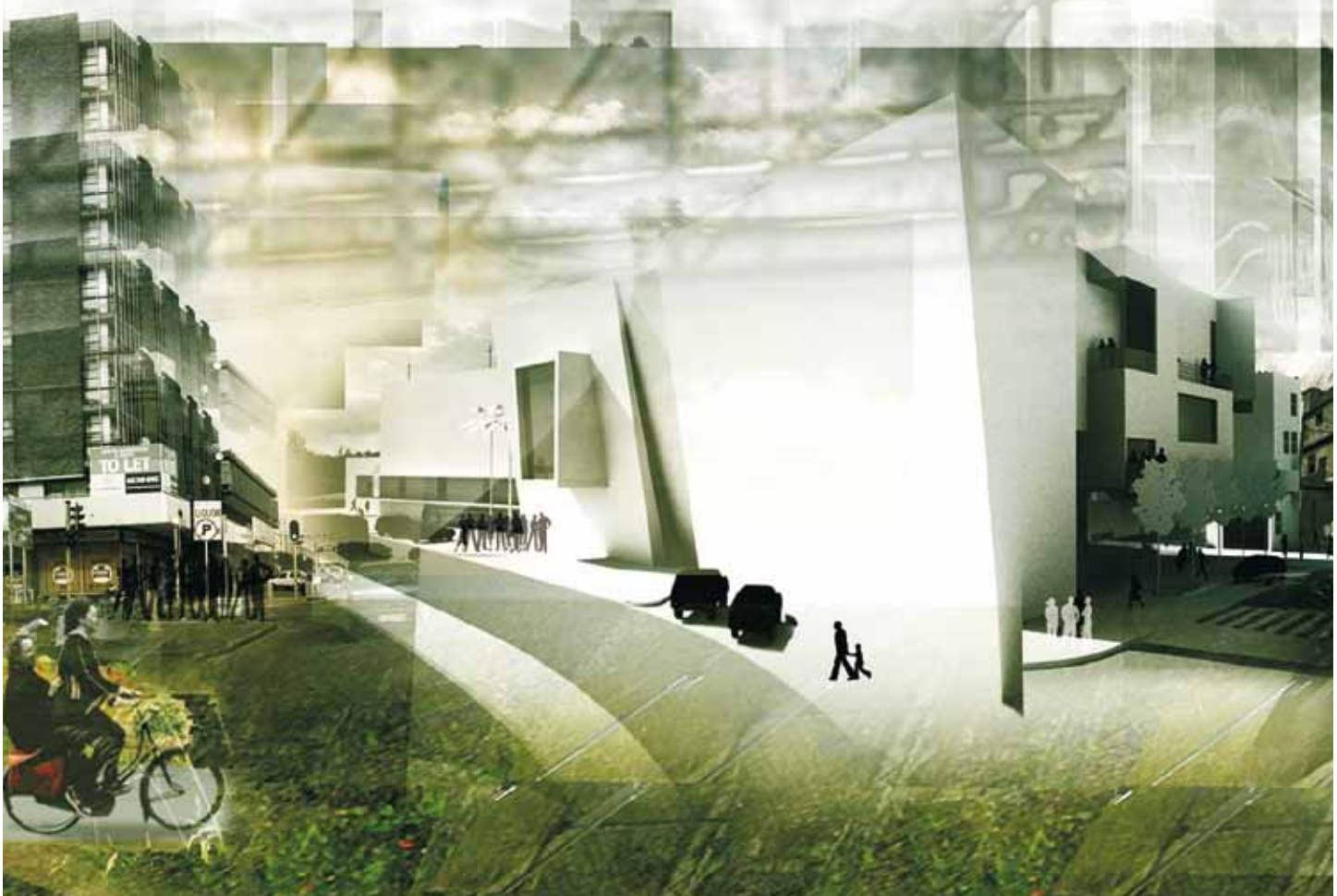


Figure 27. Vision for Pretoria West Industrial Area: The area must accommodate regenerative production industries. Diversity in terms of industrial processes is important to generate emerging opportunities in the Pretoria West Industrial Area that will establish re-connections with the rest of the urban fabric: Pretoria West Group Framework 2010.

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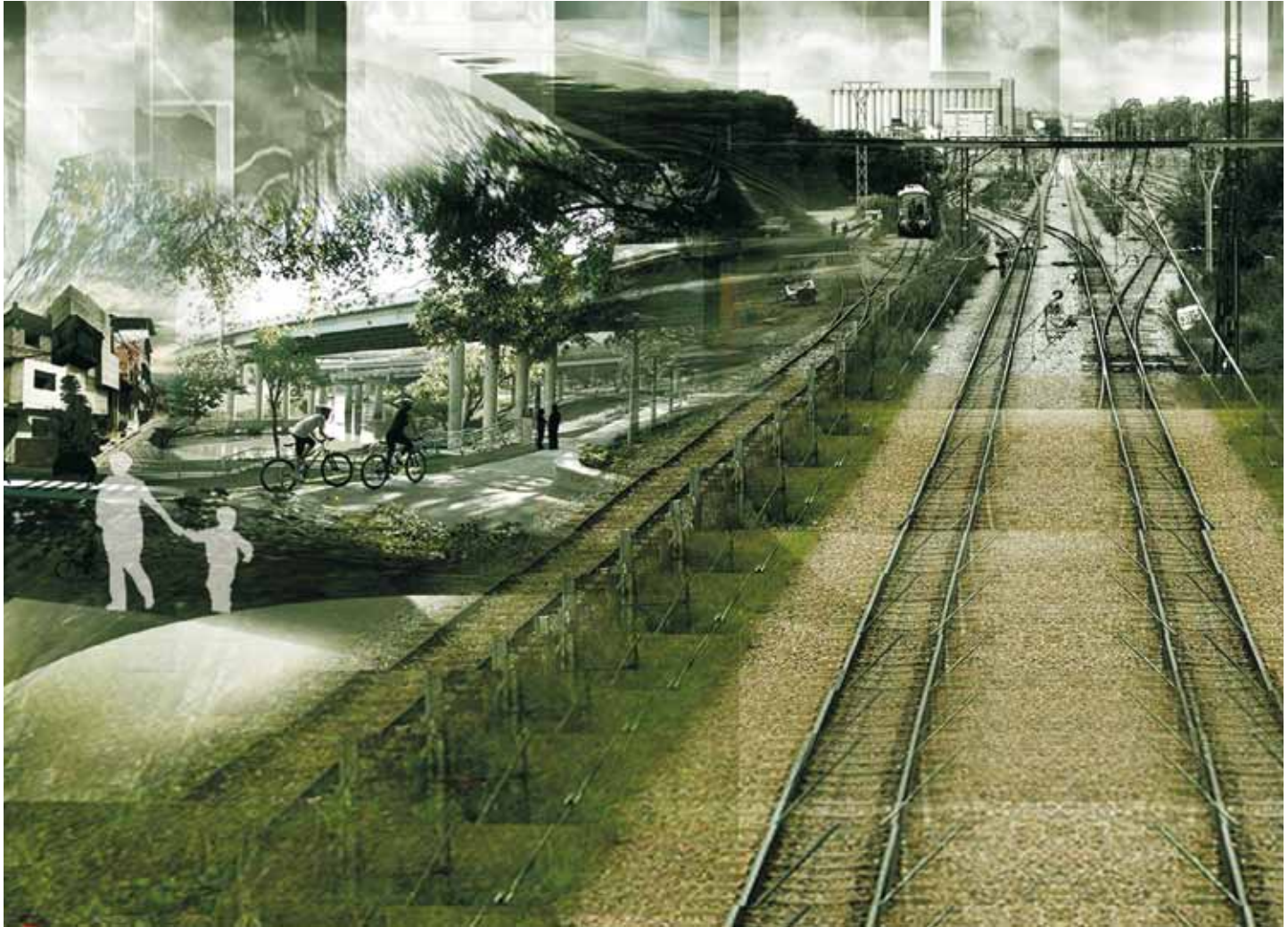


Figure 28. Vision for Pretoria West Industrial Area: The area must connect to the urban fabric that will demonstrate sustainable social integration. It is important for the industrial processes to have a positive impact on the urban fabric and not function as the current isolated entity: Pretoria West Group Framework 2010.

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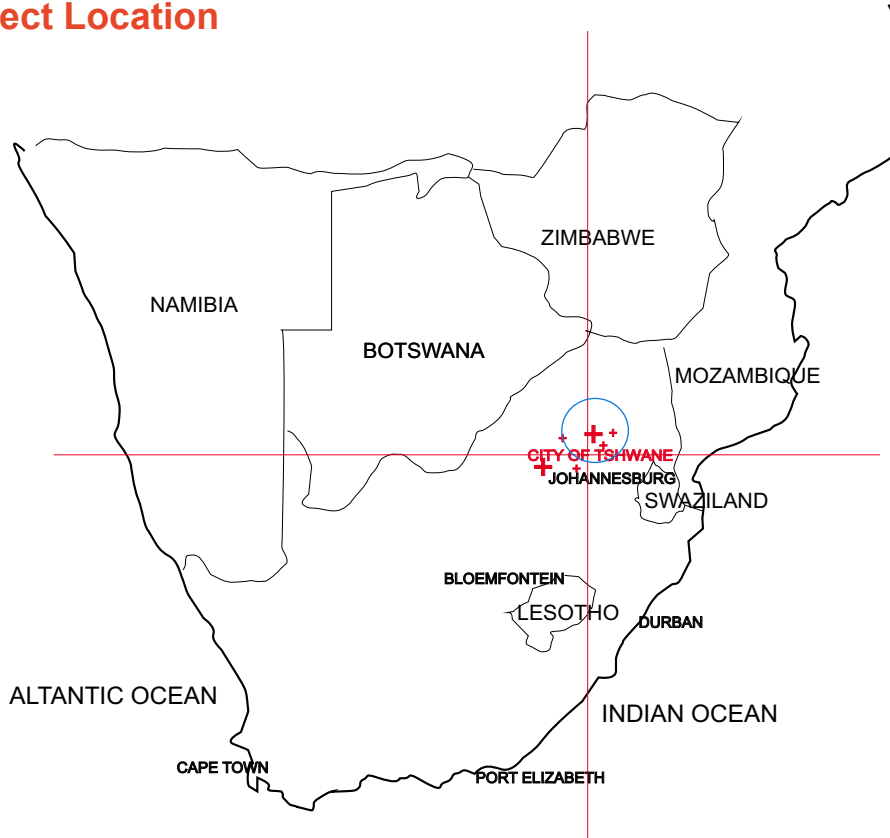


Figure 29. South Africa with City of Tshwane as indicated. From: www.samaps.co.za, edited by Author 2010.

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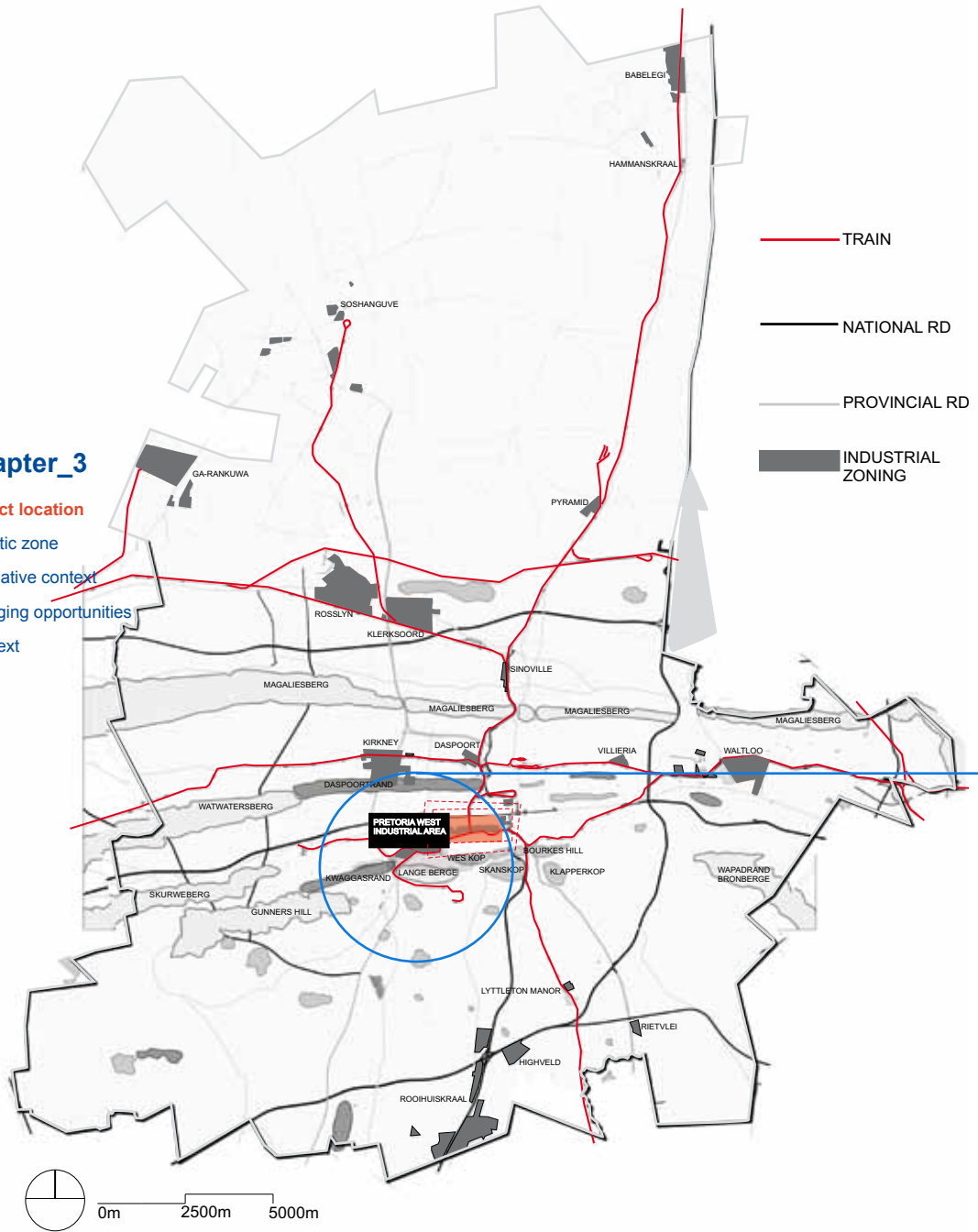


Figure 30. The study area of Pretoria West Industrial Area in context to the industrial areas of City of Tshwane. From: City of Tshwane Municipality, edited by Author 2010.

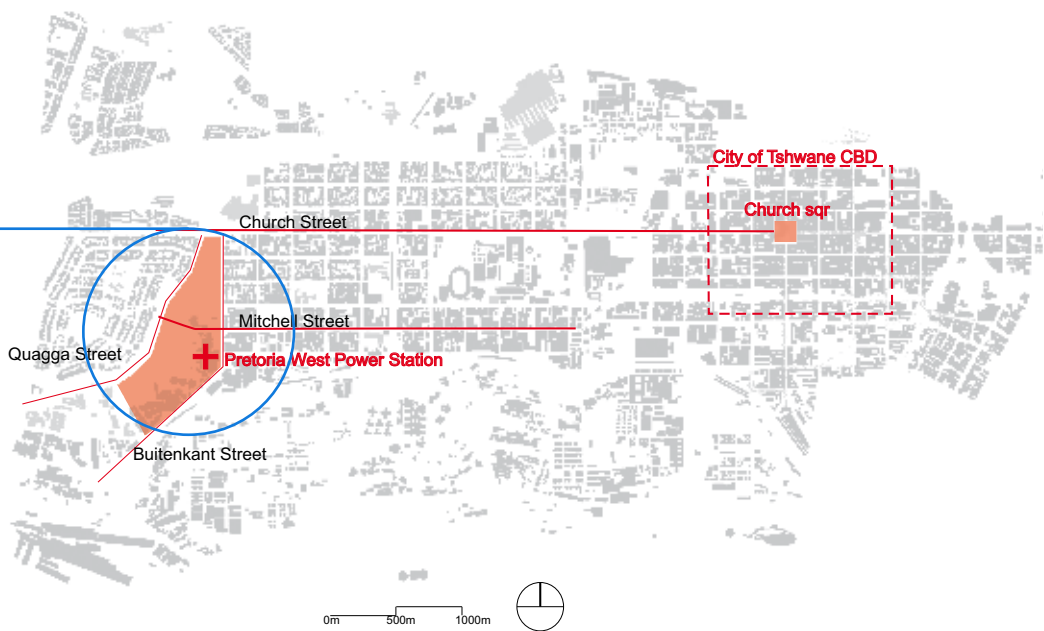


Figure 31. The study area of Pretoria West Power Station in context to the City of Tshwane CBD. From: City of Tshwane Municipality, edited by Author 2010.

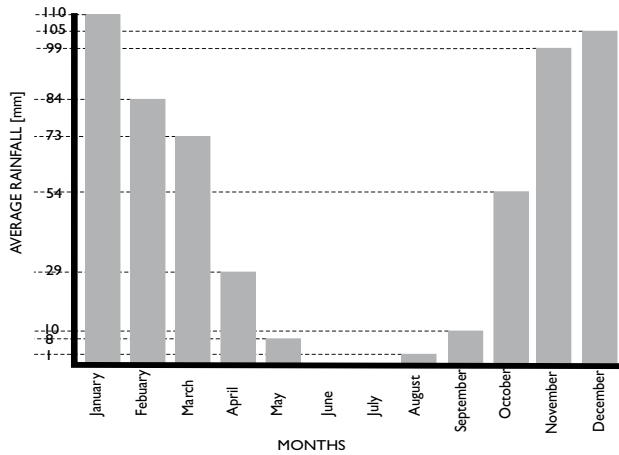


Figure 32. Average rainfall: City of Tshwane: Holm 1996.

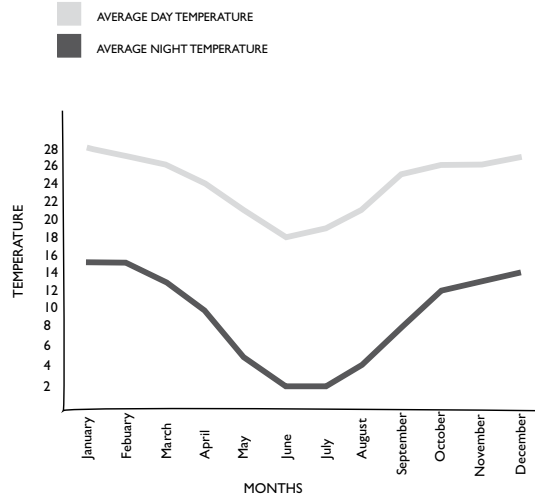


Figure 33. Average day and night temperature: City of Tshwane: Holm 1996.

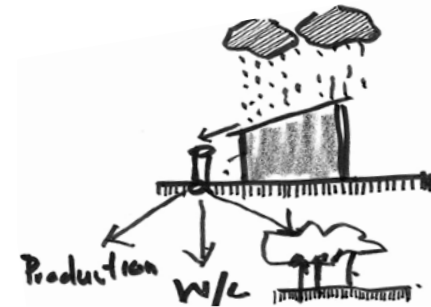


Figure 34. Rainwater harvesting: Author 2010.

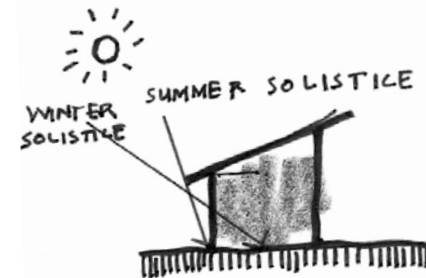


Figure 35. Passive solar design: Author 2010.



Figure 36. Capturing solar energy: Author 2010.

Climatic zone

General high temperature (fig: 33) and moderate humidity levels characterise the climate of the City of Tshwane. Thunderstorms are fairly common in this area with precipitation rates of up to 100mm per hour. The high average rainfall (fig: 32) per year provides the opportunity for rainwater harvesting (fig: 34). It would be a convenient way to shield entrances from sporadic thunder storms.

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Project location

Climatic zone

Legislative context

Emerging opportunities
in context

The City of Tshwane is situated in a climatic zone with large temperature variations and dry rainy seasons. Provided that the walls and floors give thermal mass, lightweight insulated roofs may be used in this area. External spaces should provide shade in the summer. External surfaces should be light coloured or reflective to minimize solar heat gain in the overheated period (Holm, 1996: 69).

Wind:

Major wind directions: north-east (summer) and north-west (winter). The City of Tshwane is located in a valley, between Magaliesberg, Daspoortridge, Skanskop and Klapperkop so wind is not a very effective energy resource. The structure of the building should be designed in such a way to maximise cross ventilation.

Solar:

Allow sunlight to enter in the winter and screen in the summer (fig: 35).

Vertical sun angle in Pretoria:
summer solstices – 64.24°
winter solstices – 40.73°

Typology:

The City of Tshwane is 1330m above sea level and is nestled between Magaliesberg, Daspoortridge, Skanskop and Klapperkop.

Renewable energies:

Electricity can be generated from the sun, using Photo Voltic(PV) panels (fig: 36). Each PV panel can generate 100 watts per square meter (depending on the type of panel), thus 10sqm = 1kW peak power.

The production depends on the area in which it is installed, i.e. sunlight hours and intensity. In the City of Tshwane, you would get an average of 6,2 hours of sunlight x 1kW = 6,2kWh/day from a 1kW array (Holm, 2010).

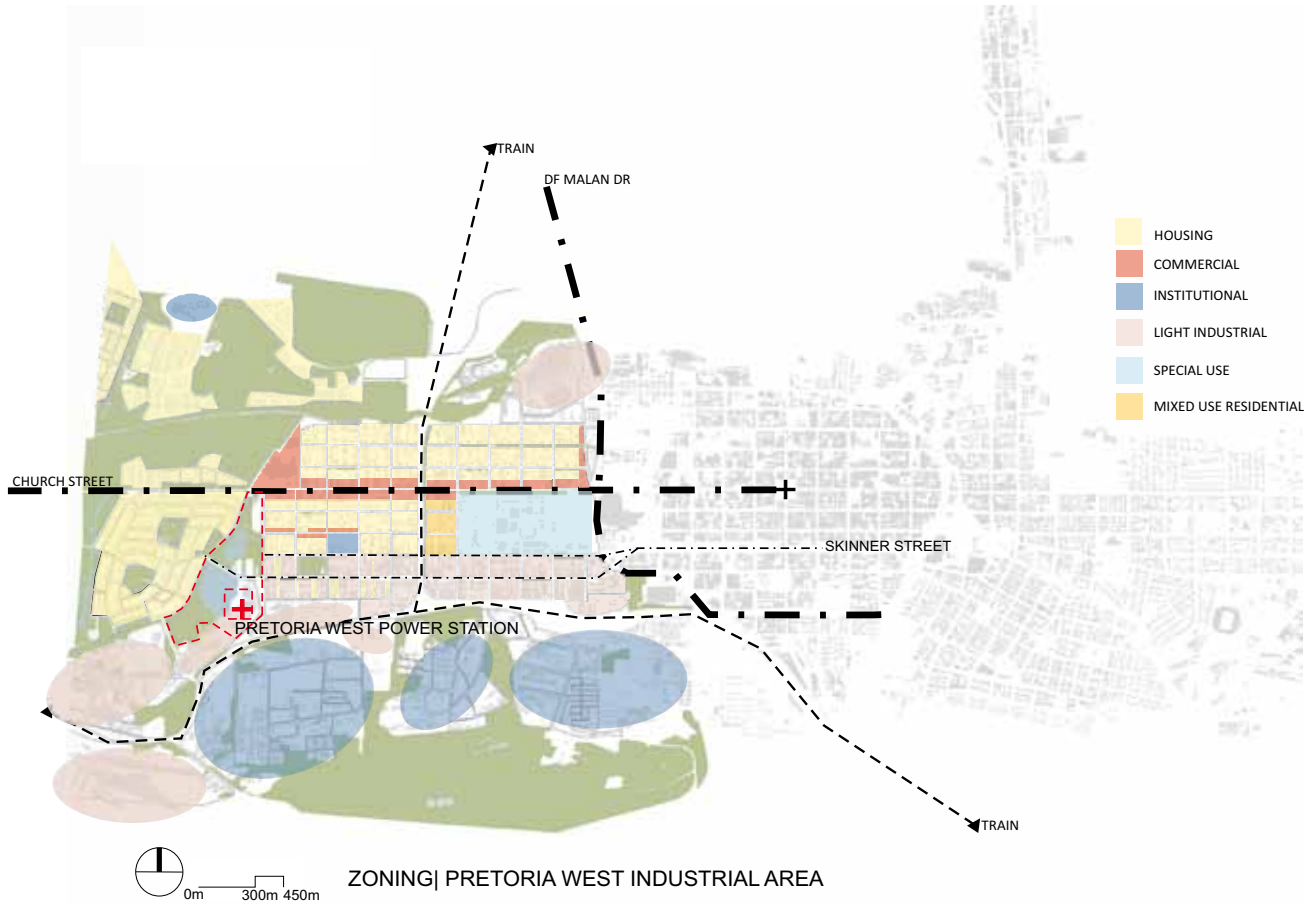


Figure 37. Zoning for Pretoria West Industrial Area. From: City of Tshwane Municipality, edited by author 2010.

Legislative context

Restrictions as per zoning certificate (fig: 37) issued by the City of Tshwane: Details: portion 460 of the farm Skinnercourt, Pretoria Town Planning Scheme, 1974

Pretoria West Power Station site area: 48.3 ha

Bio-diesel plant site area: 3700m²

Bio-diesel plant: 2650m²

Bio-diesel footprint: 2177m²

Density restriction: none

Coverage: 58%

FAR: 1.2

Building lines: street – 3m

SABS classification

Occupancy class: D3 – low risk industrial

Emerging opportunities in the Pretoria West Industrial context

One of the major challenges of sustainability and eco-design is the concept of economy versus ecology. The goal of economy is to maximise wealth and power of its elite, while the goal of ecology is to maximise the sustainability of the web of life (Capra, 2002: 262). The greatest challenge of ecology in the coming decades is to fully and productively integrate the complexity and global scale of human activity into ecological research (Alberti, 2003: 1173) to generate a sustainable way of life. Sustainable development is therefore process orientated, with interconnected mechanisms. For this dissertation the definition of the NSFW (2000) on urban sustainability will be accepted:

It is processes of social contexts. We understand the processes of social and ecological reproduction to be non-linear, indeterminate, contextually specific, and attainable through multiple pathways [...] Within the terms of this definition sustainability: it entails necessarily flexible and ongoing processes rather than fixed and certain outcomes; transcends the conventional dualism of urban versus rural, local versus global, and economy versus environment; and supports the possibility of diversity, differences, and local contingency rather than the imposition of global homogeneity.

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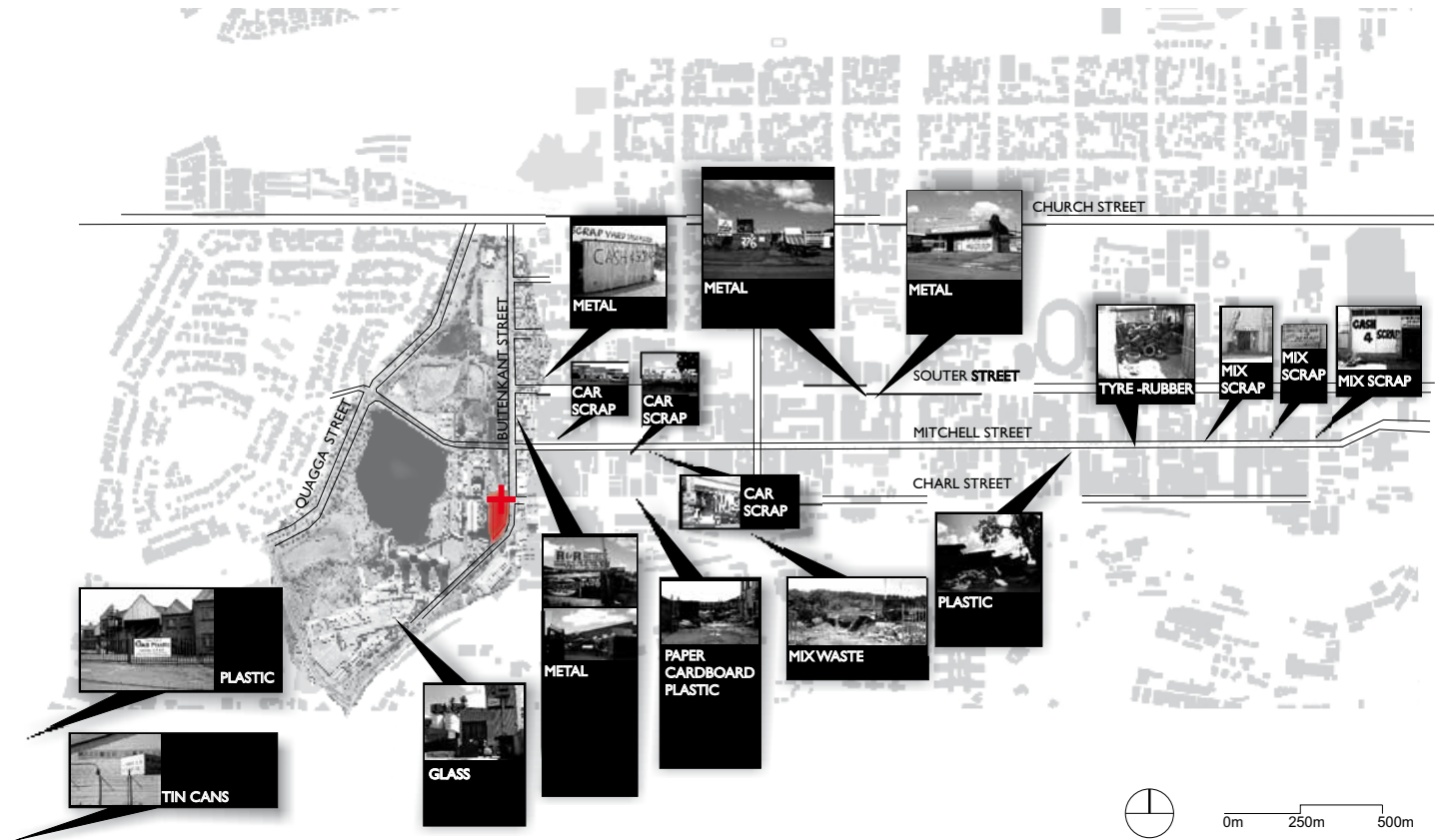


Figure 38. In the Pretoria West Industrial Area, along Charl, Mitchell and Souter Street, seventeen technical harvesting centres have been identified that could plug into the industrial metabolism where products-of-service are generated. Designing products as products of service means designing them to be disassembled and to be part of numerous cycles, generating an industrial ecosystem: Author 2010.

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**Emerging
opportunities in
cotext**

Capra (2002: 234) states that a major clash between economy and ecology derives from the fact that nature's ecosystem is cyclical, where as our industrial system is linear. Nature operates according to a system of nutrients and metabolism in which there is no such thing as waste (McDonough, 2002: 262). When waste equals food, it means that all products and materials manufactured by industry, as well as the waste generated in the manufacturing processes, must eventually provide nourishment for something new (Capra, 2002: 234).

At the moment, our carbon-intensive development model treats the city as a linear system, where the consumption of energy, food, water and environmental resources are disposed as waste (Pieterse, 2010: 17). The average person produce 0.5 ton of manure and 2.5 ton of waste per year (Bjarke, 2010: 52), the City of Tshwane produce 2.5 million ton of waste per year and only 2.5% of this is recycled (Dekker, 2010).

In the book *Yes is More*, Bjarke Ingels Group Architects argue that one should move away from the fundamental misunderstanding that puts ecology against economy as good versus evil (Bjarke, 2010: 50). They state that ecological initiatives will only prosper in the real world if they work as viable economic models, and business models based on the wearing-down of our natural resources

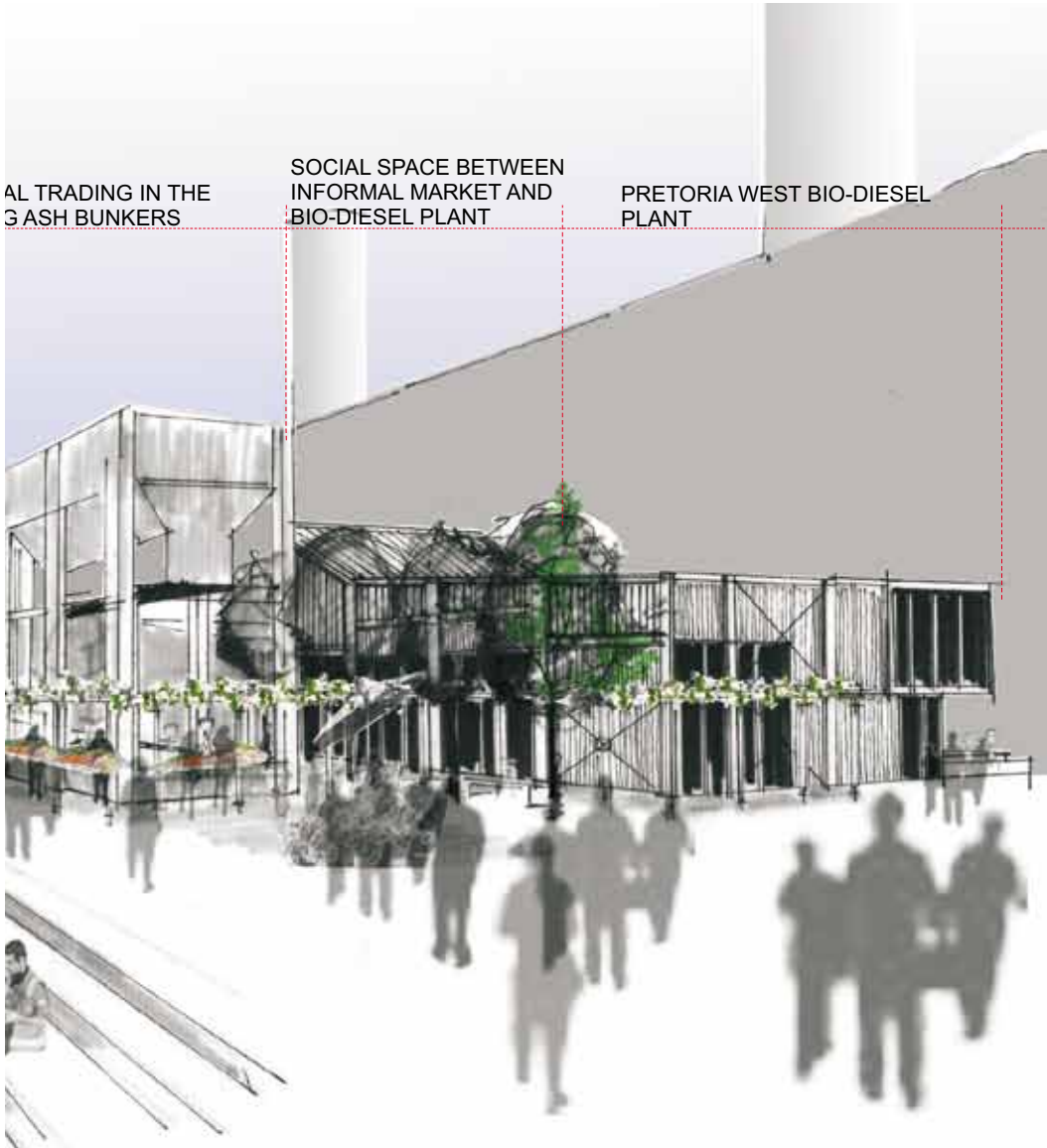
are not viable for long term growth. The idea is to turn the urban environment into an economical and ecological ecosystem which might seem like an Utopian idea/ model, due to its magnitude (Bjarke, 2010: 57).

The focus should shift from economy and ecology competing against each other to both becoming cyclical ecosystems existing in harmony, with energy flowing through both systems. When waste is turned into resources, new revenue streams are generated, new products are created and overall productivity increases (Capra, 2002: 265).

McDonough (2002: 110) states that a technical nutrient is a material or product that is designed to go back into the technical cycle, into the industrial metabolism from which it came. For example, a television consists of approximately 4360 chemicals. Some of them are toxic, but others are valuable nutrients for industry that are wasted when the television end up in a landfill. Isolating toxic chemicals from biological nutrients allow them to be up-cycled rather than recycled, to retain its high quality in a closed loop industrial cycle. Thus a sturdy plastic computer case, for example, will continually circulate as a sturdy plastic computer case, or some other high-quality product such as a car-part or medical device, instead of being down-cycled into soundproof barriers or

flower pots.

In the Pretoria West Industrial Area, along Charl, Mitchell and Souter Street, seventeen technical harvesting centres (fig: 38) have been identified that could plug into the industrial metabolism where products-of-service are generated. Designing products as products-of-service means designing them to be disassemblable to become part of numerous cycles thereby generating an industrial ecosystem.



Site analysis

The site analysis investigates the following concepts:

- The Pretoria West Power Station as a discarded space
- Regenerating the Pretoria West Power Station through movement, activity and social interaction
- The prevailing social themes in the Pretoria West Industrial area

Discarded space

The discarded Pretoria West Power Station will act as a laboratory to demonstrate sustainable community integration with the production process and the urban fabric.

In order for the production process to function as an ecosystem (fig: 39-) it needs to be cyclical (process orientated) and not linear (product orientated). The problem with the linear approach to production is the creation of waste that is discarded, and processes are implemented to yield an optimum product irrespective of the effect that it might have on the ecology. Potential concepts for form-generation in the cyclical approach where waste equals food will produce creativity and emergence; key aspects to address challenges on various scales and levels.

The spontaneous emergence of order at critical points of instability is one of the most important concepts of the new understanding of life. It is technically known as self-generation and is often referred to simply as 'emergence'. It has been recognized as the dynamic origin of development, learning as evolution. . . And since emergence is an integral part of the dynamics of open systems, we reach the important conclusion that open systems develop and evolve. Life constantly reaches out into novelty (Capra, 2002: 14).

Mcdonough (2002: 103) raise a very important question that associates the concept of process with community and product with the individual:

What would have happened, we sometimes wonder, if the Industrial Revolution had taken place in societies that emphasise the community over the individual?

A community is a network of processes. Williams (2007: 45) defines the elements of a community as land and structures, people and their socio-cultural activities, and business and educational institutions; all vital and interconnected. As a result, improvement to one simultaneously enhances the others, and degradation to one degrades the others. What good is it to solve an economic problem if, by doing

so, it increases air pollution and other environmental problems? What good is a solution to an environmental crisis if it wrecks economic havoc on its citizens?

In either case, the community as a whole suffers. The idea of community is central to ecology where materials and energies constitute to create the forms and patterns of the community, and these constituent elements are characteristics of the community's scale and size (Williams, 2007: 69).

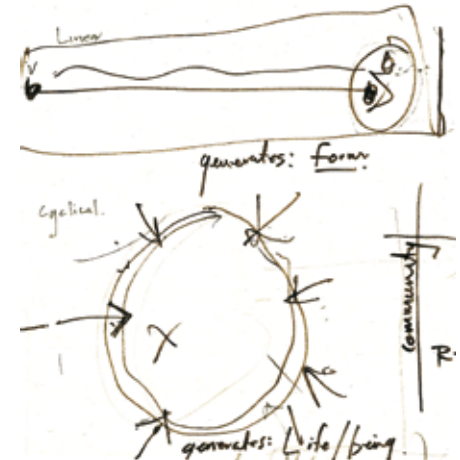


Figure 39. In order for the production process to function as an ecosystem it needs to be cyclical (process orientated) and not linear (product orientated): Author 2010.

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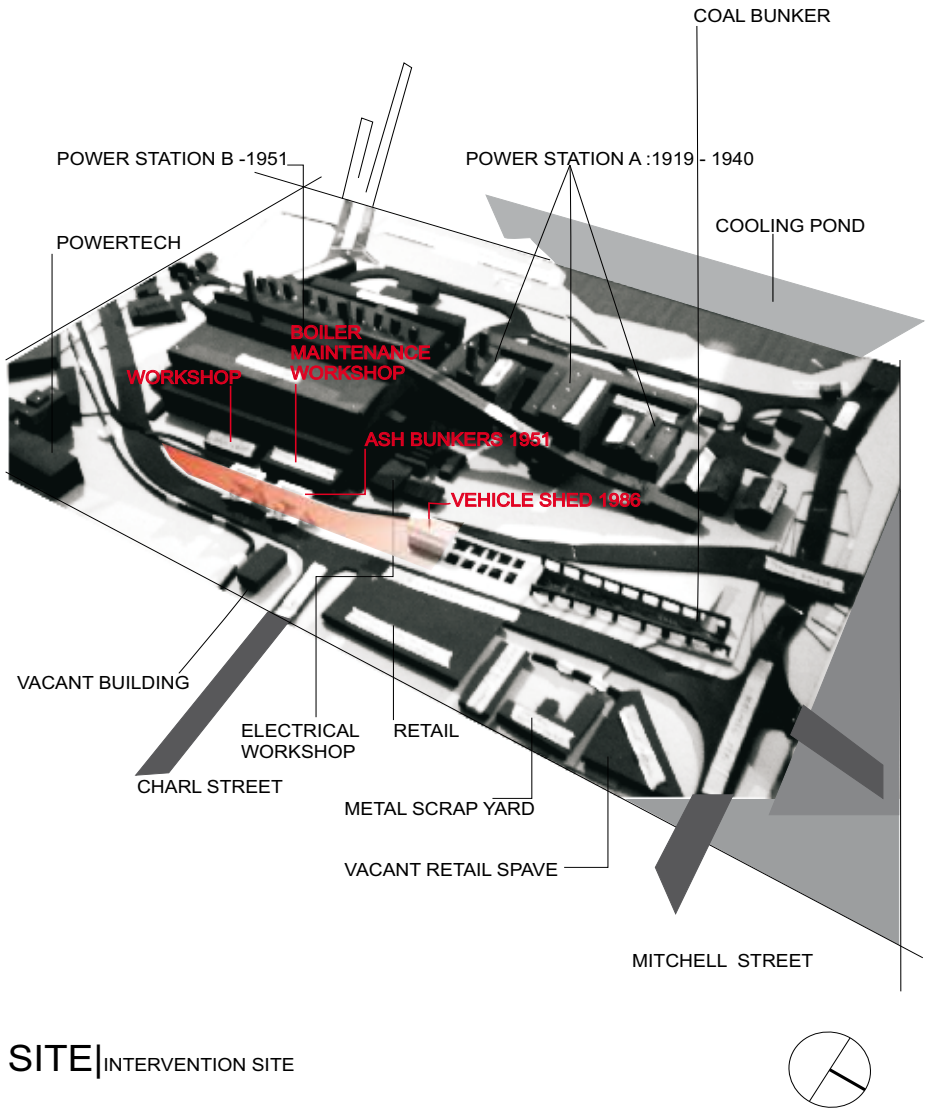


Figure 40. Existing conditions at the Pretoria West Power Station: Author 2010.

The concept of the individual, drawn to socially accepted pleasures, is useful to an expanding capitalist economy as it fuels consumption (Hill, 2006: 43).

Today most so-called durables are tossed. Who on earth would repair a cheap toaster today? It is much easier to buy a new one than it is to send the parts back to the manufacturer or track down someone to repair it locally. Throw away products have become the norm (Mcdonough, 2002: 92).

The action of consuming thus generates a sense of wellbeing and safety to the individual. Consumable commodities provide assistance and security that isolate individuals to function on their own, with little or no help from others, only to weaken the sense of community. Hill (2006: 21) states; the myth of a mass-produced commodity is somehow individual and can transform and define an individual, leading to a capitalist economy that generates ever-expanding cycles of consumption that cultivate rather than resolve feelings of personal inadequacy.

Societies that value community, will value the in- and outflow of energies and the consequences that it might have on the rest of the network where services and products are produced. On the other hand, an individual oriented society focuses on the most effective and economically viable product, irrespective of the in- and outflow of energies and its consequences.

The discarded Pretoria West Power Station (fig: 40) will be explored as a laboratory to demonstrate sustainable community integration with the production process and the urban fabric.

Building program

The building program emerged to be a production process that moves away from a linear approach to a cyclical approach. It is in this cyclical approach to production that emerging opportunities will have the capacity to address the regeneration of the urban fabric.

In keeping with the regenerative approach to discarded objects and memory of energy production (Pretoria West Power Station), the emergent program is to use discarded objects (used cooking oil) to produce energy (bio-diesel). The production of bio-diesel presents an environmentally-friendly and sustainable process that would have a positive impact on the community through training, job creation and the provision of a much-needed energy resource.

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STRUCTURES **SUNKEN** AND RAISED LANDSCAPES

0m 250m 500m



Figure 41. Pretoria West Power Station: Existing Structures: Author 2010.

Discarded space in the industrial city [destruction breeds creation]

All industrial space that exists does so because it was possible to sink its foundations in logic (Mueller, 2009: 33). The development of the Pretoria West iron industry in 1930 led to major factories being developed along Mitchell Street; an area originally developed in 1910 as single middle class and workers' houses (PWIF, 2004). The function of these factories was mostly related to the iron industry due to its location and direct link to the rail.

In December 2004 ArcelorMittal (formerly known as ISCOR) announced the relocation of its head office from Pretoria to Vanderbijlpark. Downscaling of its Pretoria works (fig: 42) commenced in the early 1980s. A planned rehabilitation program was implemented and the demolition of the plant and buildings, and the moving of large volumes of potentially hazardous material was completed without any negative environmental impact (ArcelorMittal Steel South Africa limited annual report, 2004).



Figure 42. ArcelorMittal (March 2010), Pretoria West, City of Tshwane: Author 2010

This relocation had an effect on the remaining functions of the factories in Mitchell Street. Today the industry is predominately car related.

The Pretoria West Power Station (fig: 41), another key industrial generator in this area, faces an uncertain future, with conversations by the City of Tshwane Municipality to close it down due to its low energy contribution and economical inefficiency. The total power demand of the City of Tshwane Metropole is 1800mW with only 160mW (8,8%) supplied by the Pretoria West Power Station (when it runs at full capacity). Rooiwal Power Station supplies 200mW and Eskom 1440mW (Massut, 2010).

The first power station in the City of Tshwane Metropolitan Municipality was constructed in 1892 at the present Tram Shed in Schoeman Street. It soon became evident that the above site was too restricted in terms of area and facilities (it had no rail access) to accommodate the increasing amount of generator plant required to deal with the growing demand for power. In 1919 a new site was selected on Mitchell Street, Pretoria West. There was access to it by rail and road and a dam could be constructed to provide cooling water for the power plant (Massut, 2010).

The initial capacity of 9mW at the Pretoria West site, subsequently called the 'A' Station (fig: 40), was increased as demand for power increased and in 1940 the capacity was increased to 54mW. In the same year a report was submitted to the city council to increase the capacity by a further 37,5mW. The plant for this extension was ordered in 1940 but owing to the war it was only fully commissioned in 1949. The "A" station was shut down in 1975 due to the high operational and maintenance costs (Massut, 2010).

The design of a further extension to the Pretoria West site, the current 'B' station, commenced in 1949. The station with an installed capacity of 180mW consisted of six 30mW steam-driven alternators. The first two alternator sets were commissioned in 1952 and the last set in 1960 (Massut, 2010).

When the operation of the Pretoria West Power Station terminates, this discarded space could through emergence reinvent itself; just as Barcelona reinvented itself when its port died. Cities are where human beings live, and cities do rethink themselves (Mueller, 2009: 36).

Regeneration

[i am frequently asked: how can we transform failing cities into thriving cities? But there is no magic formula (Solzi, 2009: 56)

Urban regeneration was defined in the introduction as a process whereby an area is rehabilitated or improved through the creation of a sustainable ecology between economic and ecological networks. The aim of regenerating the Pretoria West Industrial Area is to reconnect renewable energies and resources to the urban form. Only then will this industrial urban cell be in a position to emerge as a sustainable community, and reconnect and support the central business district of the City of Tshwane.

Much of the current thinking in urban and community design focuses on the form of neighbourhood and community. In these projects, many important objectives are stressed: walkable neighbourhoods, small scale streets, good edge definition, design, and location of town and neighbourhood centres, transportation, and community gathering places. However, long term sustainability is not achievable in these communities, as they rely almost entirely on non-renewable energy. No matter how charming the pattern, any biological community, including the human community, must tie its long term development and use to sustainable energies and resources that are resident to the place. When resources dry up, so do communities. A sustainable urban and community pattern comes from understanding and connecting and adapting to local sustainable resources (Williams, 2007: 69).

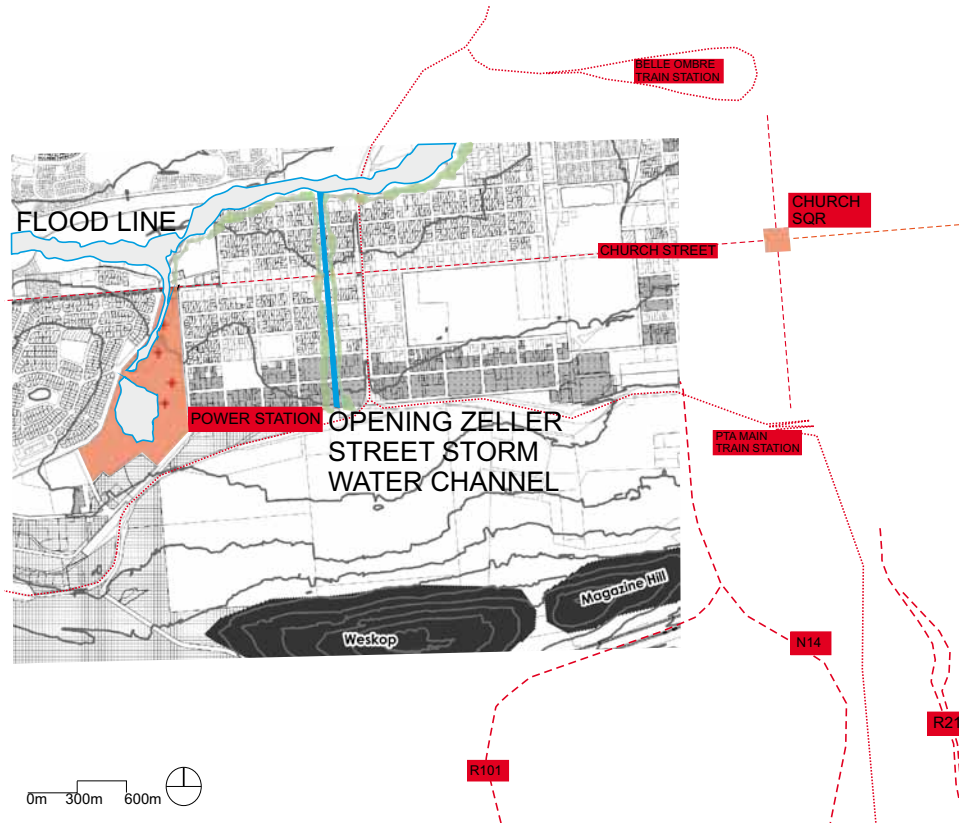


Figure 43. Main movement routes linking to the Pretoria West Industrial Area: Author 2010.

Both Norquist (2009: 51) and Halliday (2009: 58) suggest that the modern urbanists should go back to the basics of urban design. Norquist argues that in an urban context the time tested practice of connecting the natural system to the urban system is based on movement, activity and social interaction.

These concepts will be explored and applied to the Pretoria West Industrial Area, the Pretoria West Power Station and the proposed bio-diesel plant.

Movement

The short-sightedness of leading thinkers in design is often only revealed through time. The great modernist Le Corbusier said; 'kill the street', meaning get the pedestrians and pavement cafes and other obstacles out of the way of traffic (Halliday, 2009: 58). His propaganda was aimed at eliminating emerging connections and focusing on the functional.

Urban planners lose sight of the benefits of chaos. They forget that without pedestrians to slow them down, cars are apt to go too fast and kill their drivers, and without the eyes of the cars on them, pedestrians can feel vulnerable and isolated. Cities laid out on apparently rational, where different specialised facilities – houses, shopping centres, offices – are separated from one another across a vast terrain connected by motorways and presuppose that we march from place to place with a sense of unflagging purpose (de Button, 2009: 53).

The Pretoria West Industrial Area acts as a moving corridor between the City of Tshwane CBD and western suburbs (Atteridgeville, Proclamation Hill, Danville etc.) with only a few destination points (Pilditch Stadium, Showgrounds, schools and churches). The main economical activity of the area is predominantly car-related. With it being a movement corridor to the suburbs and the lack of diversity in activity contribute to the fast vehicular movement towards the eastern and western directions. This functional approach to movement makes the area uncomfortable and unsuitable for pedestrian activities, due to the speed of movement and scale of the roads (a one way, three-lane road). While vehicle access is necessary, it should not determine the design of our streets as it is today (Solzi, 2009: 57). It is clear that it is much easier to sort out the functional aspects of a city than the qualitative aspects like atmosphere, character, and scale.

Movement in the Pretoria West industrial Area:

The aim would be to slow down the movement towards the eastern and western directions, through interventions in the northern and southern direction. This will contribute to the diversity and quality of the space (fig: 43). The first interventions would be to link predominantly private vehicle movement towards the east and west with public transport nodes (train and Bus rapid transport (BRT) stations).

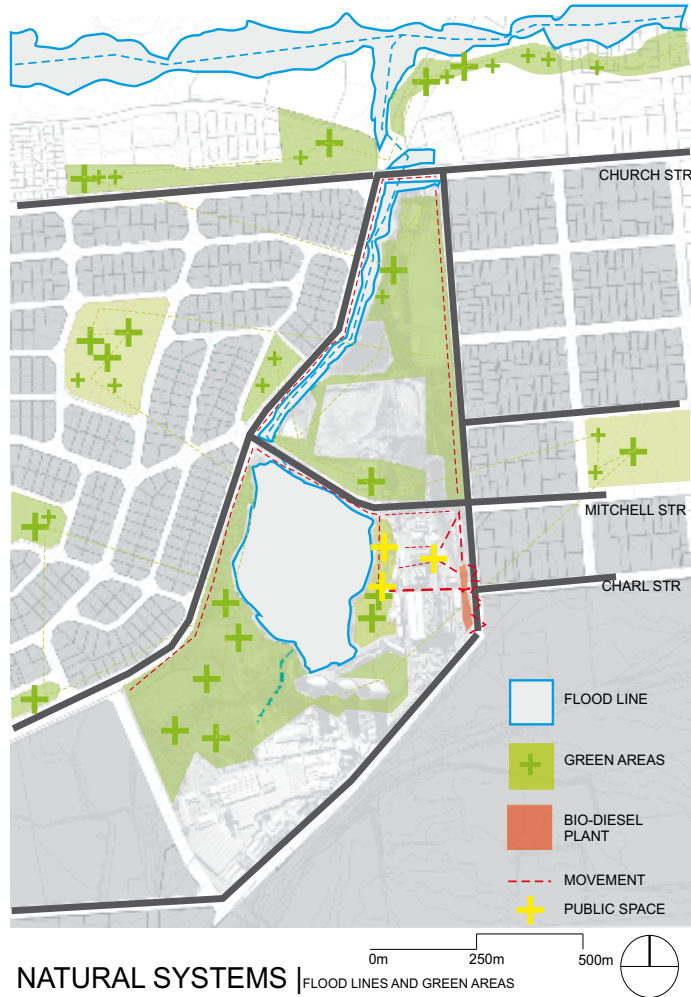
The second intervention (fig: 43) would be to link the natural system with the urban system; the currently closed stormwater channel in Zeller Street that serves as the catchment for Weskop Hill, should be opened up and developed as a much-needed urban open space with floodwater stored for recharge while civic amenities are created.

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Movement in the Pretoria West Power Station:

The main movement activities (fig: 44) would be along the natural systems of the site and would lead to the public spaces (destination points). The aim of the public spaces would be to accommodate emerging (economical and social) activities and to coordinate the user in terms of space and destination.

Figure 44. Pretoria West Power Station: natural systems: Author 2010

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Movement in the proposed bio-diesel Plant:

Movement along the opened facade on Buitenkant Street would form visual connections to the production process, and generate conversation that would interweave the production process into the urban fabric (fig: 45).

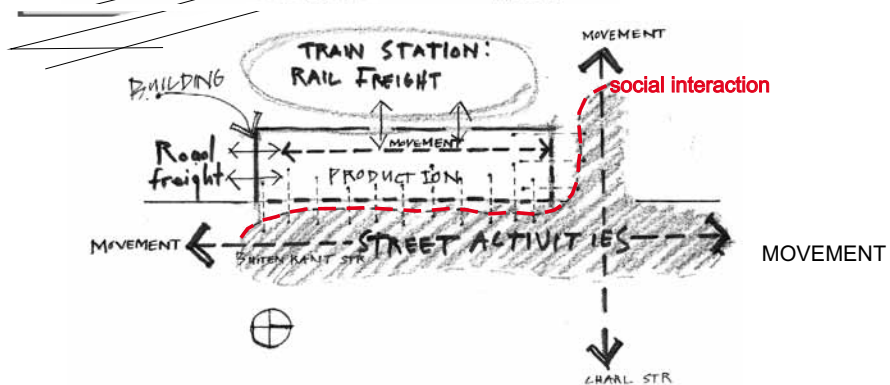


Figure 45. Movement along the street edge (Buitenkant Street) and the proposed bio-diesel plant: Author 2010.

Activity:

In an urban context the street is the host of economic and social activities, it is where business deals are negotiated, and where people interact through observation or verbally-shared ideas and thoughts. City streets need to be pleasant places to live, but also facilitate small businesses, craft-makers and even the odd car mechanic. They might be unsightly, noisy and lower the tone of the street, but they make a neighbourhoods thrive, and anyway, too much peace and quiet can be bad for you (Tuck, 2009: 66). Only a very small group of the most annoying industrial activities is unsuitable for integration with residence (Gehl, 2006: 102).

We've become so hooked on the value of clean service jobs and big business that we've forgotten that cities also need to be places where we make things. Of course it's hard to persuade people that noise is needed, but a bit of clutter does us good. When streets are too quiet, every little noise becomes the sound of a potential intruder (Tuck, 2009: 66).

Activity in the Pretoria West Industrial Area:

In the study area the predominantly car-related industries, such as panel-beaters, vehicle repair workshops and scrapyards, all function behind solid façades with very little or no interaction with the street. This might be due to security reasons or no

desire to have interaction with the street. The nature of car-related activities in the Pretoria West Industrial Area attracts once-off clients, that wouldn't come to this area if it isn't for a specialised vehicle-related need. The pattern of repetitively visiting a location that relates to an activity (for example: buying food at your local grocer) is necessary for a person or group to build attachment and meaning to create a sense of place. Diverse activities (food shops, hair salons, clothing shops etc.) in the study area would attract more people thereby generating regular interactions. People and activities are the key components of a living place that generate place attachment, sense of belonging and community (Shuhana & Norsidah, 2008: 404).

There are some things, though, that all cities should consider. We come to cities in order to enjoy more opportunities. And the more densely populated a city is, the higher the chance of encounters that can lead to economic and social opportunities. This does not just mean a high concentration of residents. A city needs a variety of different people in order to build the relationships of buyers, sellers and creators (Solzi, 2009: 57).

The sense of place is viewed as a form of connection or bonding, between a person and the setting (Hidalgo & Hernandez, 2001: 279), and we have established that activities serves as the first generator to create a sense of place or appropriate

space.

Activity in the Pretoria West Power Station:

The nature of electricity production is a close and isolated process (fig: 47). The activities proposed to intervene with the Pretoria West Power Station (fig: 48) include light industry, housing, urban agriculture, transport node and mixed use activities (local grocer, restaurants, a hotel, a convention center etc.) These activities would establish connections with the surrounding industrial urban fabric needed to regenerate the area to ultimately reconnect with its surrounding urban-cells.



Activity in the proposed bio-diesel Plant:

By creating production annexes to accommodate the production activities a non-linear facade would be created that would enable a tacit connection between the production process and the local community through visual and social interaction (fig: 46).

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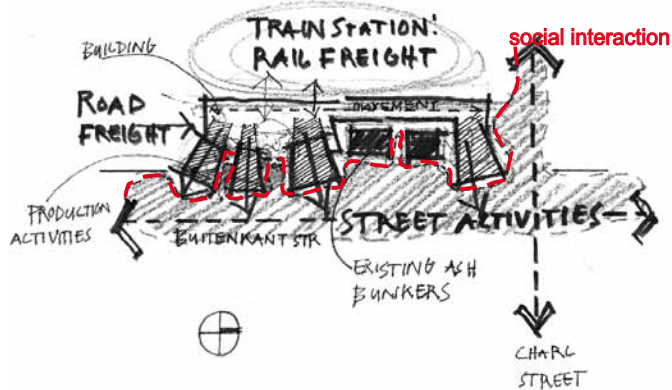


Figure 46. Non-linear facade to generate maximum interaction with street activity (urban fabric): Author 2010.

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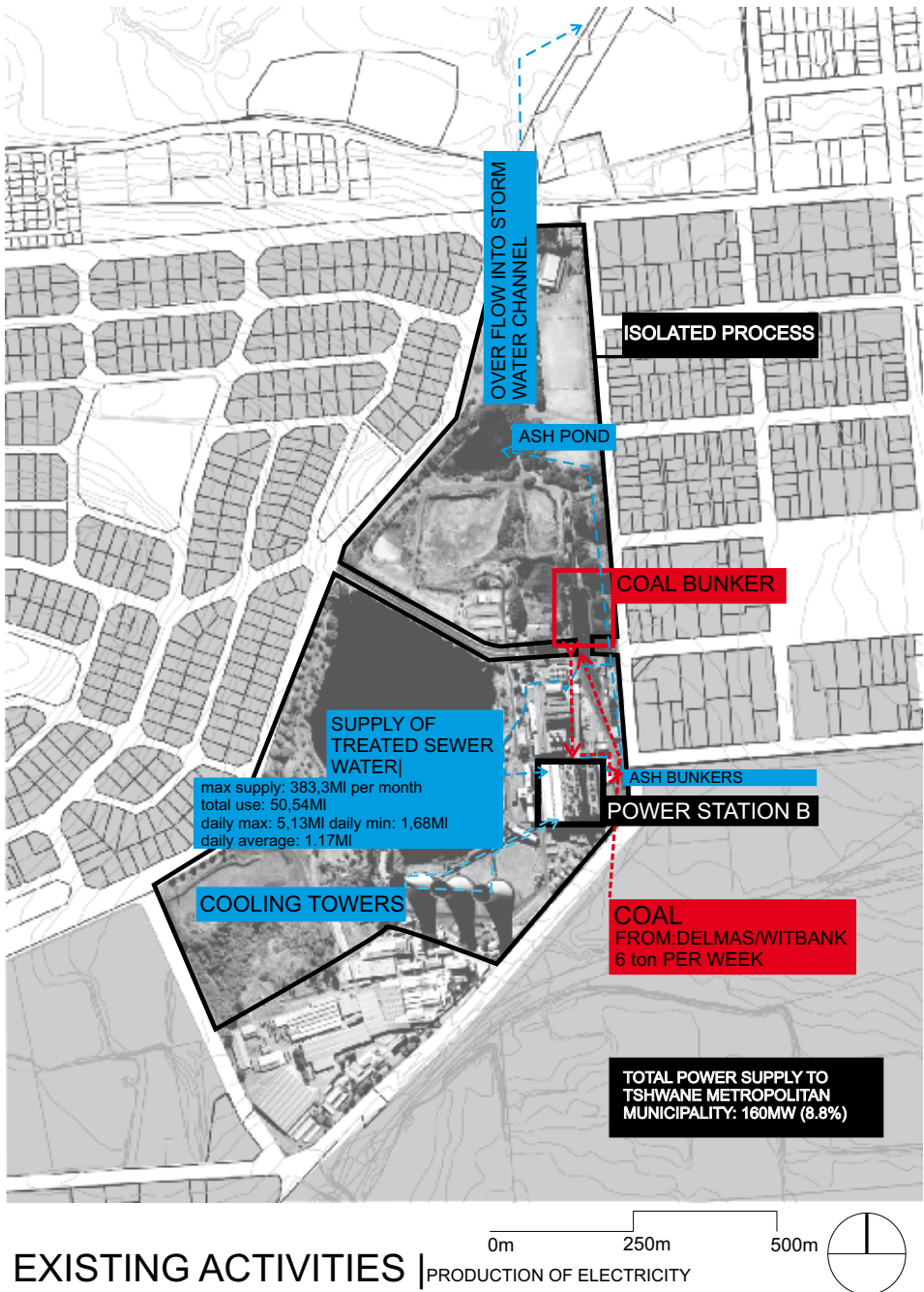


Figure 47. Existing activities in the Pretoria West Power Station, City of Tshwane: Author 2010.

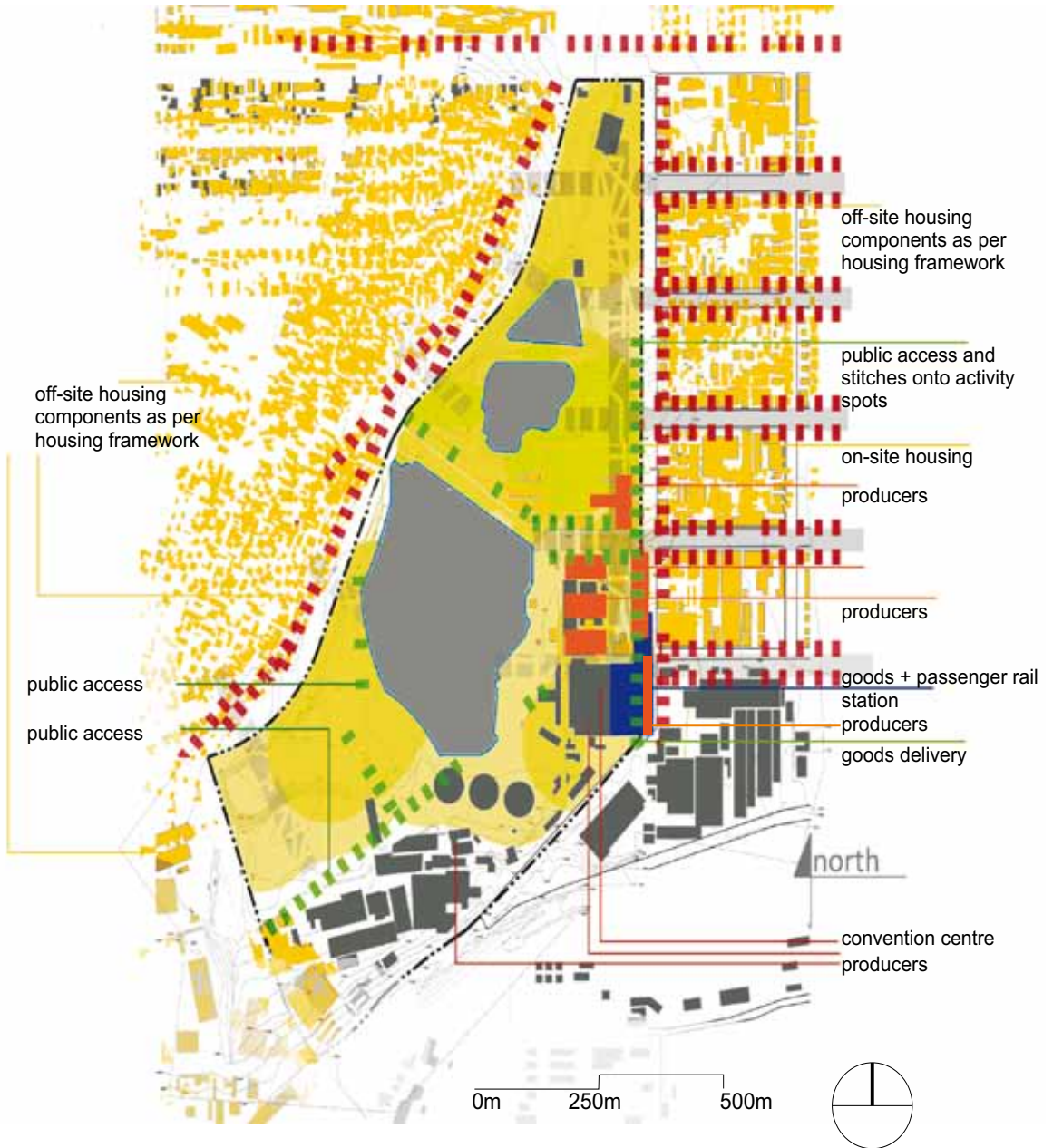
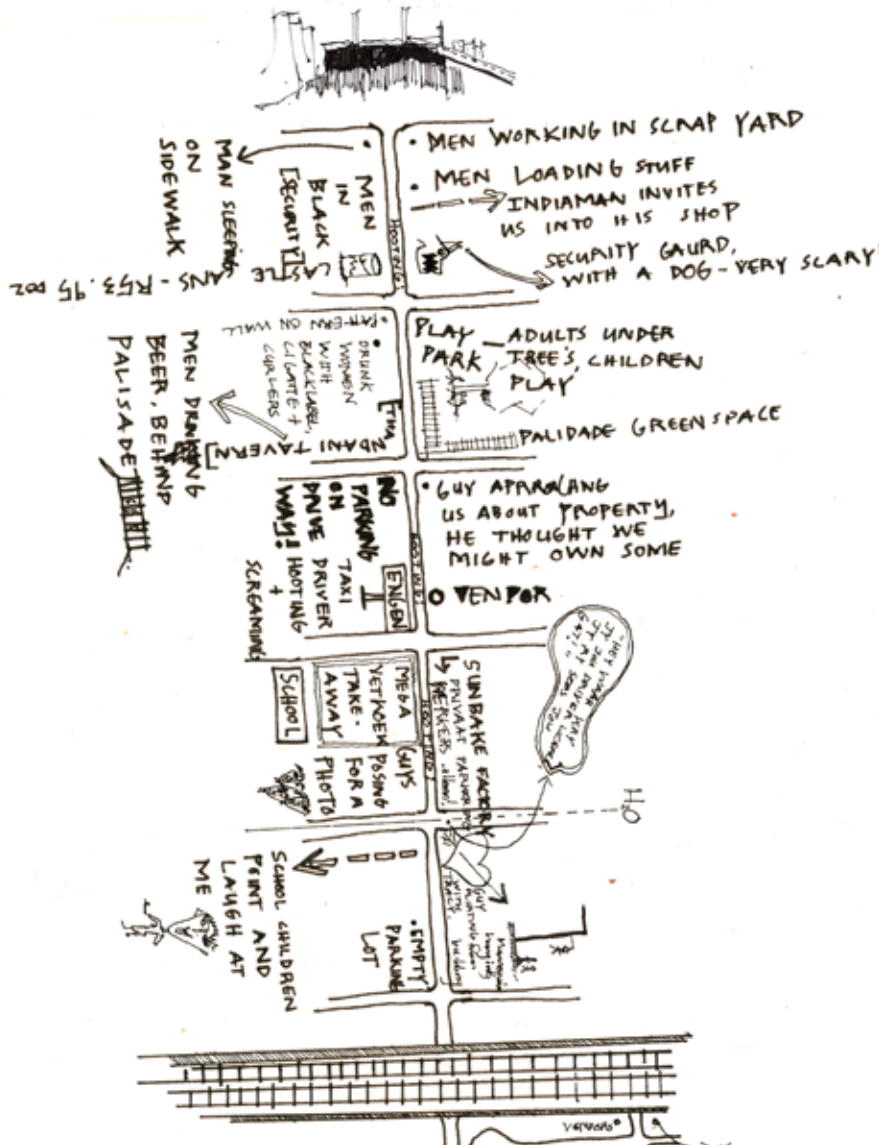


Figure 48. Proposed activities in the Pretoria West Power Station, City of Tshwane: Pretoria West Group Framework 2010.



Flaneur as per methods described on page 15:

Mitchelle Street, reminiscing of a place that had its hey days. Young men jumping of trains to come and earn a living. The beginning of the industrial life:

new dreams
new horizons

The Berrel Hotel, the old lady that stood the test of time, her grandeur is still distinct but not polished, and does that matter? People still talk to each other, still laugh at the shebeen, are still drunk after work, still selling their bodies,

are still just human?

Did I only come to look for decay? School children point and laugh at me, Susan at the Berrel Hotel says she doesn't live in this shit hole . . . "I only work here".

The method of flaneur is implemented to understand the social interaction on the Pretoria West Industrial area. For the site of the Bio-diesel plant, the concepts of movement and activity (fig: 51) is implemented to understand the social interaction that the building have to respond to.

Social Interaction in the proposed bio-diesel plant:

Integration of the production process into the urban fabric would be achieved through (fig: 50):

- Opening up the facade to establish a visual connection to the production process
- Production annexes that would form a non-linear facade

Urban space is an extension of the space contained inside the building. By looking at the city through the concept of a continuous space it becomes more evident that the building and the city loose their weight in a possible hierachy. Both are lowered to the same level of importance when subordinate to the space (Carta, 2010: 157)

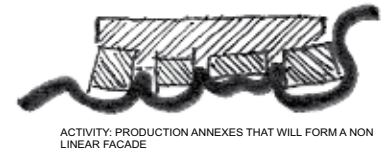
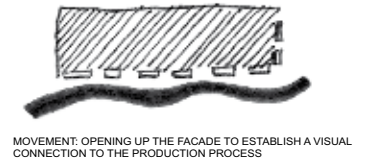
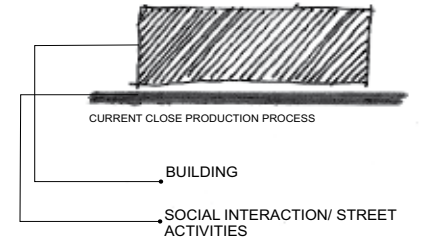


Figure 50. Integration of the production process into the urban fabric through movement and activity: Author 2010.



A



B



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Figure 51. The surrounding landscape that indicates industrial (view B) and residential activities (view A) from the Pretoria West Power Station: Author 2010.

THEMES		QUALITATIVE [emergence]	QUANTITATIVE [industrial architecture]
-RELOCATION OF PEOPLE		-IDENTITY AND COMMUNITY economics /work	-HOUSING + JOB CREATION
-CRIME	PROVISION	-SELF RESPECT economics and community	-MANUFACTURING AND CREATING job creation
-SERVICE DELIVERY	DEPENDENCE	-SELF SUSTAINED government, economics -taxes	-PASSIVE DESIGN economics + job creation
-EDUCATION	EMPOWERMENT	-ENTREPRENEUR social change, economics	-TRAINING FACILITY/BUSINESS job creation and empowerment
-ILLEGAL DUMPING		-SELF REGENERATIVE community/ ownership/ education	-RECYCLING PLANT community/ education
-POVERTY		-DIGNITY awareness/ economics / education / identity/	-CREATIVE SKILLS TRAINING education
-PUBLIC TRANSPORT	DEPENDENCE	-STABILITY services, government, economics	-TRAIN AND BUS STATION services: economics / dependency: job creation
-SPORT		-CHARACTER, ENDURANCE health, entertainment, recreation	-SPORT FACILITY health/ recreation
-ILLEGAL IMMIGRANTS	LOCAL IDENTITY	-DIVERSITY community, identity, economics	-TRANSFER OF SKILL local identity/ community/ job creation
-RECYCLING PROGRAMS		-WASTE EQUALS FOOD education , economics , job creation	-RESEARCH + EXPERIMENT - REGENERATIVE PRODUCTION job creation
-CLEAN YOUR SUBURB		-OWNERSHIP, RESPECT identity/ education / community	-GREEN SPACE/RECREATIONAL SPACE communal social space
-SAVE WATER		-RESPECT AND VALUE economics / education	-WATER RECYCLING PLANT education + job creation

Figure 52. Emerging themes in the Pretoria West Industrial Area, City of Tshwane. From Pretoria West Record newspaper (Jan - Apr 2010) as per periodical analysis described under methods on page 15.

Prevailing social themes in the Pretoria West Industrial Area:

For Aguilar (in Breed, 2010) when the press writes about the city a double process is revealed. Collective forms are recuperated and exhibited by giving value, themes and hierarchies to the urban context (or space). It could be politics, housing or development, where something is lacking e.g. facilities or amenities or something that is going to happen such as new proposals by government or consultation between different parties. At the same time, these values are recuperated in a convenient form (which can be an informative note, a report or advice given) that orientates, models and gives representation of social recognition to a previous social discourse.

Chapter_4

Discarded space
Regeneration
Social themes
Landscape

The Pretoria West Record newspaper covers the Pretoria West Industrial Area. It is freely distributed on Fridays to 18 800 households, and the aim of the newspaper is to be a voice for the community. The newspaper is published in English with a small synopsis of the article in Afrikaans. Fifteen exemplars (22/01/2010 – 16/04/2010) consisting of 12 pages each were analysed.

The aim of the analysis (full study in addendum A) is to determine the hierarchy of themes currently prevailing in this area; guiding the author in identifying the emerging opportunities in the Pretoria West Industrial Area that would contribute to the regeneration of the urban fabric.

The following themes were discovered in the news paper analysis:

The newspaper analysis formed part of the process to understand the prevailing themes in the area in order to guide the author in determining the appropriate building intervention for the site. The intervention would have to address job creation and economic empowerment if it is to contribute to the wellbeing of the community.

(Only a synopsis of the main themes is discussed here, the full study appears in addendum A)

The lack of economic empowerment is the main emerging theme (fig: 52). In addressing this challenge the question arises: What can economic empowerment promise ?

- Generation of opportunities.
- Urban Regeneration.
- Self-sustainability.
- Identity through sense of community.
- Skills (empowerment) development.

These economic ways to empowerment were addressed further during design development.



Industrial scale

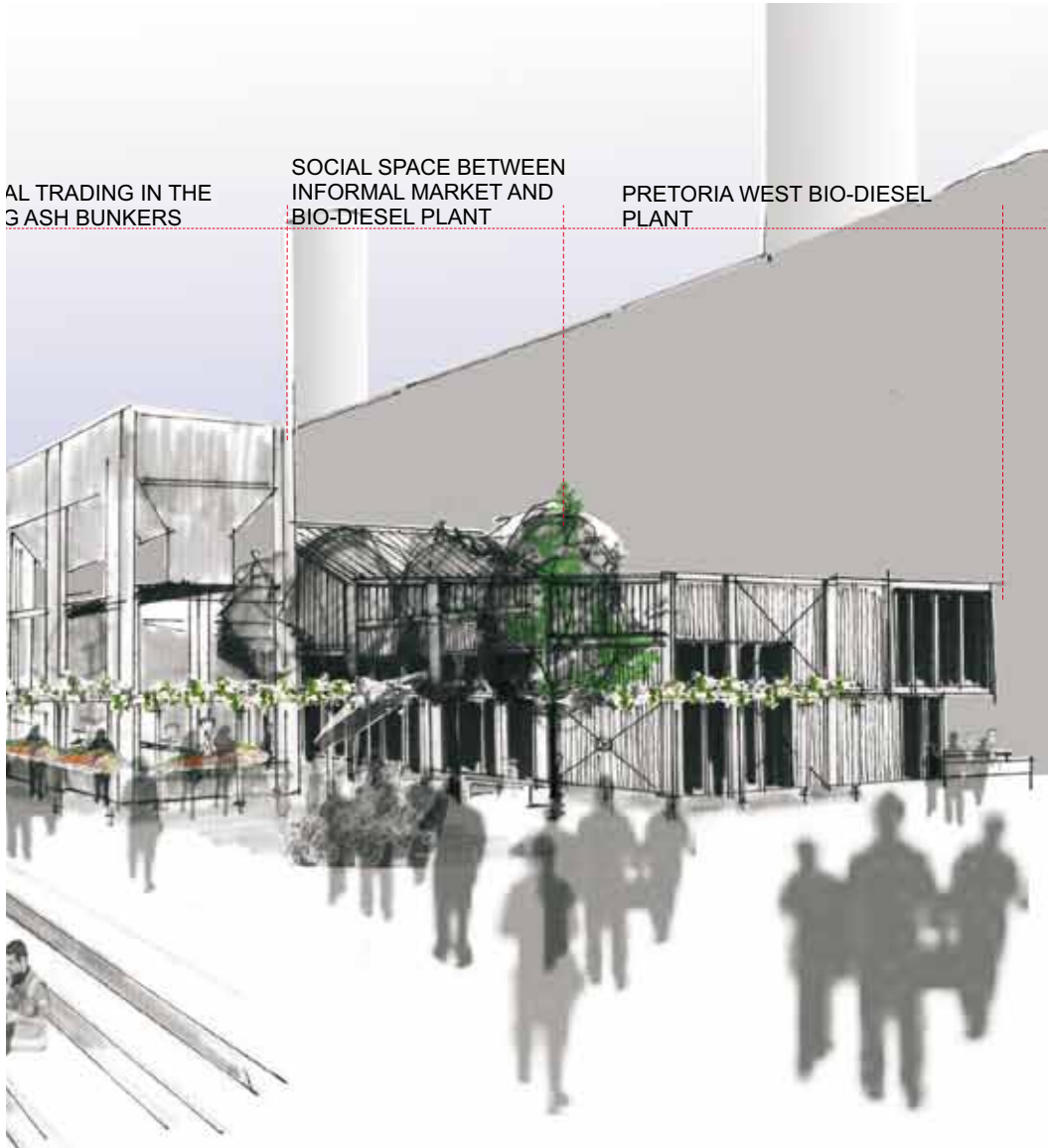


Function or process defines spatial quality



Landmark quality of cooling towers

Figure 53. Drawings of the Pretoria West Power Station to show the character of the site: Author 2010.



Precedent studies

The precedent studies focused on the following premises:

- John T Lyle Regenerative Centre as an example of passive design.
- Turbine Hall as an example of the heritage approach to design.
- Harmonia office building to demonstrate the building as an ecosystem
- Uptown Oil, a bio-diesel plant, as an example to aid in the understanding of the production process.

Passive design

ID: John T Lyle Regenerative Centre.
Location: Pomona, CA, USA.
Design: John T. Lyle.
Client: California State Polytechnic University, Pomona.
User: Students and lectures.
Date: 1994.

The term “regenerative” describes processes that restore, renew or revitalize their own sources of energy and materials, creating sustainable systems that integrate the needs of society with the integrity of nature (Brown, 2010).

Purpose:
To advance the principles of

environmentally sustainable living through education, research, demonstration and community outreach (Woo, 2010).

Aim:

To research and demonstrate a wide array of regenerative strategies; low-energy architecture, energy production technology, water treatment, organic agriculture, ecological restoration and sustainable community development.

Building systems aimed at energy efficiency:

- Minimize energy required for heating and cooling.
- Work with natural patterns of the sun as well as airflow.

Trellis structures on the southern side of the building support grape, chayote, or other deciduous vines (fig: 54 and 56). The shade from the vines limit direct sunlight from entering in summer, helping to keep the interior spaces from heating up. In winter the vines lose their leaves and the lower sun angles allow direct sunlight to penetrate into the interior spaces, passively warming the building.

The building is designed to control airflow to increase human comfort. Hot air is allowed to dissipate out of clearstory windows as cooler air enters the space from below (fig: 55).

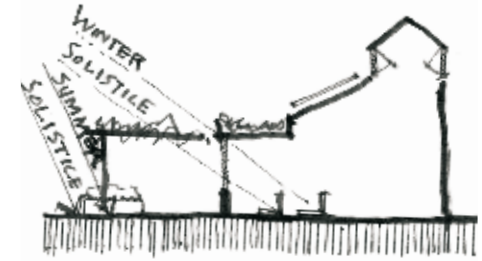


Figure 54. Trellis structure with vines to allow sun to enter the building in winter and limit it in summer: Woo, 2010.

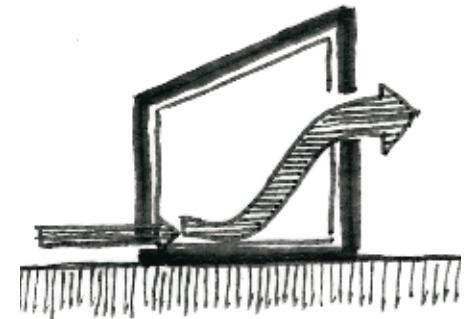


Figure 55. Hot air is allowed to dissipate out of clearstory windows as cooler air enters the space from below: Woo, 2010.

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Building material

Building exteriors are finished with fast growing renewable cedar.

The centre continually explores alternative building materials, particularly materials that are waste products of our society. For example, the Centre constructed a strawbale incubator building which houses its bio-diesel operation. Straw is a wasteproduct of agricultural activity that is also an effective building material.

Energy systems

In designing an energy system, it is important to understand the needs of a community as well as their capacity to implement and maintain technology.

Solar energy

- The centre operates an Amenix Solar Concentrator Unit. This unit tracks the sun throughout the day, and is capable of generating up to 12.8kWh on a summer day (fig: 57).
- The centre also has a number of smaller fixed and tracking photovoltaic panels throughout the site.
- Another solar alternative at the centre is solar shingles.

Wind energy

The centre operates one windmill. Local conditions at the centre are not conducive to high wind generation, so the hybrid system generates only around 5.5kWh on windy days.

Bio-fuels

The centre actively conducts research into bio-fuels, particular bio-diesel, a substitute for petroleum based diesel fuel made from vegetable oil. The centre uses bio-diesel to power its machinery, and conducts numerous workshops and demonstrations of the refining process for the community.



Figure 56. John T Lyle Regenerative Centre: a trellis structure on the southern side of the building support deciduous vines, the shade from the vines blocks direct sun from entering in the summer, helping to keep the interior spaces from heating up: Woo, 2010.

Chapter_5

Passive design

Heritage

Building as an ecosystem

Production process



Figure 57. John T Lyle Regenerative Centre: roof profile design to accommodate solar panels:Stine, 2000.



Figure 58. Turbine Hall, Jeppe Street, Johannesburg: The development stands as a example of modern architecture coupled with the conservation of an historic site and the seed for an urban renewal programme: Krige & Beswick 2001: 2.

Heritage

ID: Turbine Hall and South Boiler House.

Location: Jeppe Street, Newtown, Johannesburg, South Africa.

Design: TPSP Architects.

Client: AngloGold Ashanti/ Tiber Group.

User: Corporate office for AngloGold Ashanti.

Date: 1998-2003.

The origins:

After the First World War (1914-1918) came a surge of secondary industrialisation and with a huge demand for electrical power (Krige & Beswick, 2001: 18). After many delays, the first section of the Jeppe Street Power Station came into operation in September 1927, consisting of the North Boiler House, the Turbine Hall and three concrete cooling towers (Krige & Beswick, 2001: 25).

The Jeppe Street Power Station was the last and largest of three steam-driven power stations built in Newtown in the early twentieth century to supply electricity to Johannesburg. The Station could not keep up with the city's demand for electricity, and so, in 1934, the South Boiler House was built, and the Turbine Hall extended. However, demand still outstripped supply. In 1942 the newly-built Orlando Power Station was able to share the supply of electricity to Johannesburg, but by 1955 it too fell short in meeting demand.

During the 1950s, two more power stations were built. By 1958, the Jeppe Street Power Station was effectively operating as a substation and was decommissioned in 1961 (Krige & Beswick, 2001: 3).

The rebuild:

Aim: the Turbine Hall development (fig: 57) will stand as a world-class example of modern architecture coupled with the pragmatic conservation of an historic site and the seed crystal for an Urban Renewal Programme (Memorandum, annexure B: motivation letter from TPSP Architects in Krige & Beswick, 2001: 76). In terms of inner city rehabilitation, the Turbine Hall building was seen as a key reversing the decline in the western sector of Johannesburg (Krige & Beswick, 2001: 83).

Heritage:

The Heritage Impact Assessment (HIA) emphasises the positive impact of AngloGold Ashanti's decision to conserve two of the three buildings which make up the power station. If AngloGold Ashanti did not demolish the North Boiler House, the company might have been forced to build aboveground parking on adjacent land, in a building taller than Turbine Hall (fig: 57). This would have resulted in a building out of scale with the heritage building and therefore not appropriate from the aspect of heritage conservation (Krige & Beswick, 2001: 90).

The HIA case for the demolition of the North Boiler House states that:

If the viability of the site for development and that of Newtown are not to be compromised, then, despite what might appear to be a contradiction in terms of the demolition of the North Boiler House would best serve the interest of conservation in Newtown and economic survival (Prins, H in Krige & Beswick, 2001: 90).

The BURRA charter (which provides guidance on the conservation of culturally-significant places) states that:

Demolition of significant fabric of a place is generally not acceptable. However, in some cases minor demolition may be appropriate as part of conservation. The possibility of removing the existing ground floor of the North Boiler House and the numerous supporting concrete columns would be a supportable action to take with a view to adaptive re-use of the building (Turbine Square Development, Heritage Impact Assessment in Krige & Beswick, 2001: 91).

The heritage assessments took a holistic view in understanding the impact of the development on the urban fabric in the case of the Turbine Hall development.

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Passive design

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Production process



Figure 59. Re-interpretation of a theme in Turbine Hall: the X-brace as structural and aesthetic device. The architecture is sympathetic to the existing architecture and urban fabric, preserving as far as possible the 'ethos' of the existing power station complex: Krige & Beswick, 2001: 24.



Figure 60. The original concrete hoppers in the demolished North Boiler House are commemorated as skylights in the central atrium of Turbine Hall: Krige & Beswick, 2001: 110.



Figure 61. Solar panels on the roof of the Turbine Hall and natural lighting through use of skylights: Krige & Beswick, 2001: 121.

Design phase of the Turbine Hall:

The fundamental concept behind the development was to create modern, functional office space for the tenant, preserving as far as possible the 'ethos' of the existing power station complex. This was achieved through the demolition of one of the existing structure to make space for the new building and the subterranean parking structure. These buildings then relate to the existing complex in a way that makes them spatially and functionally interdependent (Krige & Beswick, 2001: 98).

The architecture of the development is sympathetic to the existing architecture and urban fabric. The steel structures borrow freely from the ranking beams and connections evident in the existing engineered structure (fig: 58). The soaring spaces of both the existing and new architectures relates harmoniously to each other (fig: 59) (Krige & Beswick, 2001: 98).

Going green:

In terms of retaining the building, you would score a lot of points from adaptive re-use. A green building is not about what you see but what the building does. Energy strategies such as solar panels and allowing daylight into the building is an invisible part of the building (fig: 60); it is embedded in the building (Noir, E in Krige & Beswick, 2001: 120).

Conclusion:

The memory of the old buildings has been retained by many of the elements from the demolished sections that were saved and build into the new structures. Whilst new work was painted, the old was left as it was and every threshold or transition between old and new was emphasised with diagonal elements that makes a story of the building that is very legible and easy to understand (Fraser, N in Krige & Beswick, 2001: 134).

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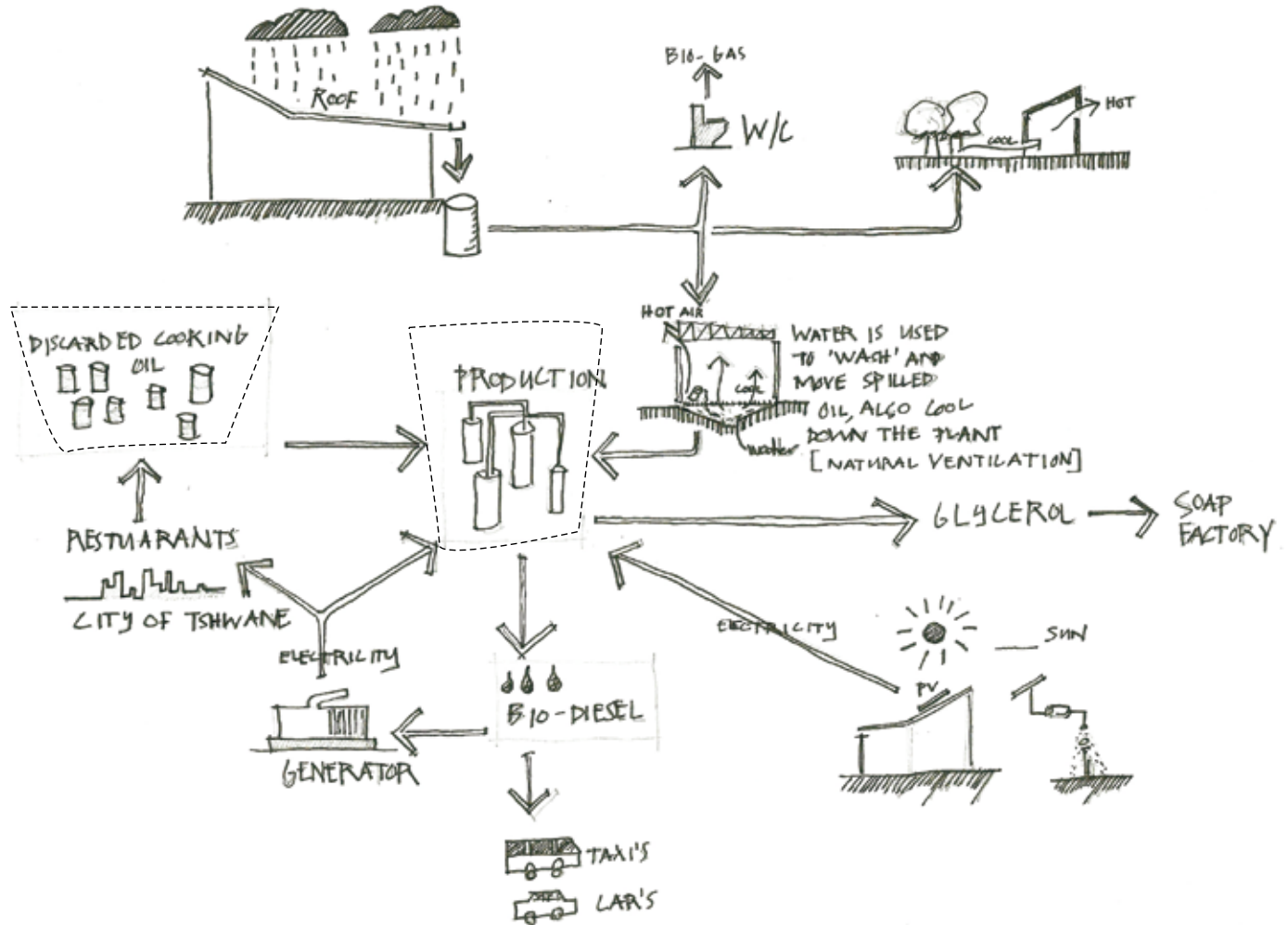


Figure 62. Pretoria West Bio-diesel Plant ecosystem: production process, rain water harvesting and solar energy. As inspired by the Harmonia Office building precedent study: Author 2010



Figure 66. Map of London underground indicating the location of Uptown Oil Bio-diesel Plant: London Underground Station, 2010.

Production process

Uptown oil Bio-diesel Plant (London, UK)

The Up-Town Bio-diesel plant (fig: 68) is integrated into the urban fabric and is surrounded by housing and commercial activities (fig: 67).

The plant is located about a 5-minute walk from Waterloo Station in London (fig: 66). Due to its low-risk industrial activities this production process can easily be integrated into the urban fabric.

The company provides Bio-diesel to black cabs and to buildings to fuel their heating systems. Uptown oil supplies 45 000 litres of bio-diesel to accounting firm PriceWaterhouseCoopers' new premises in London, constituting a quarter of the premises fuel need (Uptown oil brochure, 2010).

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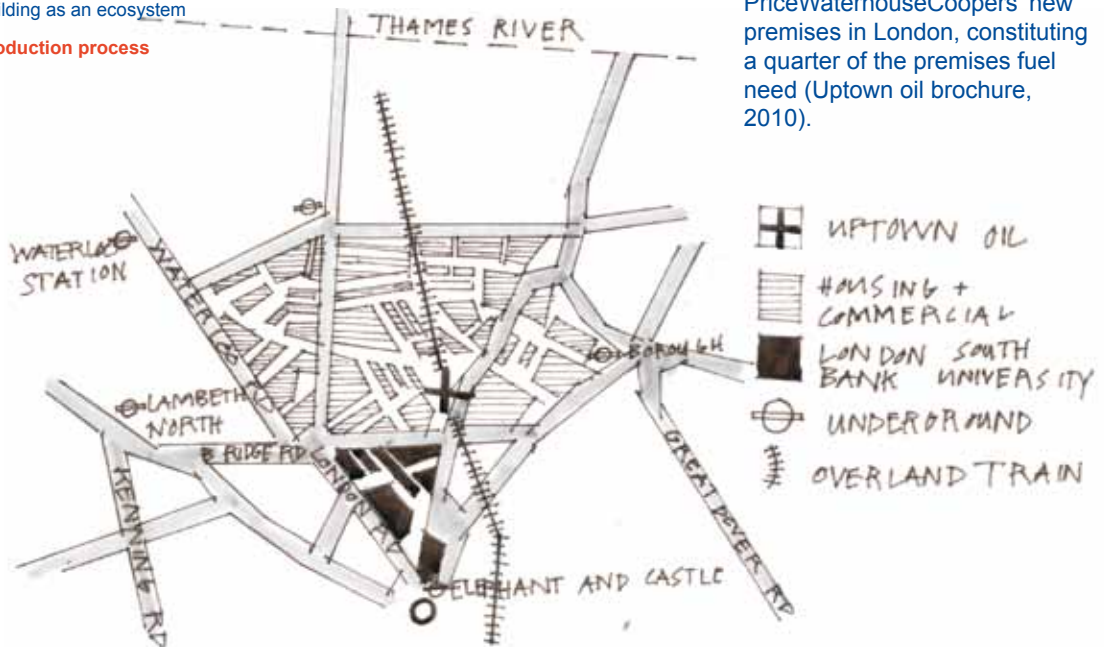


Figure 67. Uptown Oil Bio-diesel Plant in its urban context: Author, 2010.

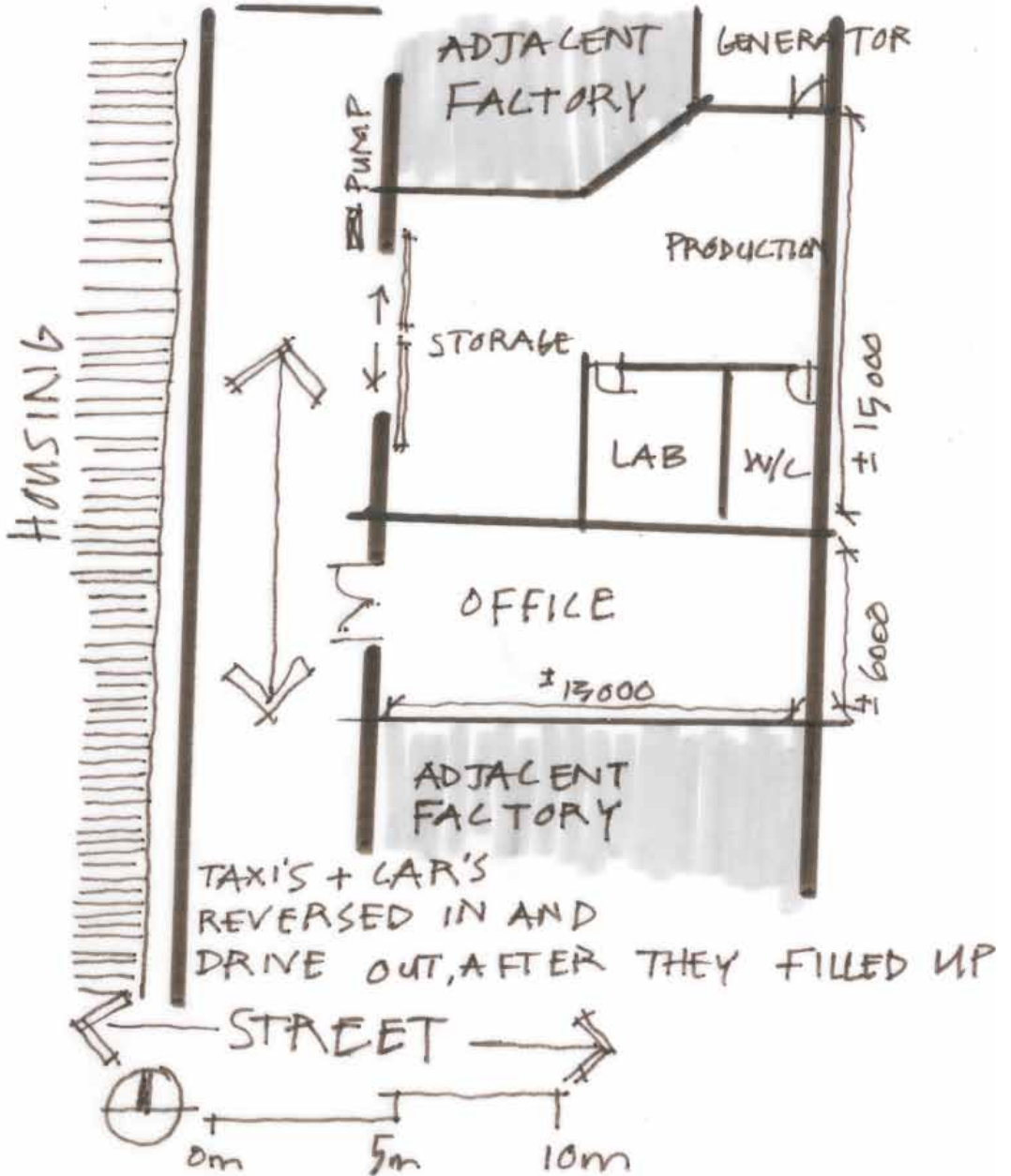


Figure 68. Uptown Oil Bio-diesel Plant plan: Author 2010.



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- Passive design
- Heritage
- Building as an ecosystem
- Production process

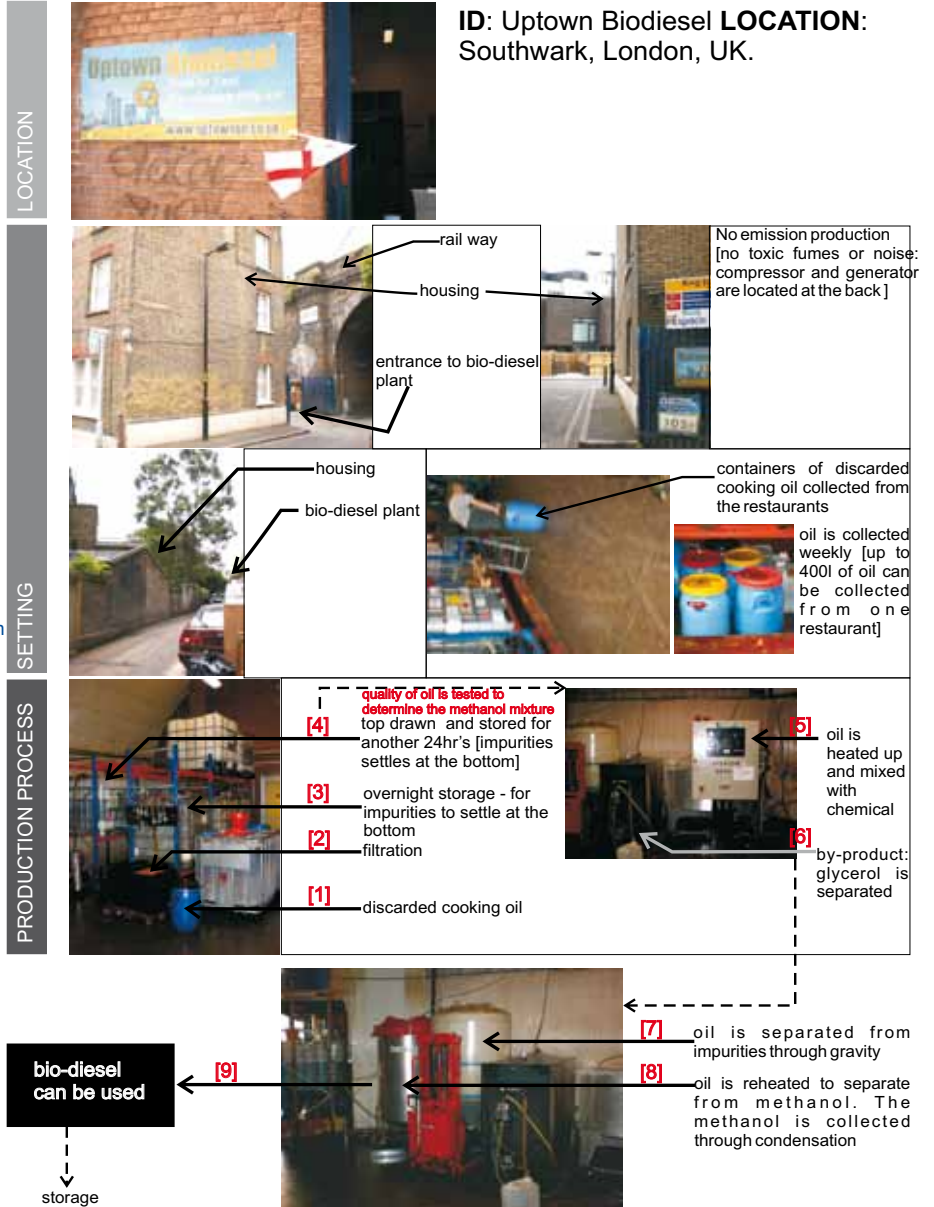
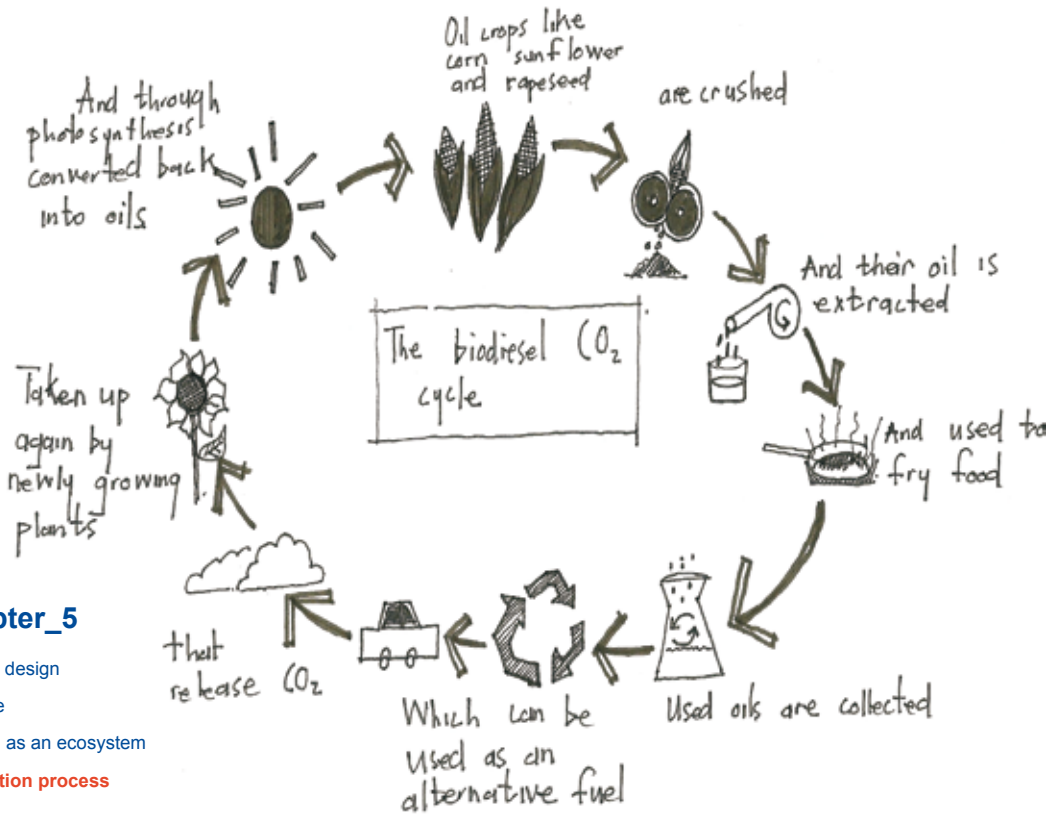


Figure 69. Diagram demonstrate the production process of bio-diesel at Uptown Oil, London, UK. Photographs by author (visited in June 2010).



Figure 70. Diagram showing the production process of bio-diesel at Uptown oil, London, UK. Photographs by author (visited in June 2010).



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Figure 71. Bio-diesel CO₂ cycle showing how discarded cooking oil can be turned onto fuel: Uptown Oil brochure, 2010.

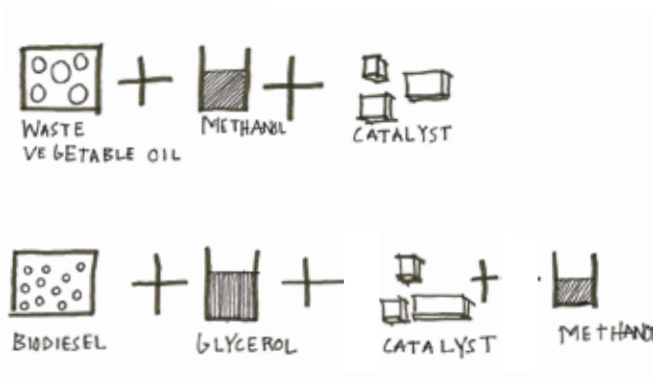


Figure 72. Bio-diesel components; showing that glycerol is a by product that can be used in another production process (for example in soap production) and methanol that are recycled, demonstrating that production can be cyclical: Bio-diesel production and quality, 2007.

Bio-diesel

The diesel engine was invented by Rudolf Diesel in 1894 and designed to run on peanut oil. He showed great foresight when he stated:

The use of vegetable oils for engine fuels may seem insignificant today but such oils may become, in the course of time, as important as petroleum and the coal-tar products of present time (Uptown Oil brochure, 2010).

Bio-diesel is a fuel derived from a process known as transesterification; the process of converting one ester into another ester. An ester is a chemical combination of fatty acids attached to alcohol. Animal and vegetable fats, oils and bio-diesel are examples of ester.

Transesterification converts the vegetable oil ester into bio-diesel ester; it separates the larger glycerol molecules from the fatty acids in the vegetable oil. The methanol combines with the fatty acids, producing smaller methyl esters thus creating the more free-flowing bio-diesel.

Benefits of using bio-diesel

- Biodiesel is completely sustainable. It is carbon neutral in that it release the same amount of carbon dioxide into the atmosphere as it took out in the first place during the growth cycle (fig: 71).
- Biodiesel is 98% biodegradable within 21 days.
- Provides better lubricate resulting in a longer life for diesel engines.
- Provides Improved fuel economy – up to 8%.
- Around 20% cheaper than fossil fuel. (Bio-diesel production and quality, 2007)

How to make bio-diesel:

The process of producing biodiesel known as transesterification, involves adding methanol to vegetable oil. The process requires a catalyst to increase the rate of the chemical reaction between the methanol and the vegetable oil. The catalyst used in the creation of bio-diesel is an alkaline.

The basic process is as follows (fig: 72):

- Discarded vegetable oil is collected from the various sources;
- vegetable oil is mixed with the Methanol and the catalyst
- when the bio-diesel is created the catalyst and glycerol can be recovered;
- waste vegetable oil that have been heated several times will cause some of the fatty acids to bond with the glycerol and float freely in the oil; the amount of catalyst in the transesterification process is therefore increased to neutralise the acids and soap as an additional by-product is created.

In South Africa, about 360 million litres of wasted vegetable oil ends up in the wrong industry. Sometimes bleach such as Jik is added so that it looks like brand-new oil and is then sold in the rural areas. It also goes to the animal food industry as chicken and cow fodder, which then ends up back again on your own plate (The Bio-energy News Desk, 2009).

Design development

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Aim of design

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Location: Buitenkant Street, Pretoria West Industrial Area, City of Tshwane.

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Purpose: to advance the principles of sustainable living through production, research and urban integration.

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Architectural goal: adaptive re-use of discarded industrial space

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Aim: to design a bio-diesel plant that will demonstrate low energy architecture, energy production and sustainable community integration (fig: 73).

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The design development process is divided into two main categories:

- Technical & practical exploration: exploring the functional design guidelines in the production process of bio-diesel.
- Spatial exploration: Integrating the functional design guidelines to appropriate spatial qualities between the production process (Bio-diesel plant) and the urban fabric that will demonstrate sustainable urban integration.

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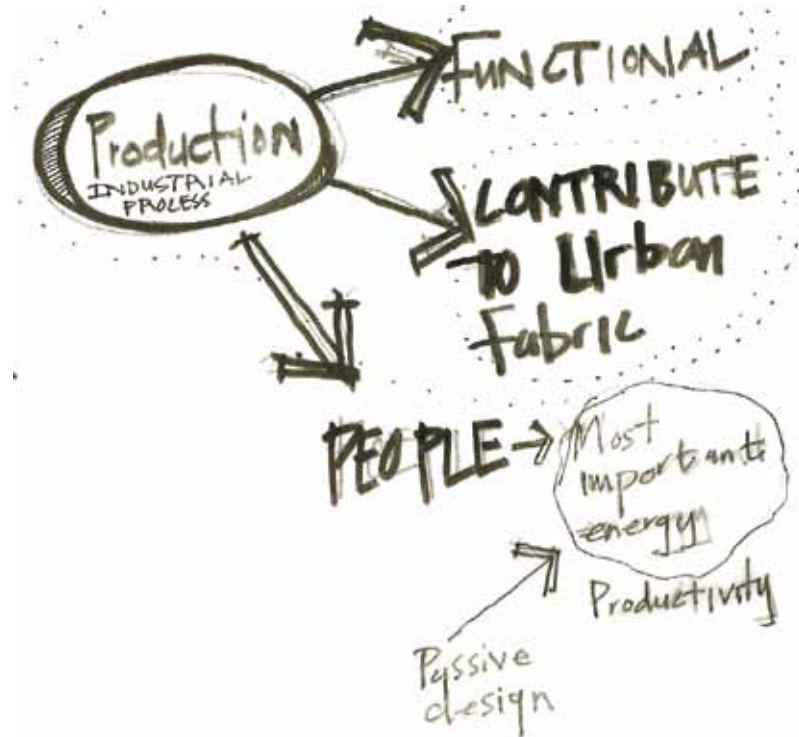


Figure 73. Diagram explaining the aim of the architectural design process for the Pretoria West Bio-diesel plant: Author 2010.

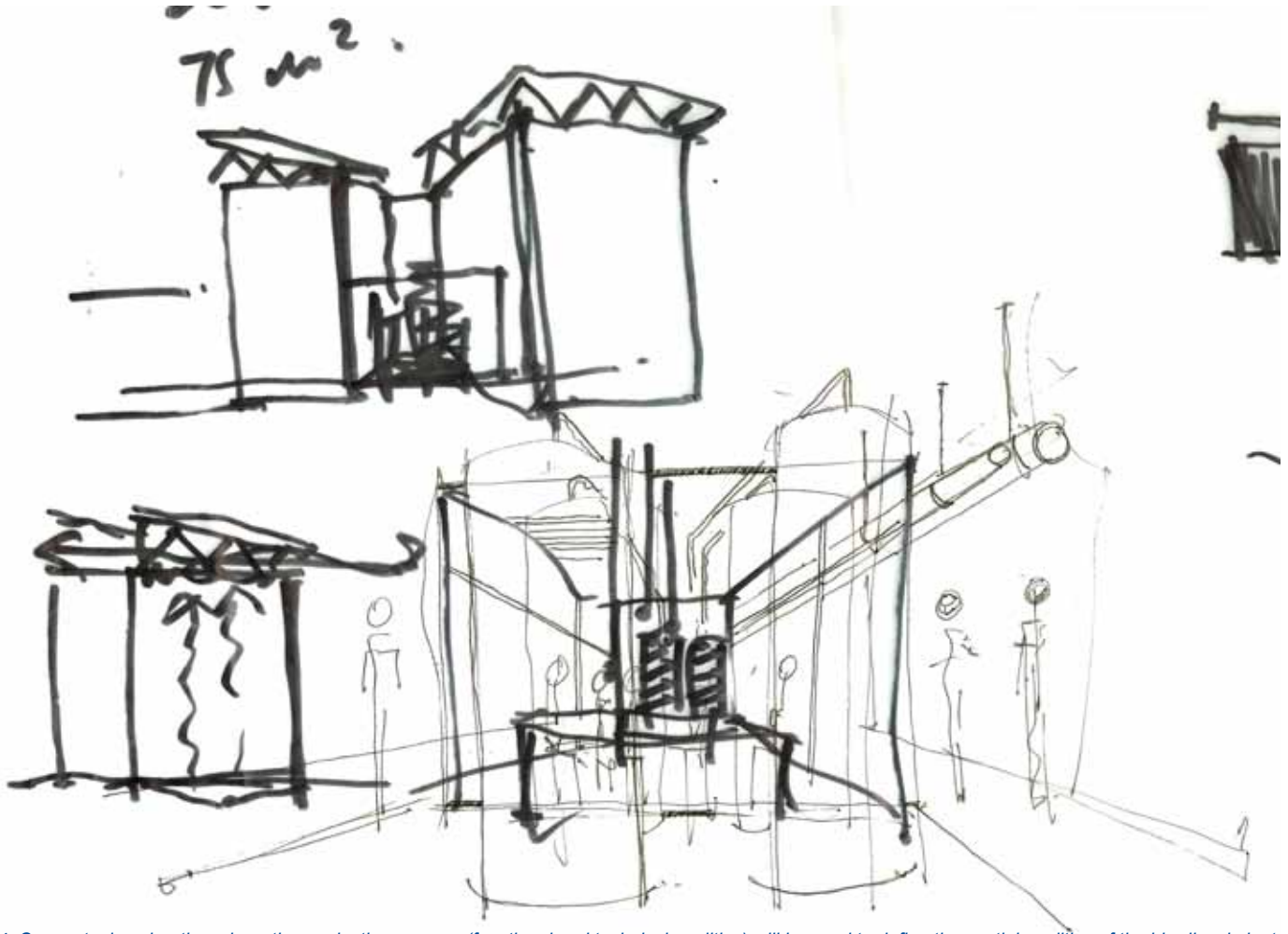


Figure 74. Conceptual exploration where the production process (functional and technical qualities) will be used to define the spatial qualities of the bio-diesel plant:
Author 2010.

Technical design development

The industrial building works on an input and output base; the arriving resources and dispatched finished products strengthen the linear and closed nature of the operations. The aim is to maximise the possibilities of the industrial building to operate less as an isolated process, and more as an integrated ecosystem in the urban fabric; to address social needs by providing economic empowerment and skills development and for the building to contribute in a positive manner to the character and wellbeing of the urban fabric (as discussed in the design development chapter).

Bio-diesel production at the Pretoria West Bio-diesel Plant (quantity):

According to the South African White Paper, released four years ago, a 2% penetration level of biofuels in the national liquid fuel supply by 2012 was set as a goal. This target was decreased from the 4.5% target initially proposed in the draft strategy document. The 2% target of the national liquid fuel supply equals around 180 million litres per annum.

The country will need large scale biodiesel plants to achieve this target, and a lot has to change in the South African bio-fuels strategy to make this possible (Smith, 2010).

The main reason commercial bio-diesel plants aren't currently viable in South Africa is due to the taxes that these commercial producers have to pay if they produce more than 300 000 litres per annum. Government policy has a negative effect on the bio-diesel industry making only small backyard bio-diesel production operations viable. One or two small commercial bio-diesel plants, with a capacity of around 500 000 litres each per month, in every major city producing SABS certified bio-diesel which could have further spawn other bio-fuel projects (Smith, 2010).

Due to the Pretoria West Bio-diesel Plant's location, it could service both the City of Tshwane (road and rail freight) and Johannesburg (rail freight). With the figure of 500 000 litre per month per one major city suggested by Smith (2010), the production of 1120 000 litres bio-diesel per month could be justified when both these major cities are serviced.

The discarded cooking oil will primarily be collected from restaurants. Another form of harvesting is to place drum containers at dumping yards for household collection. With the target of 280 000 litres per week and 40 000 litres per day; 700 restaurants would be required to each contribute 400 litres of oil per week. According to the Uptown Oil plant in London the average restaurant can provide 400 litres of oil per week. There are 6552 food premises in the City of Tshwane (refer to addendum B). The plant will be serviced by both the City of Tshwane and Johannesburg, therefore the hypothesis of 700 participating restaurants could be considered realistic and justified.

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Aim of design

Technical

Spatial

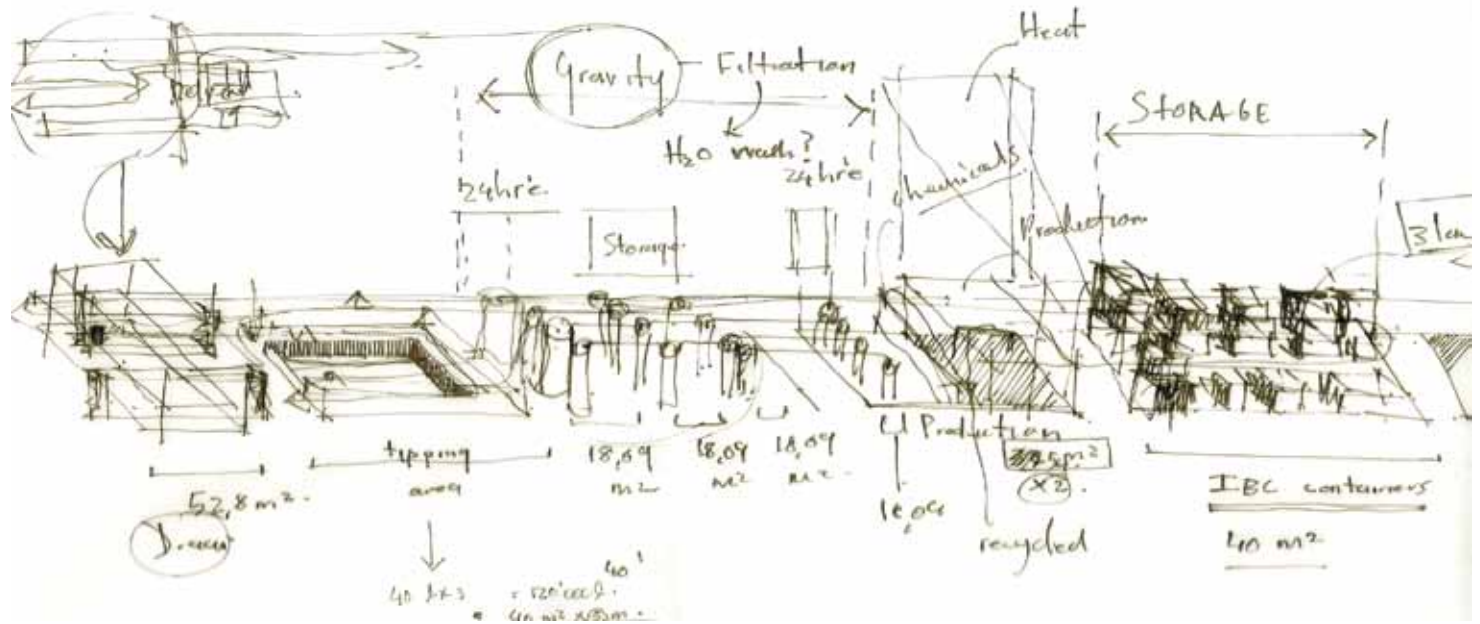


Figure 75. Exploration of the production process of bio-diesel to determine the area needed for the various functions of the building: Author 2010.

Defining area (production zoning):

Following a theoretical start it is critical to submit the proposed bio-diesel plant to the intelligence of matter.

Buildings have an interesting epic, a story that is embedded in the organisation of matter. . . (Ferre, 2002 :3)

The first step was to determine the area in square meters that is needed for the various functions of the building (fig: 75). The building mass is spread over the entire site to gain maximum floor space for the production, movement and storage of the bio-diesel.

Employment opportunities:

In the Uptown Oil case study it was stated that the plant employs 8 people and that 10 000 litres of bio-diesel is produced per day. Should the Pretoria West Bio-diesel Plant produce 40 000 litres of oil per day, the hypothesis is that 24 people could be employed at the plant with 20 working in the production area and 4 working in the office and laboratory. The employment figure of the Pretoria West Bio-diesel Plant is based on the concept of economy-of-scale; the production in relation to Uptown oil is increased with a factor of 4 (10 000 x 4) and therefore the workforce in relation to that of Uptown Oil can be increased with a factor of 3 (8 x 3).

Impact

With the production of 280 000 litres of bio-diesel per week, an average of 4 000 vehicle tanks can be filled (with the average vehicle tank having a capacity of 70 litres).

Chapter_6

Aim of design

Technical

Spatial

Accommodation schedule:

- Production area
- Movement area
- Services (energy generator, waste)
- Offices
- Laboratory
- Communal space
- Amenities

- PRODUCTION [490sqm]
- WALK WAY[412sqm]
- DELIVERY
- SHOP[50sqm]
- LAB+TRAINING[146sqm]
- W/C[111.5sqm]
- KITCHEN+COMMUNAL[183sqm]
- OFFICE[195sqm]
- SOCIAL+GREEN SPACE
- BIO-DIESEL FILLING STATION
- INFORMAL MARKET

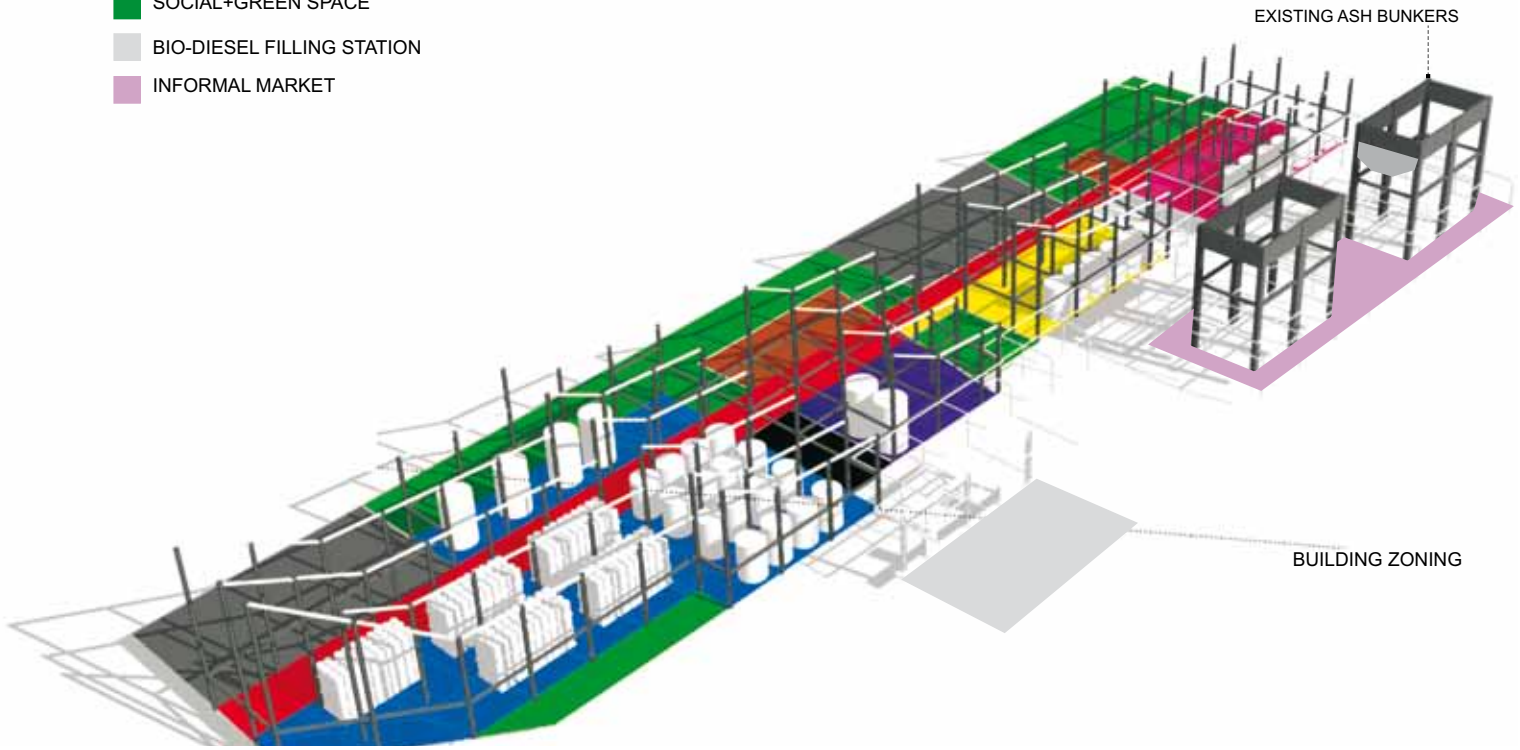


Figure 76. Diagram showing Pretoria West Bio-diesel Plant's spatial layout diagram; indicating social integration to the production process: Author 2010.

Pretoria West Power Station spatial layout (fig:76):

Production area - 490m²:

Movement area - 412 m²:

Working aisle - 1.650m

Transfer aisle - 4.300m

Offices and Boardroom - 195m²:

Office occupation: 4 people

Boardroom occupation: 10 people

Communal space - 183m²:

Indoor: kitchen and eating area

Outdoor: eating area

Lab and training room - 146m²:

Amenities - 111,5m²:

Office staff: Occupation : Male: 1 W/C, 1 urinal, 1 washbasin.
Female: 2 W/C, 1 washbasin

Production staff (w/c, changing rooms and lockers) occupation : Male 1W/C, 1 urinal, 1 Washbasin.
Female: 2W/C, 1 Washbasin.
Male: 3 showers.
Female: 2 shower.
20 lockers

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Aim of design

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Spatial

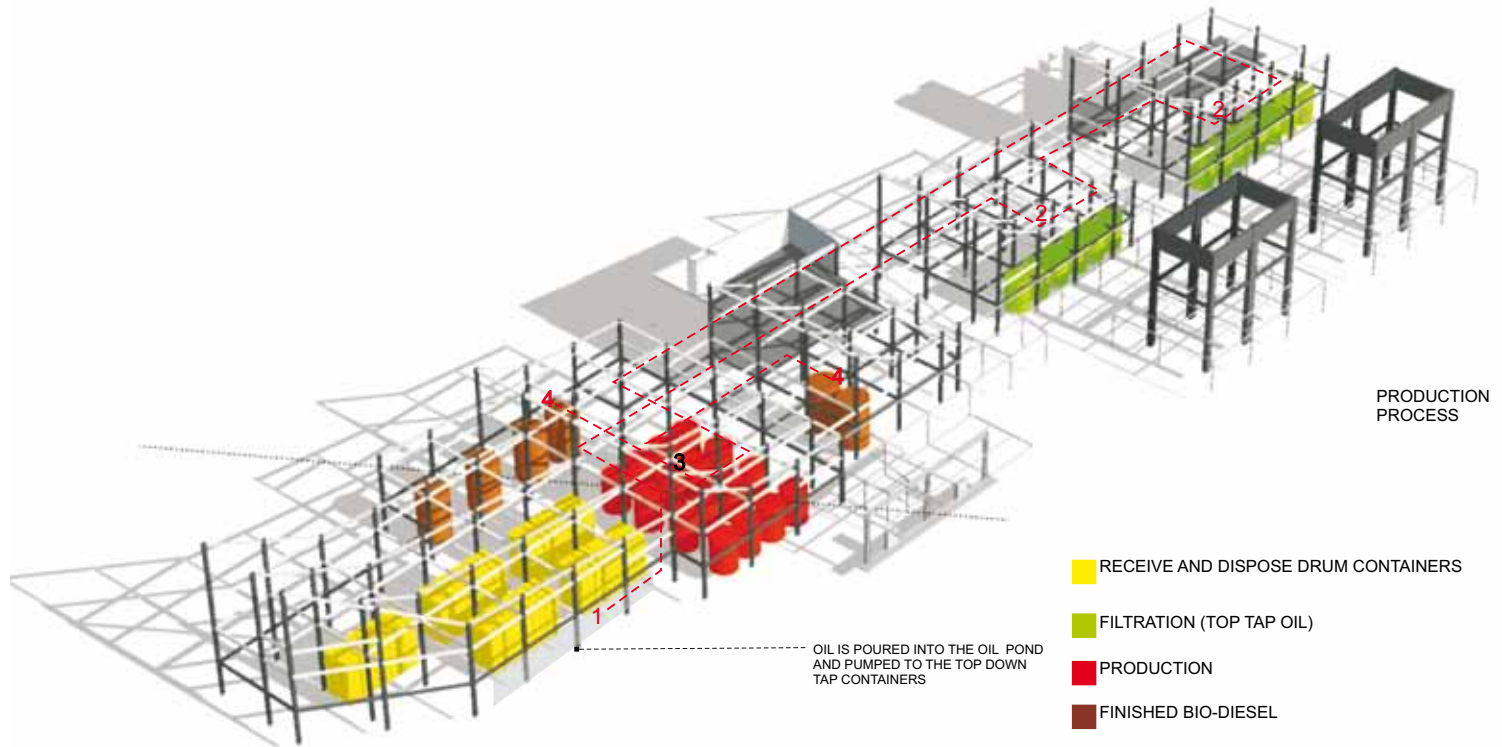


Figure 77. Diagram indicating Pretoria West Bio-diesel Plant spatial layout of the production process for bio-diesel. The current layout allows for maximum interaction between the production process and the surrounding urban fabric: Author 2010.

Production area (fig: 77) 490m² based on:

- A seven day working week,
- 700 restaurants (harvesting 400 litres of discarded cooking oil per week from one restaurant),
- producing 280 000 litres bio-diesel per week,
- producing 40 000 litres of bio-diesel per day,
- a holding period (storage) of three days (including the production day)

Drum containers (containers placed at restaurants and dumping sites to harvest discarded cooking oil):

Size: 94cm (h), 58,4cm (d), 208 litres capacity.
Area: $A = \pi r^2 = 3,142 (0,292m^2) = 0,264m^2$
Total: $0,264m^2 \times 200 = 52,8m^2$
Holding period: $52,8m^2 \times 3 \text{ days} = 158,4m^2$

Tipping area:

40 000 litres per day.
Holding period: $40\ 000 \times 3 \text{ days} = 120\ 000 \text{ litres}$.

Filtration and storage (capacity):

10 000 litre tanks
Size: 2200cm (d), 3040cm (h)
Area: $A = \pi r^2 = 3,142 \times (1,2m^2) = 4,52m^2$
Total: $4 \times 4,42m^2 = 18,09m^2$

Chemical storage:

18,09m² (equal to one storage bay)

Production:

Working on a ratio of 1 : 3 (storage : production).
 $18,09m^2 \times 3 = 54m^2$.

Dispatch and storage:

15000 litre storage tanks
Size: 2 600 (d), 3450 (h)
Area: $A = \pi r^2 = 3,142 \times (1,3m^2) = 5,3m^2$
Total: $8 \times 5,3m^2 = 42,4m^2$

Synopsis of bio-diesel production (fig: 77):

1. Used cooking oil is received and tipped into the oil ponds under the mentis grid floor where the oil is mixed with water and washed. Washing in this instance implies that the impurities in the oil will react with the water, during which the cleaning process of the used cooking oil begins (filtration process).

2. The oil is next pumped into the top tap containers, where the impurities move to the bottom of the container. This is a passive process whereby the impurities are separated from the oil through gravity. Filters are placed in the pipes, to purify the oil while it is pumped into the containers. The cleaner the oil, the less chemicals need to be added.

3. The oil then goes into the production process where methanol and a catalyst with the combination of heat are used to produce bio-diesel.

4. The bio-diesel is next pumped into the storage containers to be dispatched within two days, assuming one day is allocated to production.

Chapter_6

Aim of design

Technical

Spatial

Design generators: three concepts developed out of emergence for production

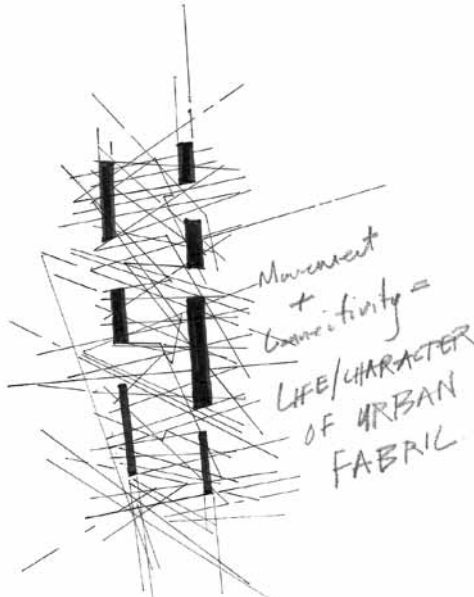


Figure 78. Connectivity: Author 2010.

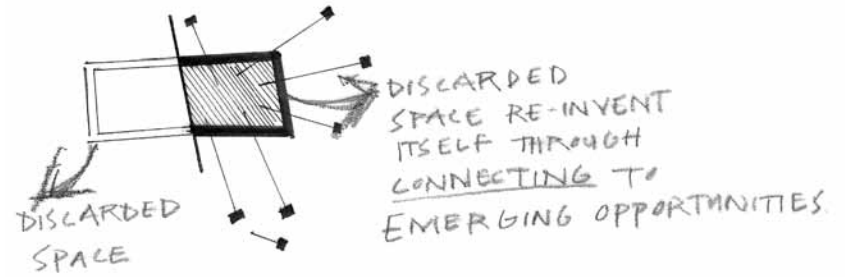


Figure 79. Discarded objects and space: Author 2010.

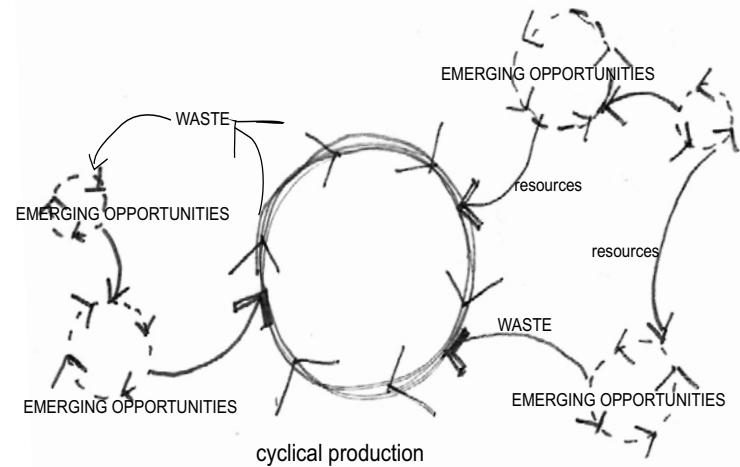
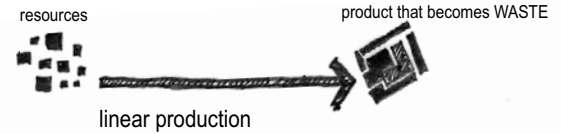


Figure 80. Production not linear, but cyclical: Author 2010.

Spatial design development

The spatial design process started with a theoretical investigation into the work of Hamdi (2004) and Capra (2002) (see page 11, chapter 1). Their analyses investigated emergence as a tool to redefine and regenerate the urban environment. Emergence can then be defined as; the integrated urban fabric that will sustain the growth and evolution of a community.

To bring this concept back to the proposed design intervention in the industrial context; the author next defines production in terms of emergence.

Definition of production in terms of emergence:

- Production that emphasises the community over the individual.
- Production that moves away from the concept of being a linear process only focused on the product to a cyclical process that respects the material and immaterial components. It is through the interaction of the material and the immaterial that emerging opportunities would arise.
- Production that uses existing energy.
- Production that establishes emerging opportunities through connectivity between the production process and the local urban fabric.

Three concepts developed out of this definition of production in terms of emergence:

- Connectivity/movement (fig: 78)
- Discarded objects and space (existing energies and activities) (fig: 79)
- Production moving away from a linear process to a cyclical process (fig: 80)

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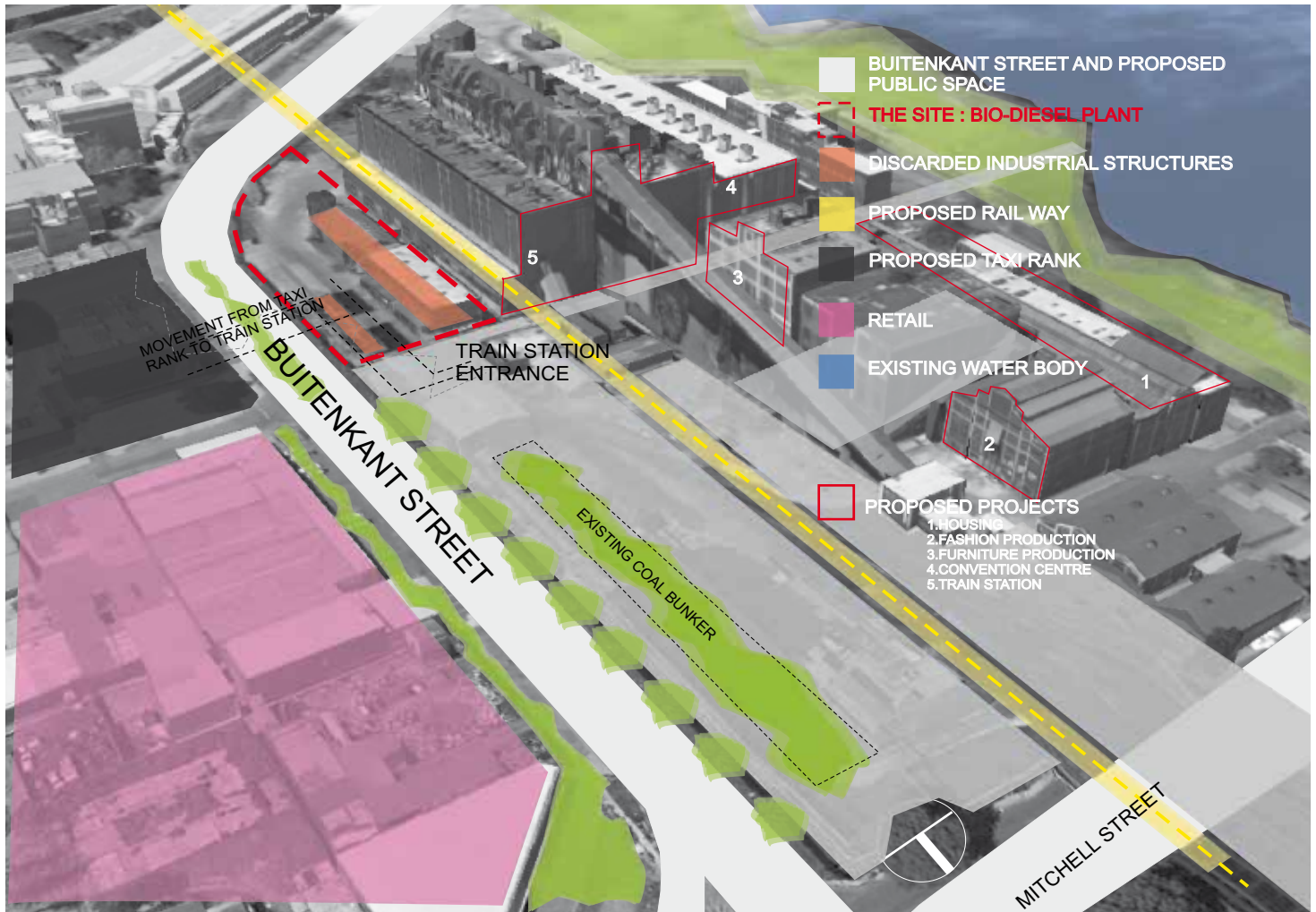


Figure 81. Factors that influence the site location: Google Earth, edited by Author 2010.

To strengthen the integrity and consistency of the design the three aforementioned concepts guided the decision-making processes; from choosing the site and determining the building programme to the design intervention itself.

The specific site was chosen for (see fig: 81):

- Its location next to Buitenkant Street and the proposed public square. This location will generate the opportunities for the industrial building to respond to the urban environment (connectivity and movement opportunities).
- The opportunity to utilise discarded industrial structures (workshop, boiler maintenance workshop and the ash bunkers).
- Its location next to the proposed train station, which will ease movement of resources in the industrial ecosystem (cyclical production).

Bio-diesel plant emerged as the building program due to :

- The industrial process being environmentally friendly and sustainable that will fit in well with the industrial ethos of the area. It will also address the social needs (addendum A, newspaper analysis, 2010) of job creation and economic empowerment.
- Discarded objects (used cooking oil) that will be used to produce energy (bio-diesel)
- The production process of bio-diesel being cyclical and its ability to create an industrial ecosystem, where, the waste (used cooking oil) of an industrial process is used to produce a resource (bio-diesel)

The European Union will require all transportation fuels to contain a 10% bio-fuel component by the

beginning of 2011 and China indicated that it will add 15% bio-fuel into its diesel and petrol in the near future. The South African White Paper, released four years ago, set a goal of achieving a 2% penetration level of bio-fuels in the national liquid fuel supply by 2012. This target was decreased from the 4.5% target initially proposed in the draft strategy document. The 2% target of the national liquid fuel supply equals around 180-million litres per annum. The country will need large scale bio-diesel plants to achieve this target (Smith, 2010).

The design intervention:

Design intentions

What emerged from the first conceptual spatial exploration is that the building started to react to the surrounding urban activities (fig: 83) through a human scale, rather than an industrial scale. The non-linear façade (fig: 82) creates rhythm and the opportunity for visual and physical connection points between the industrial process and the surrounding urban fabric (fig: 84), and soft elements such as green and social spaces become the threshold between the industrial process and the adjacent urban environment (fig: 85).

The exploration of passive design strategies guided the form of the building (fig: 86 and 87). For example, in deriving the form of the roofs, natural light flowing into the building and the angle of the position of the solar panels guided much of this process. From a theoretical point of view, deriving the form of the roofs wasn't just a linear process followed to enclose and protect the building, but also cyclical in terms of accommodating processes such as rainwater harvesting and the use of solar panels.

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Figure 82. First conceptual spatial exploration showing the non-linear facade to create social spaces that will form connection points between the production process and surrounding urban activities : Author August 2010.

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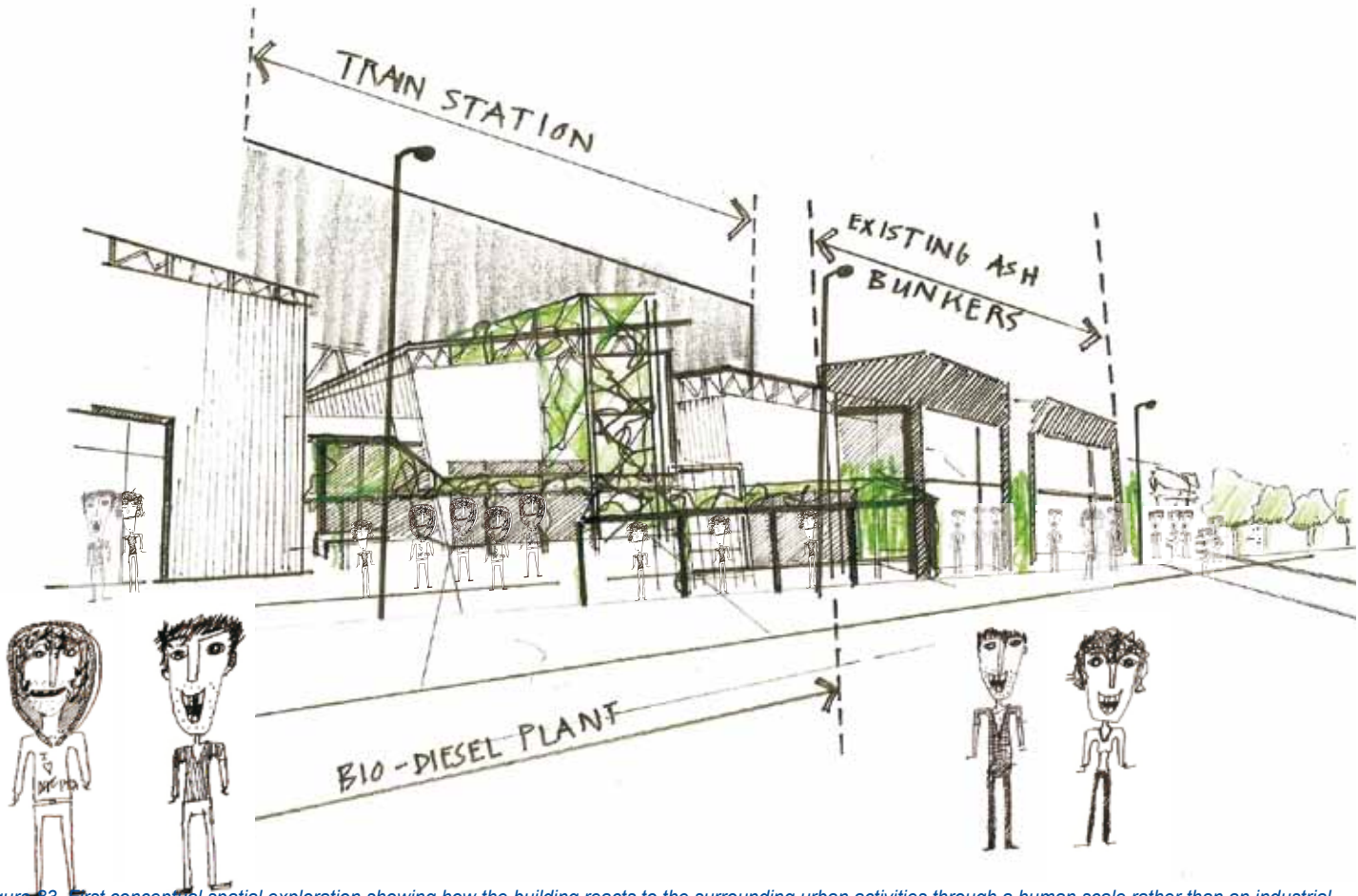


Figure 63. First conceptual spatial exploration showing how the building reacts to the surrounding urban activities through a human scale rather than an industrial scale: Author August, 2010

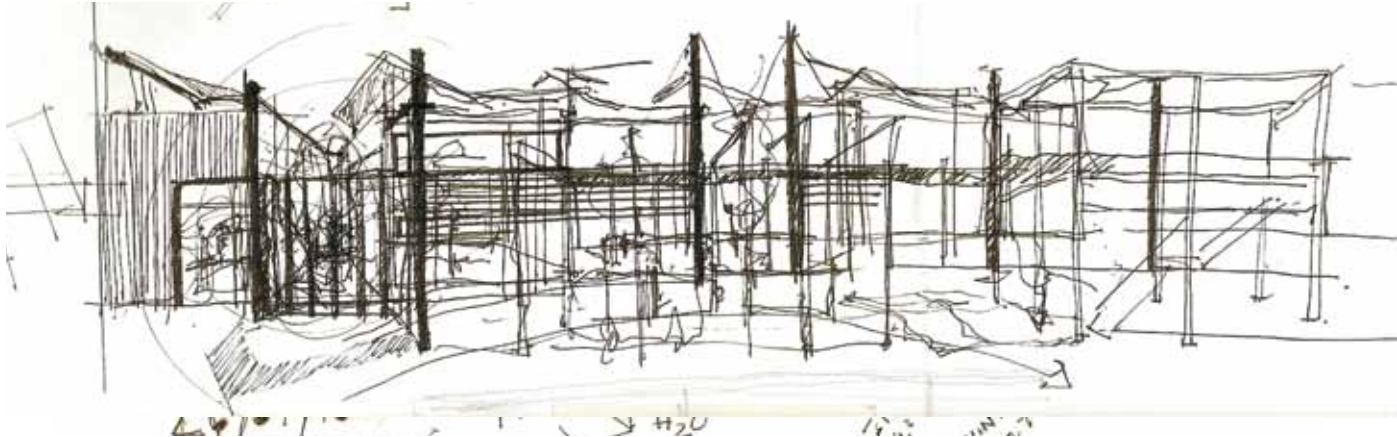


Figure 84. Conceptual exploration, the non-linear façade imitates non-linear processes and creates rhythm and opportunity for visual and physical connection points between the industrial process and the surrounding urban fabric. By breaking up the facade the building will relate to a more human scale: Author 2010

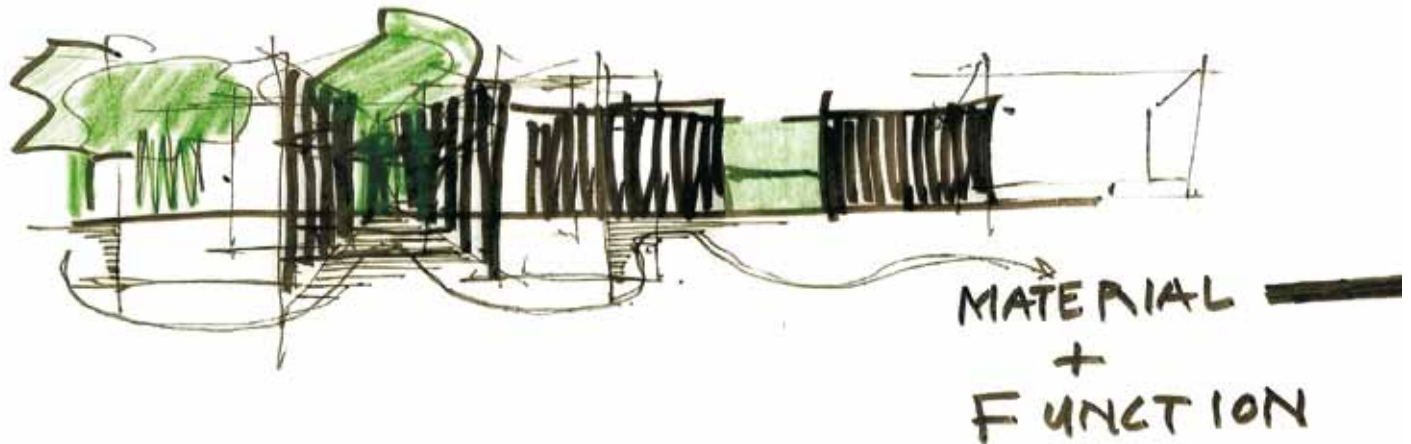


Figure 85. Conceptual exploration, soft and humane spaces become the threshold between the industrial process and the adjacent urban fabric: Author 2010

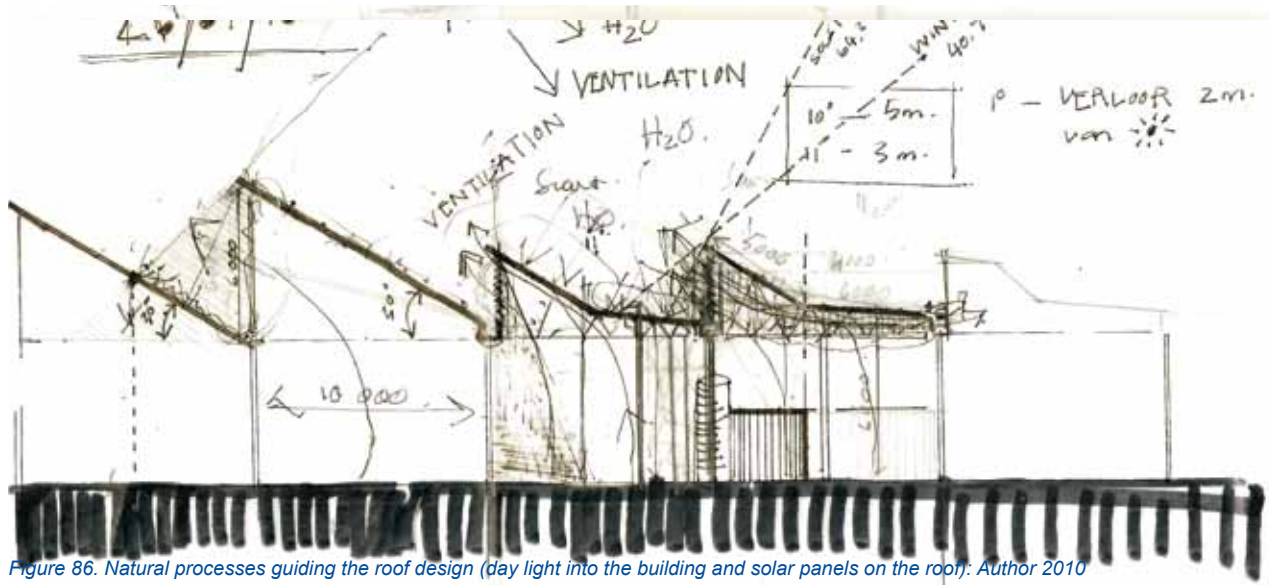


Figure 86. Natural processes guiding the roof design (day light into the building and solar panels on the roof): Author 2010

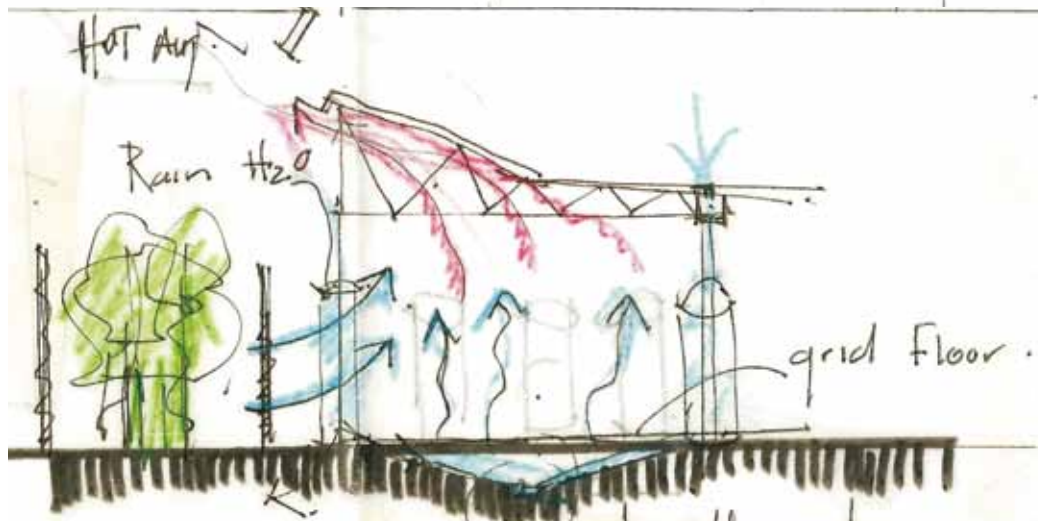


Figure 87. Natural-and production processes guided the ventilation strategy, using rainwater to "wash" the discarded cooking oil will double up as the natural ventilation system for the production area: Author: 2010.

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Natural ventilation will double up with the process to wash the discarded cooking oil. Washing the oil is a process whereby the harvested rainwater is mixed with the oils. Impurities in the oil react to the water. This process is intended to take place in a concrete funnel under the mentis grid floor. The cool air created by the water will be used to cool down the production plant and the clearstory louvers will allow hot air to escape (fig: 87).

Design response:

Contextually the Pretoria West Bio-diesel Plant must respond to the surrounding public space and to the street edge (Buitenkant Street) that will accommodate the proposed taxi rank and informal markets (fig: 89). This interaction will be programmed with thresholds, visual links and relating the industrial process to the urban environment with the appropriate human scale (fig: 88 + 89).

The integration of the production process into the urban fabric is deployed through a movement diagram (fig: 90) to organise the architecture and establish the connections between the urban fabric and the industrial building.

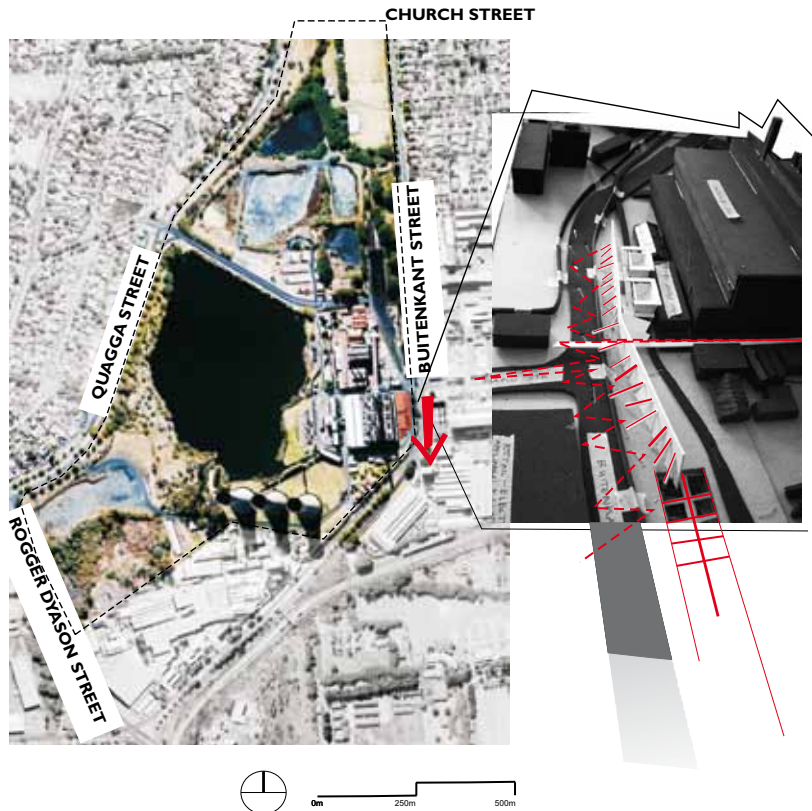


Figure 88. Integration with the public space and street edge will be programmed with thresholds, visual links and relating the industrial process to the urban environment with the appropriate human scale:

Author 2010.

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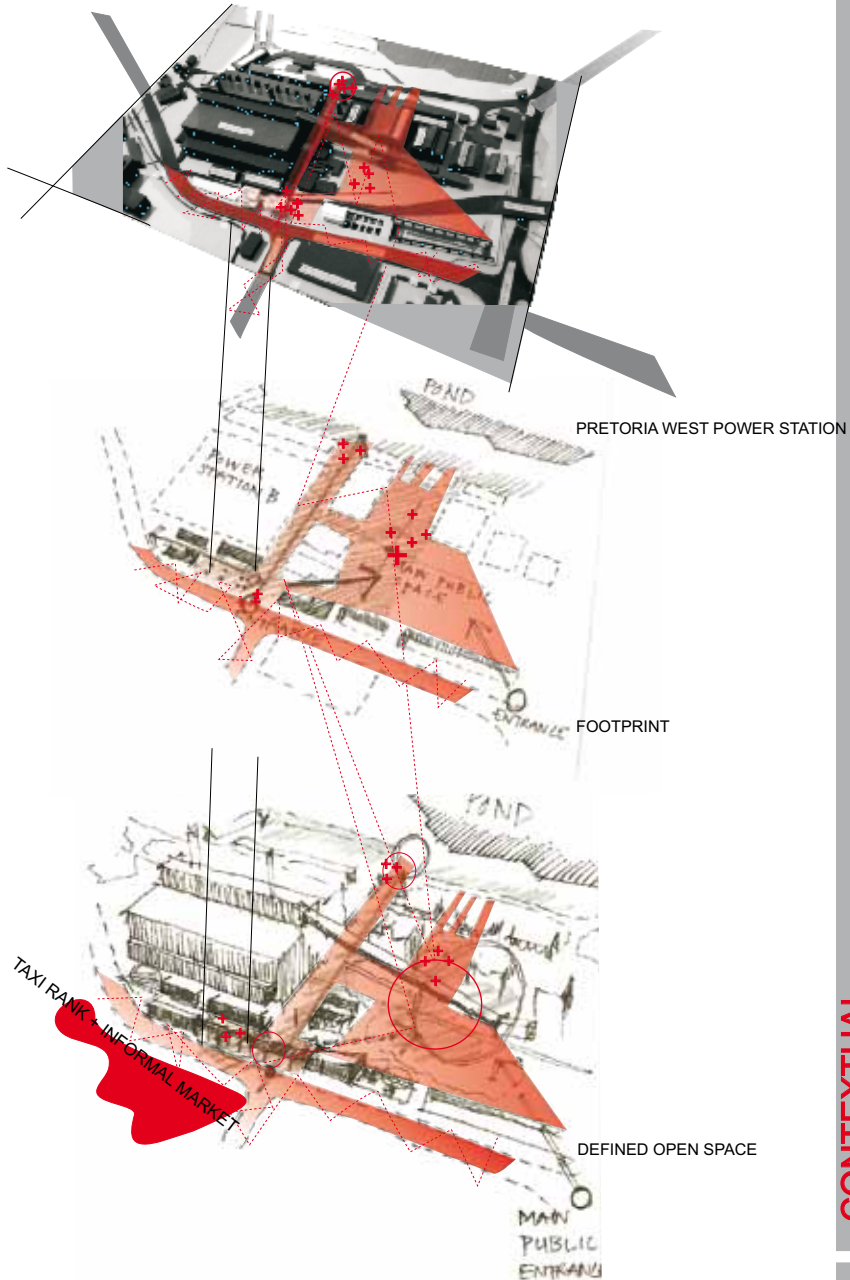
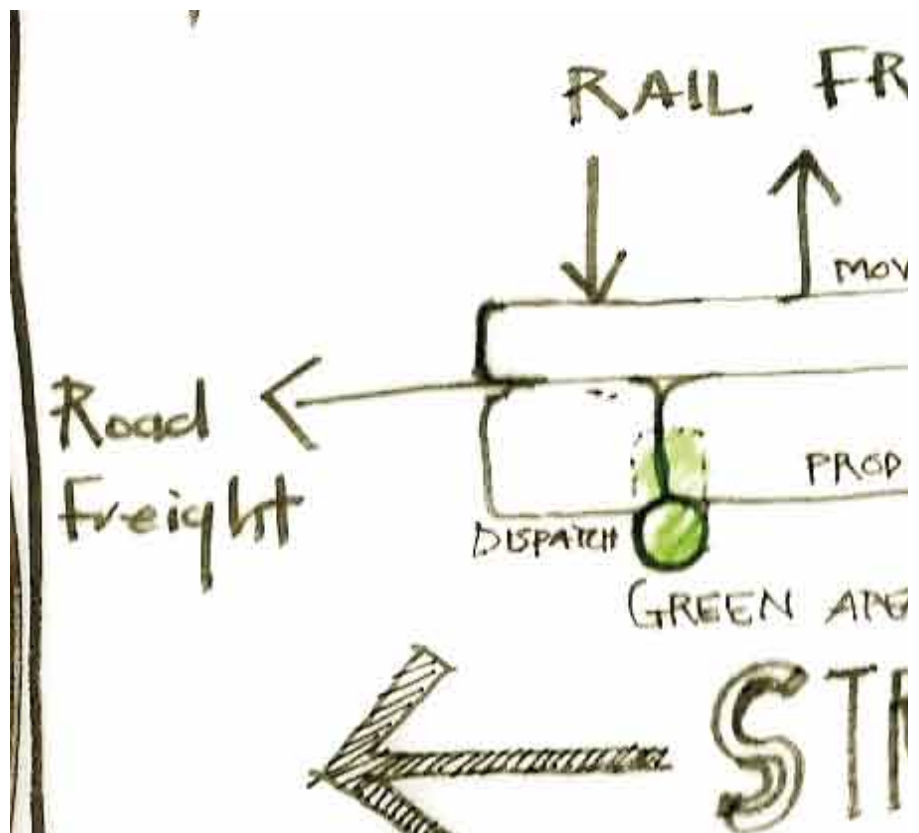


Figure 89. Contextual response based on spatial intentions; contextually the Pretoria West Bio-diesel Plant must respond to the surrounding public space and to the street edge (Buitenkant Street) that will accommodate the proposed taxi rank and informal markets: Author 2010.

Development of the movement diagram (fig: 90)

The purpose of the development of the movement diagram is to establish the connection between the building functions and the surrounding urban fabric (activities).

- The main movement corridor of the proposed bio-diesel plant is placed parallel to the street and at the back; this will allow for maximum interaction in the front with the production process from the street and yield an optimal logistical operation with rail and road freight.
- The production and related activities are placed closest to the street to establish visual connection and, by creating production annexes that will accommodate the production activities, a non-linear facade will be created that will enable a tacit connection between the production process and the local community through visual and social interaction.



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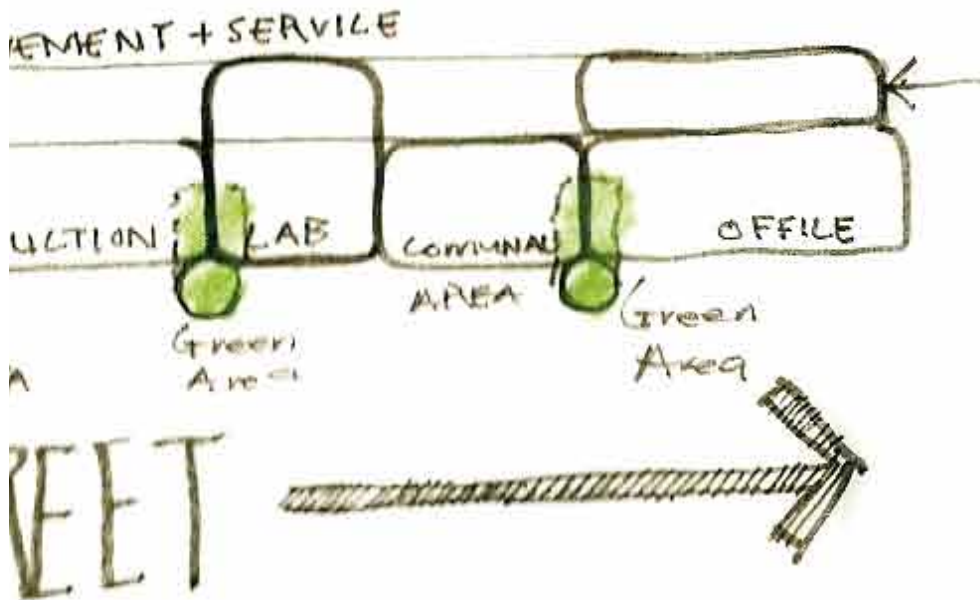
Spatial

Figure 90. The movement diagram is the first response to provide the building with spatial performance: Author 2010.

The integration strategies of the production process (Bio-diesel plant) with the urban fabric (see fig: 91):

- Movement along the non-linear facade is used to establish visual links between the urban fabric and the production process; with large openings in the facade to expose the day to day activities in the Bio-diesel plant.
- The second strategy was to integrate the activities of the Bio-diesel plant to that of the surrounding urban fabric; threshold spaces are programmed to accommodate these physical interaction. These threshold spaces are spill out areas for the Bio-diesel plant and flows directly into the surrounding urban activities; in the case of the Pretoria West bio-diesel plant it is the informal market around the ash bunkers and the adjacent public space to the north that the design responded to.
- The third strategy to integrate the production process into the urban fabric was to bring down the industrial scale to a human scale. Timber pergola structures along the facade with trees are used to define these humane areas; that are closely stitch to the surrounding urban activities.

HEIGHT



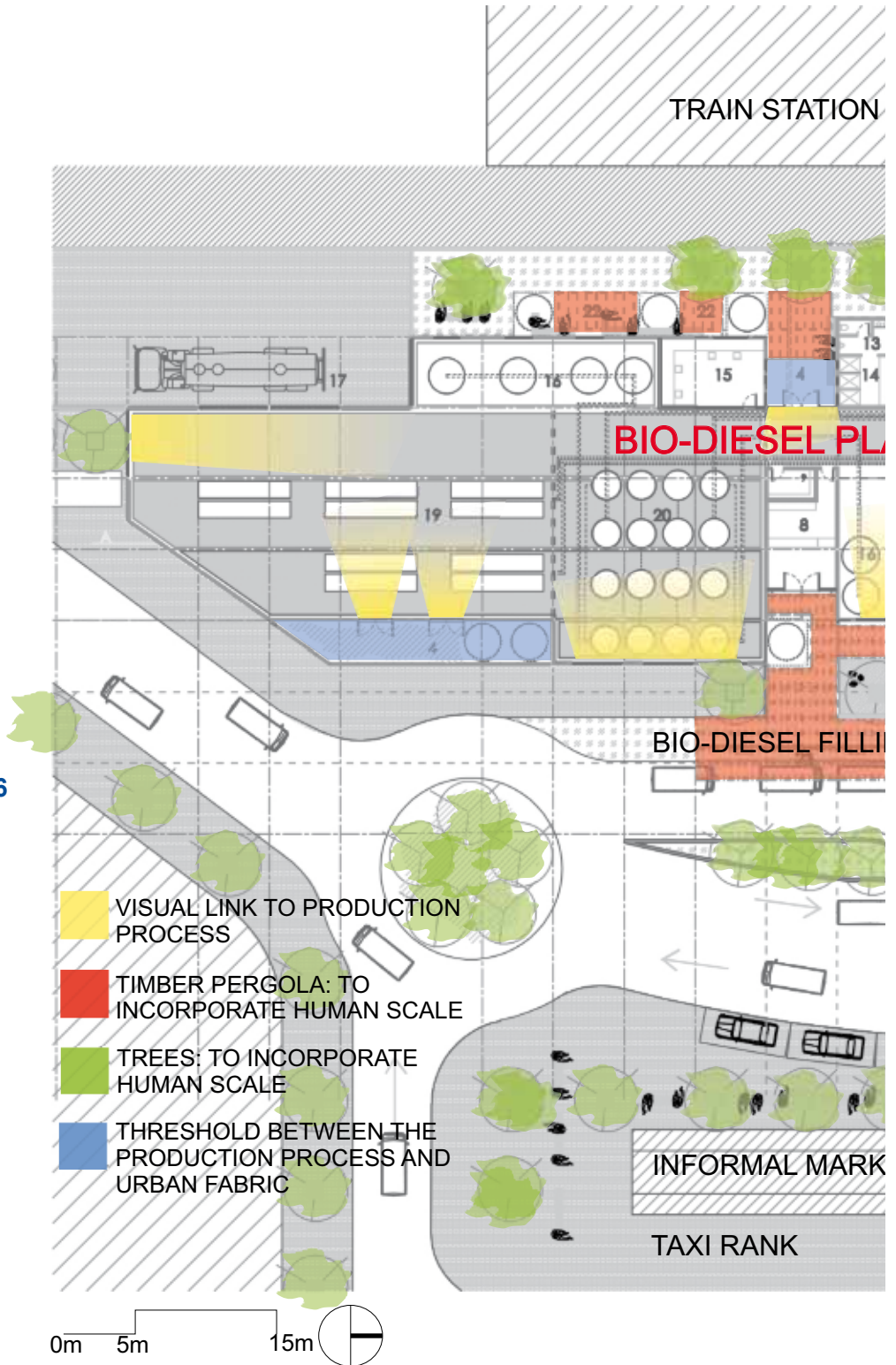
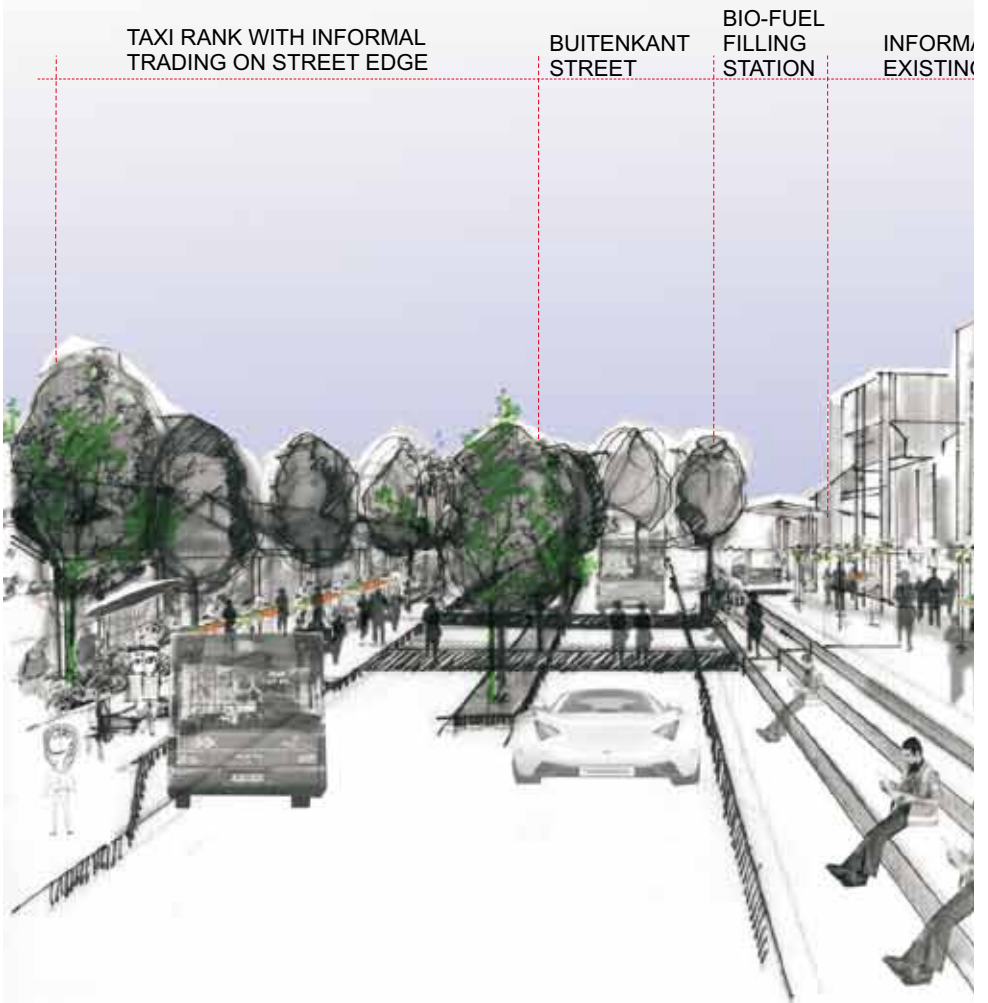
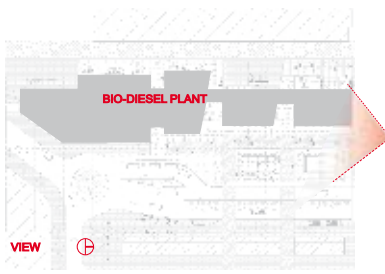


Figure 91. Pretoria west Bio-diesel Plant: showing integration with the urban fabric through the employment of visual links, threshold and incorporating human scale: Author 2010.





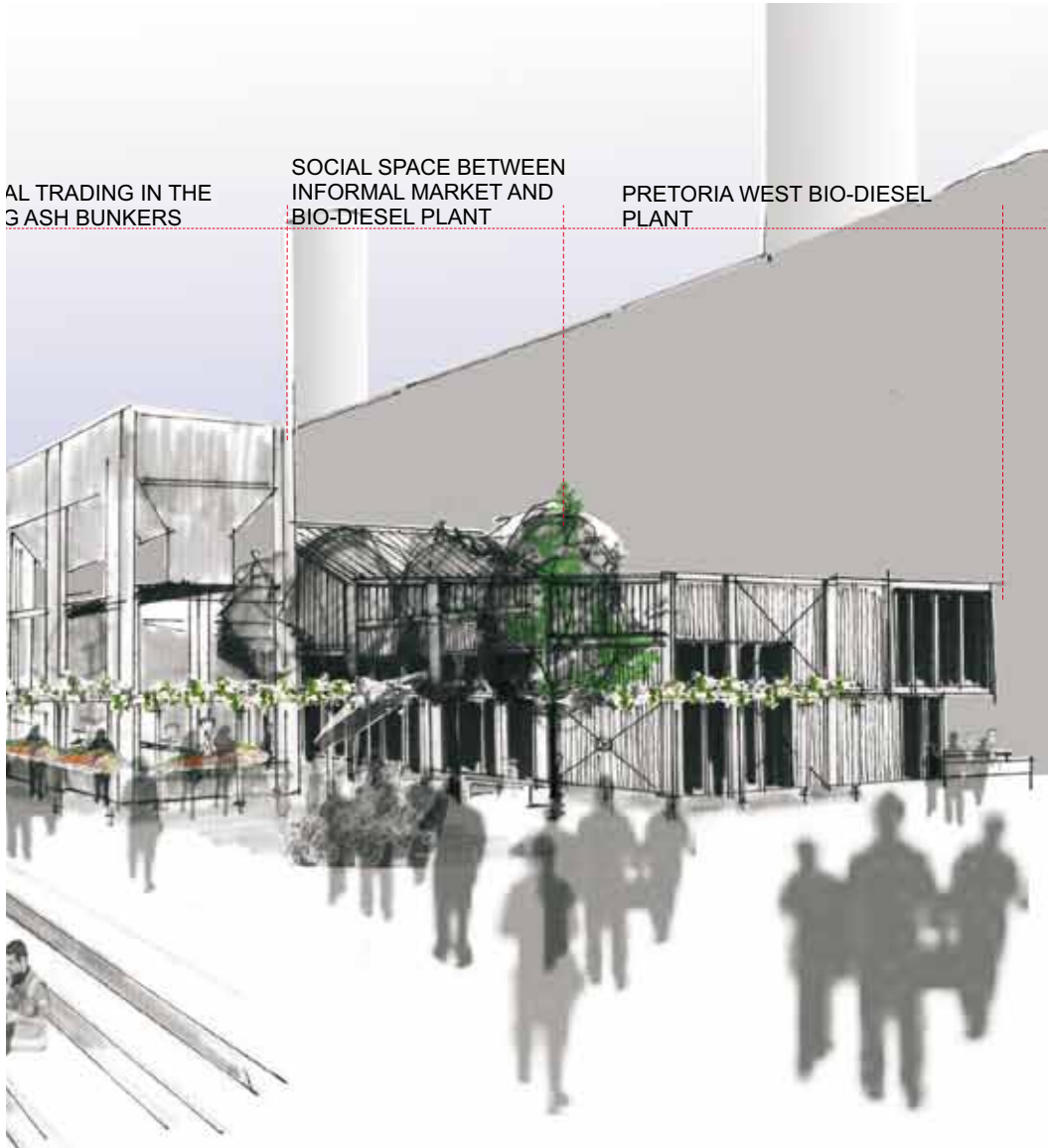
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Figure 92. Pretoria west Bio-diesel Plant: showing Buitenkant Steet and how the Pretoria West Bio-diesel plant is integrated into the surrounding urban fabric: Author 2010.



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Materiality

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To gain consistency throughout the project and minimal material weight, material is assigned to the functions of the building (fig: 94).

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Steel:

Steel will be used as the primary loadbearing structure (columns and beams) and in the secondary structure as façade cladding. This is consistent with the following concepts:

- Steel is a product of service - after the life of the building the steel can be re-used in the same capacity.
- Steel is energy efficient - light steel frame buildings are significantly more energy-efficient than heavy construction methods, both with regard to embodied energy of the materials and components, as well as operational energy relating to heating and cooling of the building over its design life. While the embodied energy of high strength steel, used for the light steel frame, is significantly higher per kilogram than conventional building materials, a significant lower mass of steel is used, rendering low-steel frame-wall assemblies vastly superior in this regard (Barnard, 2008).
- Steel is an economic building method. In the industrial sector this is a very important factor; the financial savings emanating mainly from significant time-saving to complete the building project, less rework, reduced logistical costs (which is of growing importance due to the escalation of fuel prices) and a drastic reduction of rubble on building sites, when compared with the brick-and-mortar alternative (Barnard 2008).

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Timber

Timber will be used as a secondary structure, to differentiate between the production processes and the human-related processes. Distinction between the timber and steel structure is accentuated in the connections: the steel structure focus on the functional where the components are lined up to form seamless connections and in contrast; with the timber structure the connections are pulled apart (see timber detail on page 154). The aim of timber is to stitch a human scale into the production scale. This is consistent with the concept of integrating the industrial building into the surrounding urban fabric.

- Timber is a fully-sustainable,
- and natural product.

These social spaces are vital for the workers to relate to their surrounding environment where the focus isn't on the product but on social interaction. This is important in terms of social wellbeing to enable workers to engage in conversation on the everyday mundane subjects of life, being part of a bigger community, talking about the weather, their children's achievements in school and the best bargains at the shops while observing the daily urban activities that surround the bio-diesel plant.

Masonry

The structure of the two service areas at the back of the bio-diesel plant will consist of masonry and mortar to relate to adjacent power station building B (fig: 93).

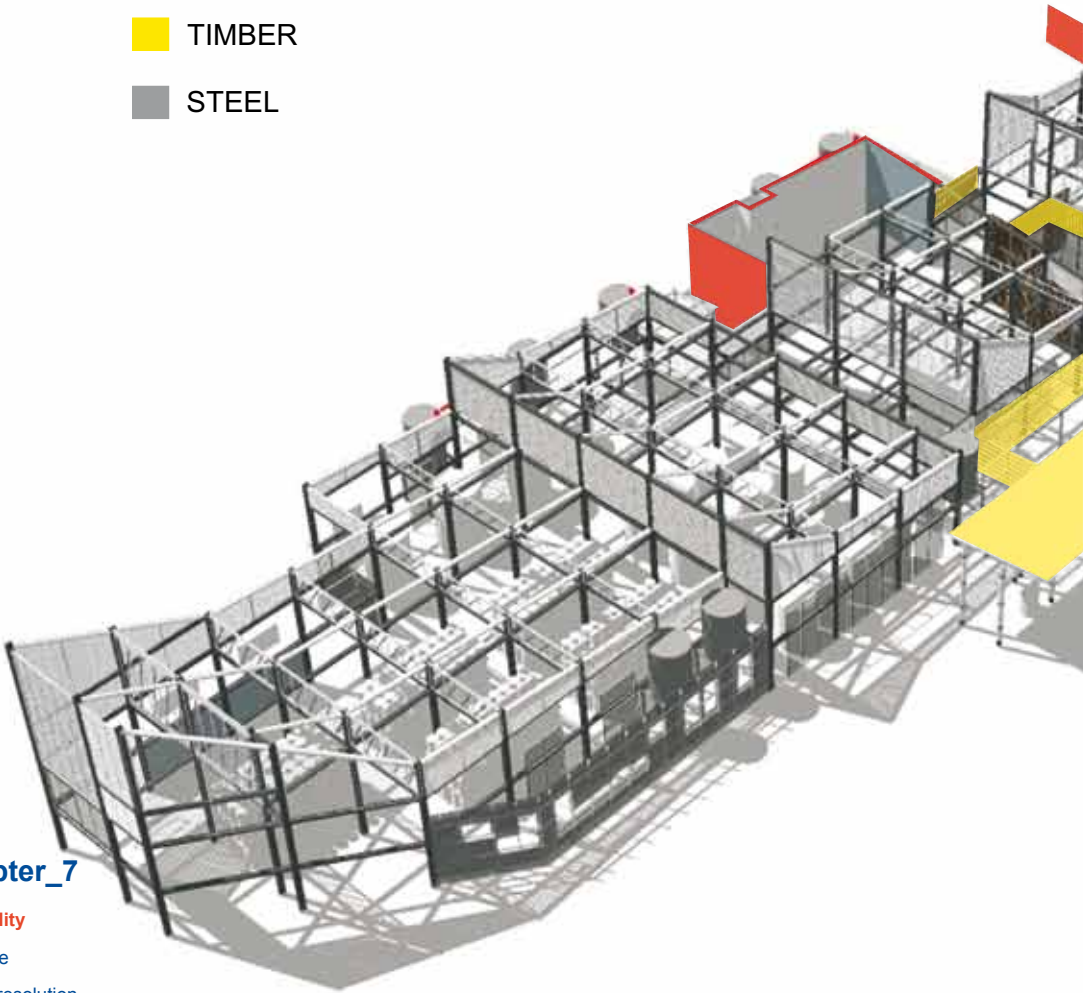


Figure 93. The structure of the two service areas at the back of the bio-diesel plant will consist of masonry and mortar, to relate to adjacent power station building B: Author 2010.

■ MASONRY

■ TIMBER

■ STEEL



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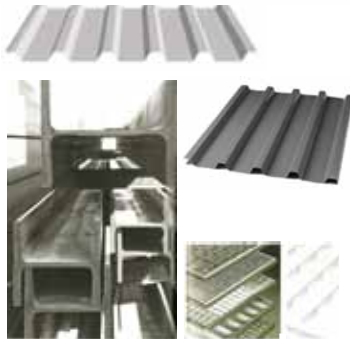
Structure

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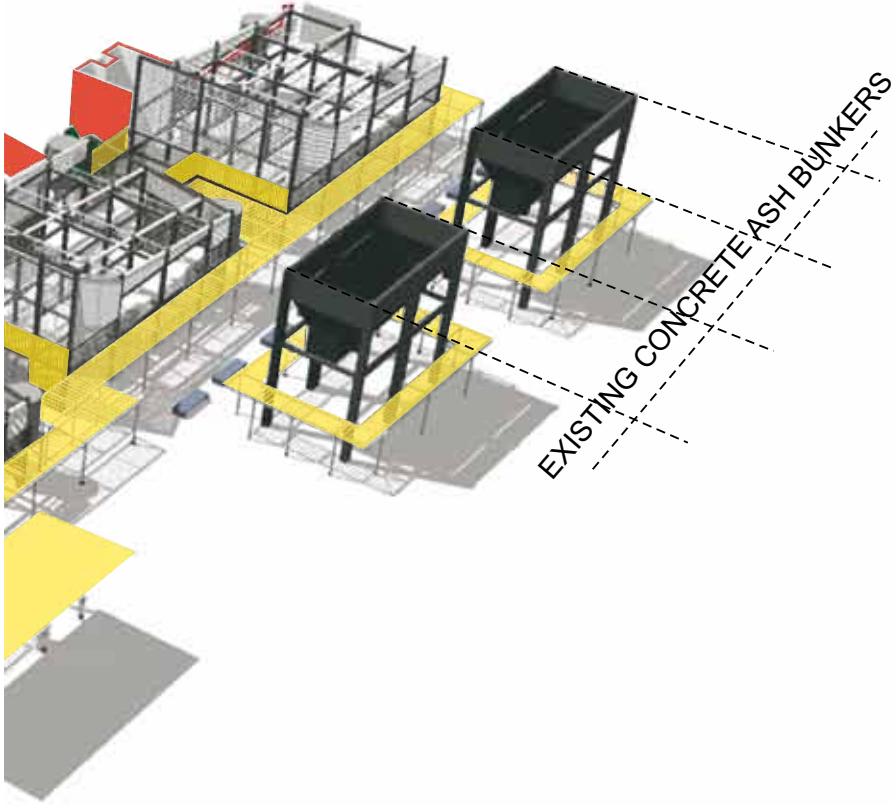
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STEEL

Figure 94. To gain consistency throughout the project and minimal material weight, material is assigned to the functions of the building: Author 2010.



TIMBER



MASONRY

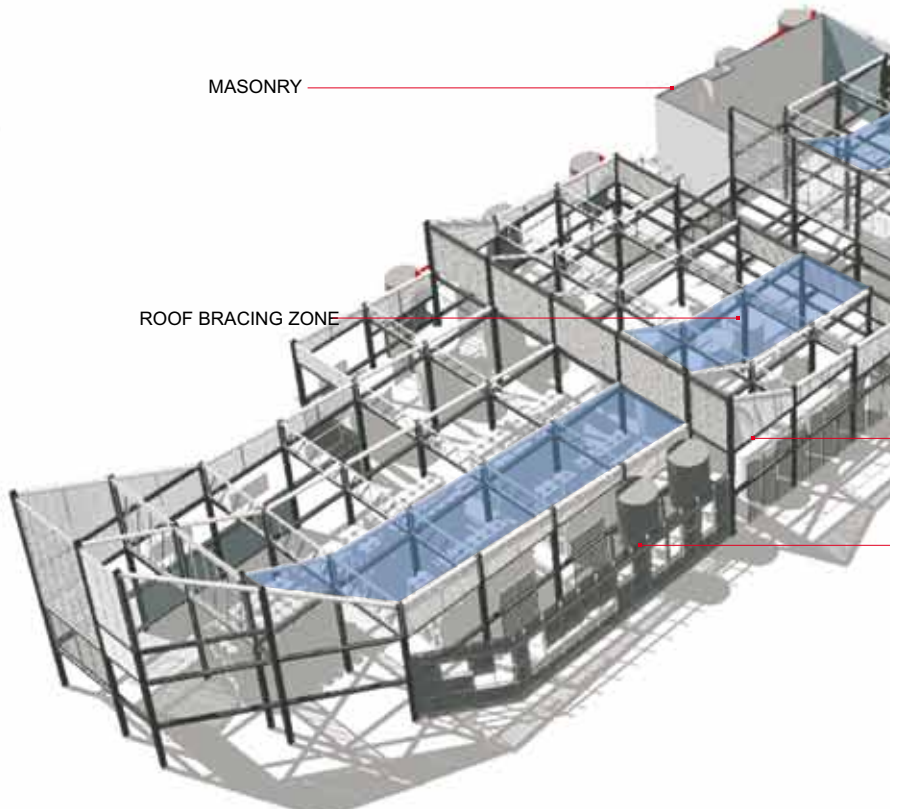
Structure



MASONRY

MASONRY

ROOF BRACING ZONE



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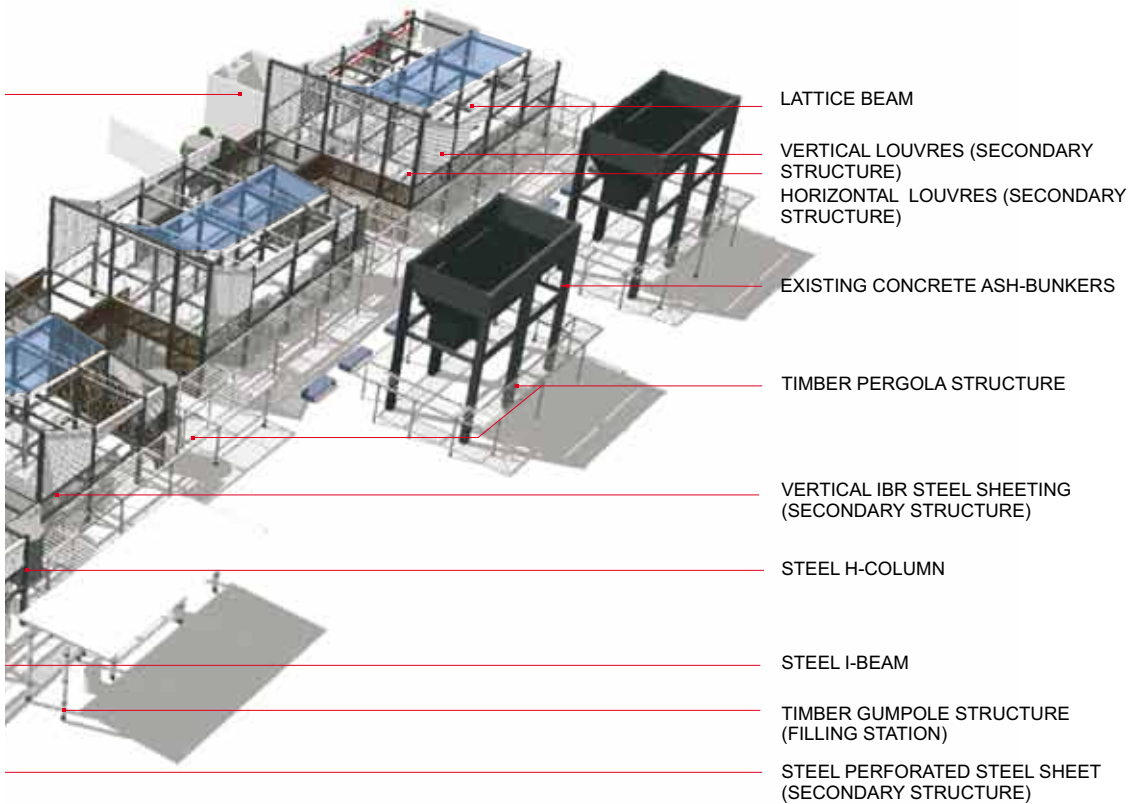
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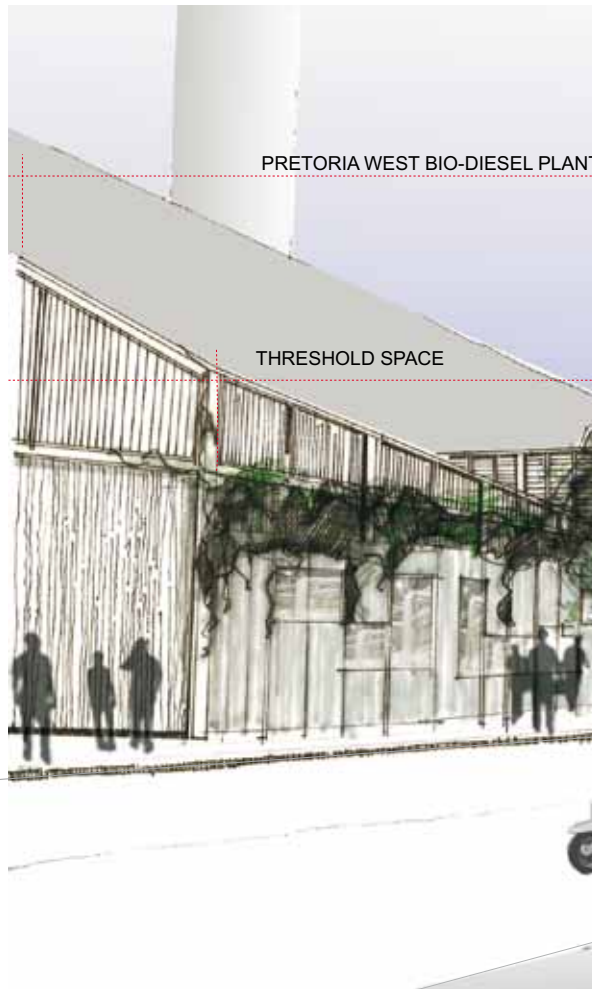
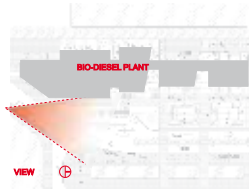
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Figure 95. The Pretoria West Bio-diesel Plant: showing the structural components of the building: Author 2010.

HORIZONTAL IBR STEEL SHEET ROOF
CLADDING (SECONDARY STRUCTURE)





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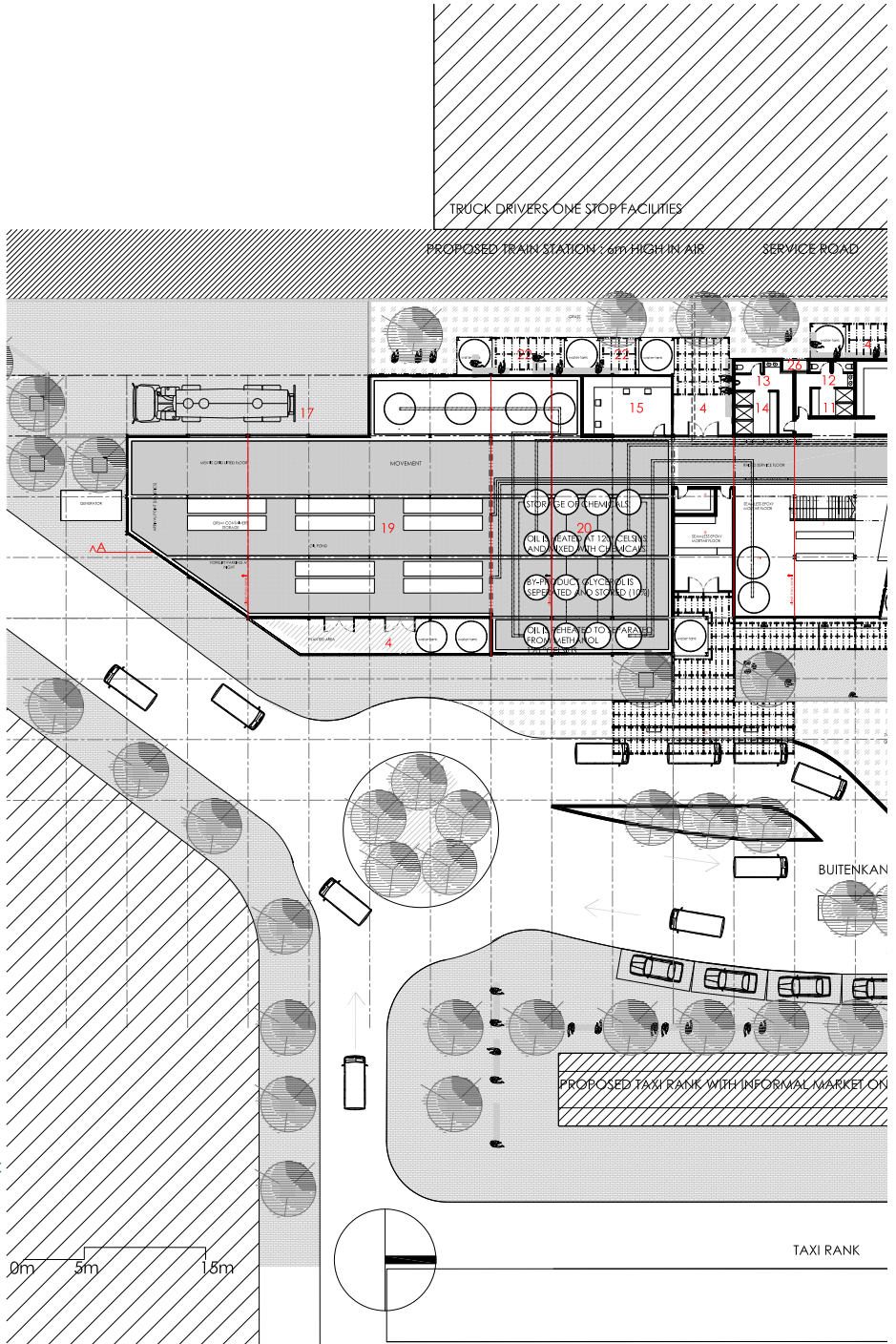
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Figure 96. On the left is the threshold between the production process and the street. In the middle back is the bio-diesel fuel station that will establish connectivity through activity. To the right is the informal market that will spill over to the Bio-diesel plant and will be accommodated in the existing ash-bunkers to establish integrated social spaces: Author 2010.





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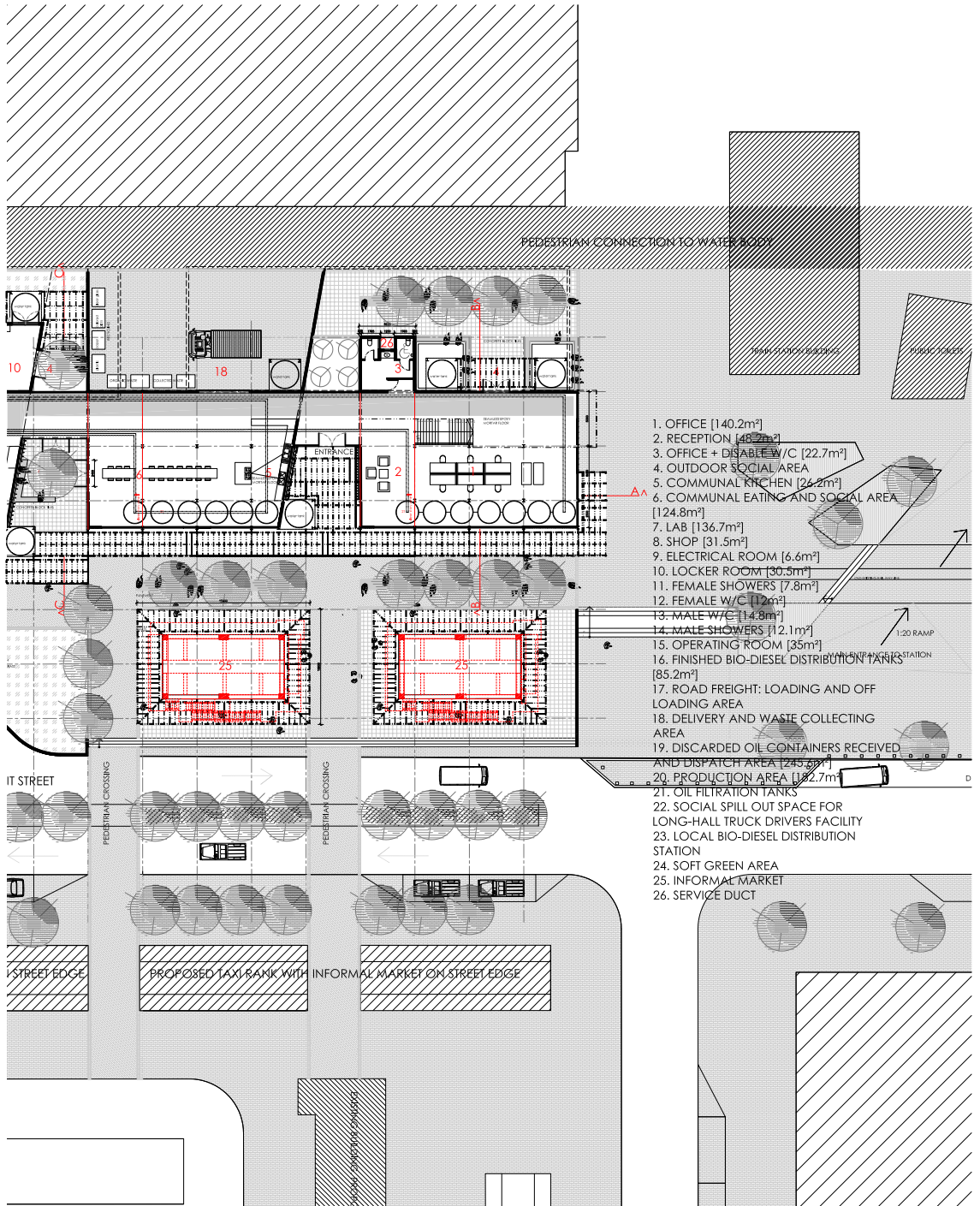
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GROUND FLOOR PLAN: PRETORIA WEST BIO-DIESEL PLANT





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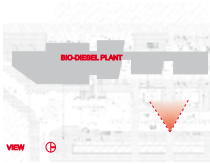
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Figure 97. On the left is the production annexe that forms a non-linear facade and accommodates the social spill out space. The facade is opened up to have a visual connection with the production activities. On the right is the existing ash bunkers that will accommodate the informal market, this leads into the social space along the facade (the timber pergola structure and trees will programme the appropriate human scale along the facade)





INFORMAL MARKET IN EXISTING ASH BUNKERS

ENTRANCE OF BIO-DIESEL PLANT FRAMED

INFORMAL MARKET IN EXISTING ASH BUNKERS



ASH BUNKERS WITH INFORMAL MARKETS, FRAMING THE **ENTRANCE** TO THE BIO-DIESEL PLANT



PRETORIA WEST BIO-DIESEL PLANT

THRESHOLD

INFORMAL MARKET IN EXISTING ASH BUNKERS



THRESHOLD SPACE BETWEEN THE BIO-DIESEL PLANT AND INFORMAL MARKET, THE THRESHOLD SPACE IS PROGRAMMED TO ACCOMMODATE SOCIAL INTERACTION.

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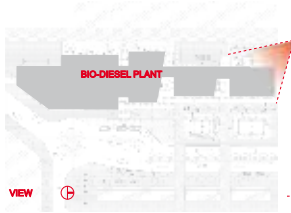
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SOCIAL SPACE
ADJACENT TO
INFORMAL
MARKET IN
ASH BUNKERS

BIO-DIESEL PLANT: OFFICE



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Figure 98. The threshold social space between the Bio-diesel plant (office) and the adjacent main public space, which will contribute to the integration of the industrial building into the urban fabric: Author 2010.

THRESHOLD SPACE BETWEEN BIO-DIESEL
OFFICE AND ADJACENT PUBLIC SPACE

OFFICE AND BOARDROOM

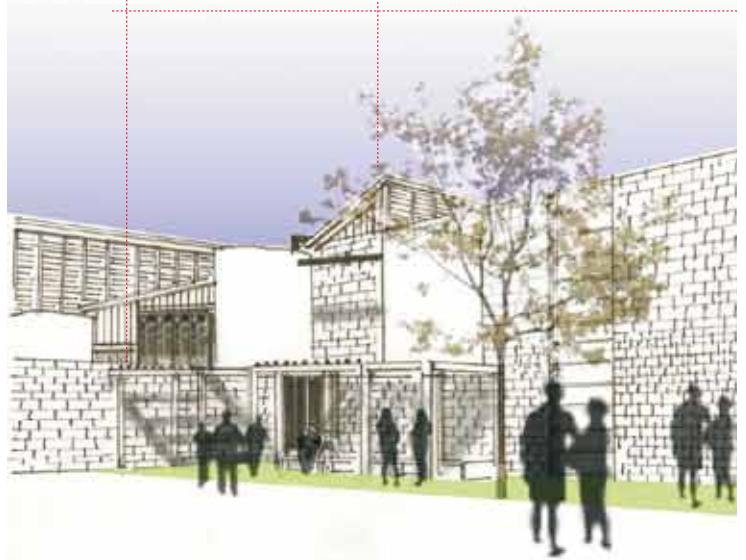




KITCHEN AND COMMUNAL AREA

LABORATORY AND TRAINING

SOCIAL SPACE BETWEEN I



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Figure 99. The social space at the back between the train station and the Bio-diesel plant: the workers are the most important source of energy in the production process, and it is therefore vital to have a space where they can interact in conversation, have a quite lunch or just be surrounded by other people away from their machine dominated work environment: Author 2010.

ING AREA

PRODUCTION AREA OF PRETORIA WEST BIO-DIESEL PLANT

BIO-DIESEL PLANT AND RAIL FREIGHT CENTRE



Building systems (energy strategy)

The author's energy strategy in terms of the Pretoria West Bio-diesel Plant is recognising the workforce of the industrial plant as the most important energy resource. Optimal and efficient levels of production depend on the wellbeing of the workers in their work environment. The following passive design strategies are proposed to be applied to the spatial design in order to obtain this goal:

Natural light:

Natural light will enter through the louvers which will be manually-operated. The functions in the bio-diesel plant are then arranged in relation to the daylight that enters the building. Human related activities are placed where the most light enters, and the storage and passive production processes where least amount of natural light reaches (fig: 101).

The lighting level (fig: 100) depends on occupancy and activity, and is determined in accordance with the requirements of SANS 10114-1. Daylight is used in the design to reduce the levels of energy used. A part of the roof angle is 27° (fig: 102) to accommodate photovoltaic panels that will generate electricity for lighting of the bio-diesel plant.

LUX calculations:

Production:

LUX: 500
AREA: 490sqm
LUX = LUMEN/m²

500 = LUMEN/490m²
LUMEN = 500 X 490m² = 245 000

Production : LUMILUX T8ES - 4800 LUMEN

Total need = 245 000 LUMEN

245 000/4 800 = 51 Luminaires are needed , with the day light factor of the bio-diesel plant only 50% will be used, thus:

25 Luminaires at 51W will be used - 25 X 51W =1 275

Hours used - 10
1275 X 10 = 12 750W/H or 12,7kW/h

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Storage: 0,896kW/h

W/C: 1,496kW/h

Retail: 3,344kW/h

Lab and Training area: 2,856kW/h

kitchen and Communal area: 0,23kW/h

Office: 6,12kW/h

Toatal: 25,142 kW/h is needed

Photovoltaic panels:

100 W = 1m²

10 sqm = 1kW

Pretoria solar factor = 6,2

Bio - Diesel Plant: 493,96m²

thus 493,96 will yield 49,39 kW

solar factor will be half due to the fact that the building is in the shade for most of the afternoon

49.4 x 3.1 = 153.14 kW

Hot water services:

The solar water heating system will comply with SANS 1307. The hot water services for the building will be heated using devices and equipment that would provide a minimum of 50% of the heat energy requirement via solar energy (fig: 102).

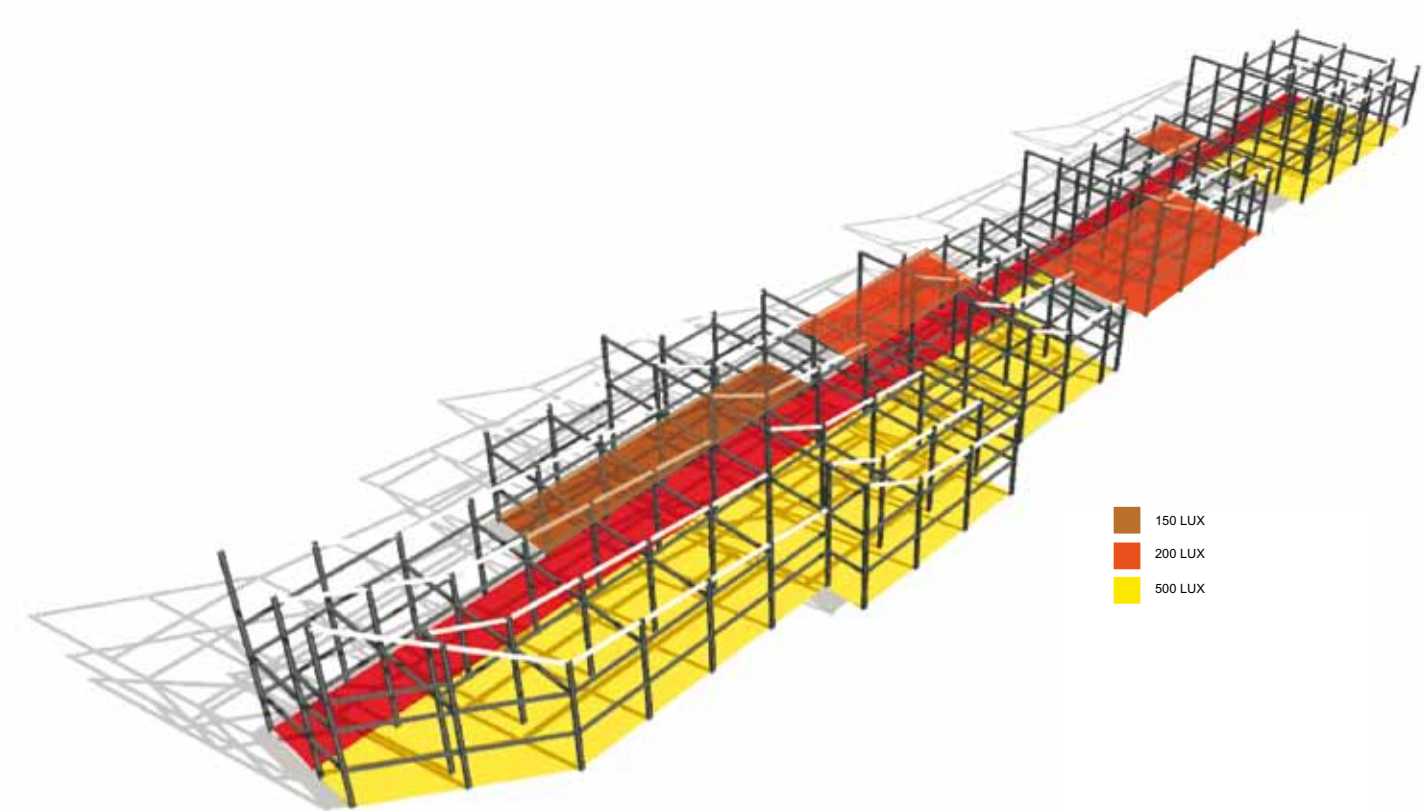


Figure 100. Pretoria West Bio-diesel Plant lighting levels: the lighting level depends on occupancy and activity, and is determined in accordance with the requirements of SANS 10114-1: Author 2010.

NATURAL LIGHT FUNCTION →

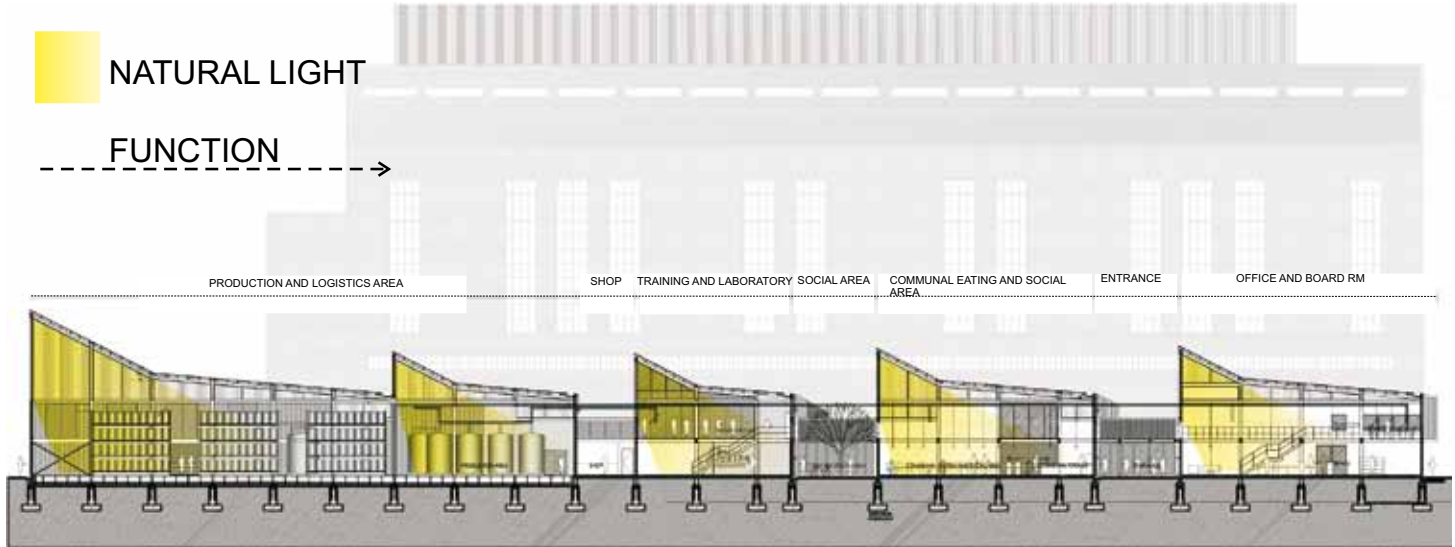


Figure 101. Daylight will enter through louvers which will be manually operated. The functions in the bio-diesel plant are arranged in relation to the natural light that enters the building; human-related activities are placed where the most light enters, and the storage and passive production processes where the least amount of natural light reaches: Author 2010.

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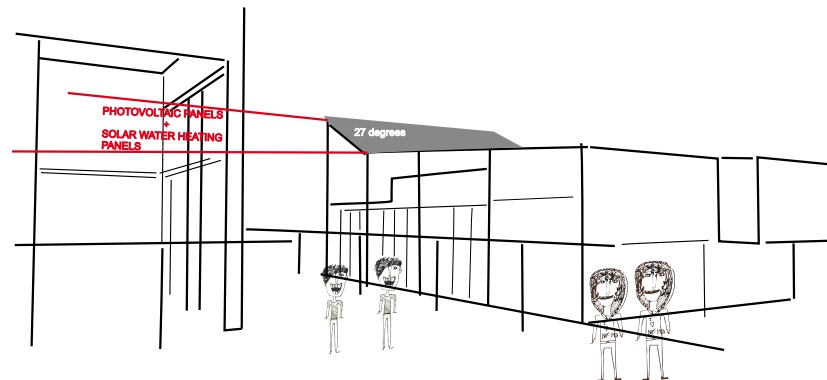


Figure 102. A part of the roof angle is 27° to accommodate photovoltaic panels that will generate electricity for the lighting of the bio-diesel plant and solar water heating panels. From: Author 2010.

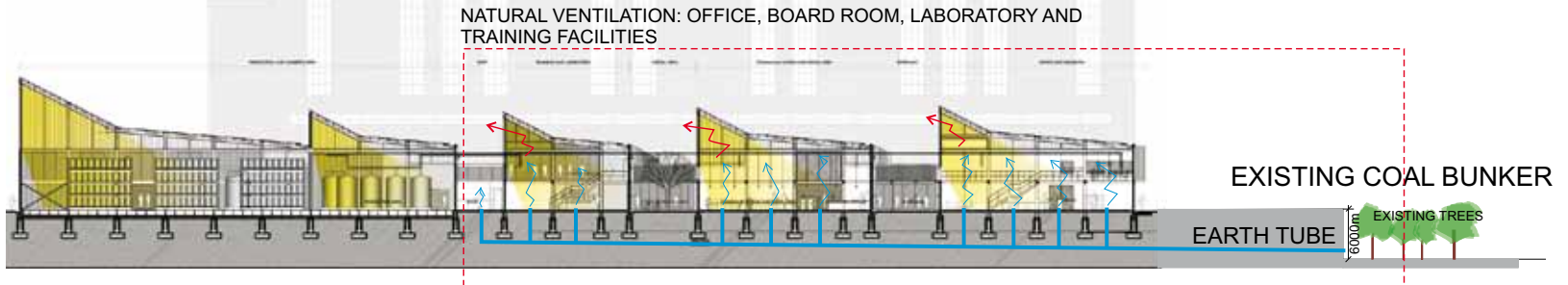


Figure 103. Earth tubes will be connected to the adjacent coal bunker where cool and fresh air will be collected. The earth tube must be sunken into the ground to a distance of at least 2m, and the tube must be installed at a 1:100 slope for condensation to run off and prevent a sick building syndrome to develop: Author 2010.

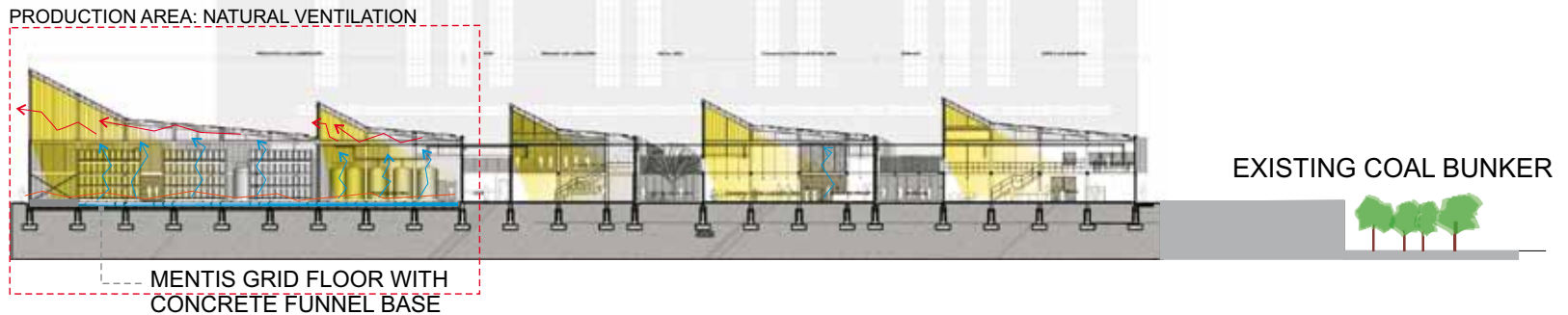


Figure 104. The floor of the production area is a raised steel mentis grid floor with a concrete funnel base which would allow for any spillage to be saved. The strategy is aimed at using use rainwater to run down the funnel base to move and 'wash' the oil (washing the oil is a process where the impurities of the discarded cooking oil react with the water). The constant water movement will cool the air from the lower level vents, that will be used to naturally ventilate the production area: Author 2010.

Natural ventilation is achieved by means of the following strategies:

Earth tubes (fig: 103) will be connected to the adjacent coal bunker where cool and fresh air will be collected. SANS 10400-0 requires that 5l/s/person of outside air is provided for office spaces. The earth tube must be sunken into the ground to a distance of at least 2m, and the tube must be installed at a 1:100 slope for condensation to run off and prevent a sick building syndrome to develop.

Earth tube size: 5l/s per person according to the national building regulation

$$5\text{l/s} \times 25 = 125\text{ l/s}$$

$$0.125\text{m}^3/\text{s}$$

Thus 0.125m² area for the tube is needed (conventional ventilation), for displacement ventilation this figure can be doubled = 0.25m²

The timber pergola structure will assist in allowing and exclude heat to the building through vines growing on it; to allow sunlight through in the winter and exclude in the summer.

Another strategy that could be applied to reduce the energy load in cooling down the space is night-flushing. Offices and other commercial buildings operate during the day and are typically unoccupied at night. During the day the building gets warm, both from the sun and internal heat loads. Typically at the end of the day, office buildings are locked up and the heat remains trapped inside the building and it would still be warm at the start of the next day. The concept of night flushing entails using the cool night air to cool down the building so that the building is cooler when occupied again in the morning. Usually the night air is blown through the building for about an hour or two just before sunrise.

Production area:

Heat is generated in the production process of bio-diesel. In summer the heat is removed from the building when the hot air rises and escapes through the louvers. In the winter the heat will be redirected and used in other parts of the building; such as the laboratory, training room, office and boardroom.

The floor of the production area is a raised steel mentis grid floor with a concrete funnel base, allowing for any spillage to be saved. The strategy is to use rainwater to run down the funnel base to move and 'wash' the oil (washing the oil is a process whereby the impurities of the discarded cooking oil react with the water). The constant water movement will generate cool air from the lower level vents, that be is used to naturally ventilate the production area (fig: 104). Natural convection can now start to take place due to the temperature difference (cold air at floor level and rising hot air from the production process), and stimulate the circulation of air through the building.

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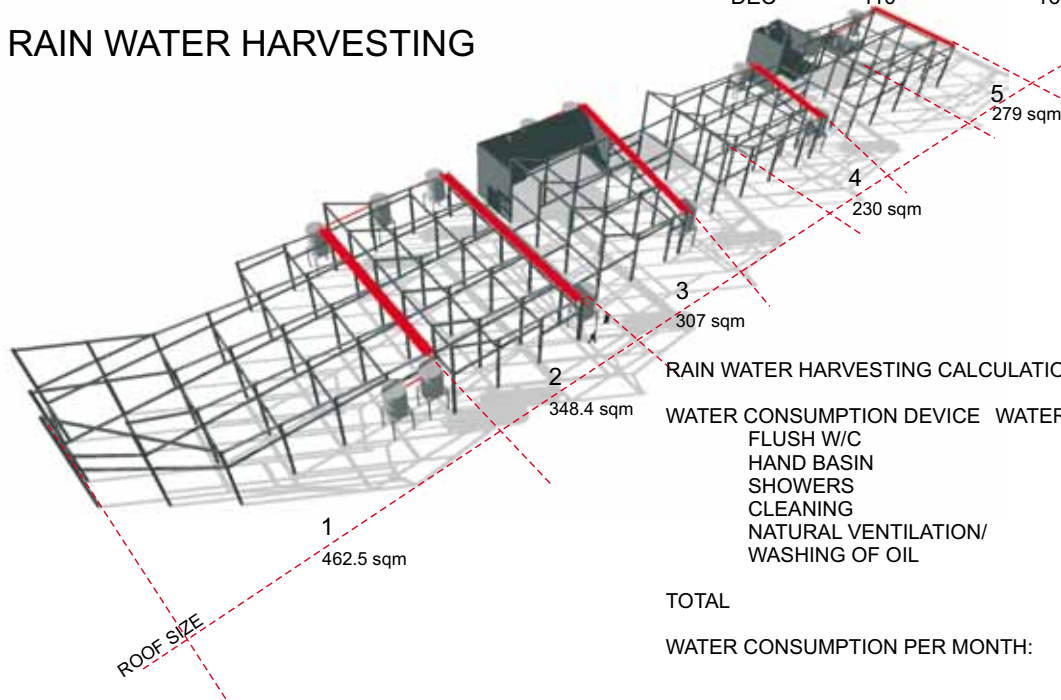
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MONTH	RAIN FALL	HARVEST	DEMAND	SURPLUS/ (NEED)
JAN	136	205252	81468	123784
FEB	75	113190.75	81468	31722.75
MARCH	82	123755.22	81468	42287.22
APRIL	51	76969.7	81468	(4498.3)
MAY	13	19619.73	81468	(61845.27)
JUNE	7	10564.4	81468	(70903.6)
JULY	3	4526.63	81468	(76942)
AUG	6	9055.26	81468	(72412.74)
SEPT	22	33202.62	81468	(48265.38)
OCT	71	107153.9	81468	25685.9
NOV	98	147902.58	81468	66434.58
DEC	110	166013	81468	84545

RAIN WATER HARVESTING



RAIN WATER HARVESTING CALCULATIONS

WATER CONSUMPTION DEVICE	WATER CONSUMPTION	AMOUNT OF DEVICE	USE	TOTAL
FLUSH W/C	9L	5	8	360
HAND BASIN	3L	7	8	168
SHOWERS	40L	5	4	800
CLEANING	20L	5	3	300
NATURAL VENTILATION/ WASHING OF OIL				1000
TOTAL				2628 L/per day
WATER CONSUMPTION PER MONTH:				81468L

Figure 105. Rainwater harvesting strategy of the Pretoria West Bio-diesel Plant: Author 2010.

Rainwater harvesting:

Tanks are used to catch and store rainwater that is harvested from the roofs of the building (fig: 105). The tanks are placed three meters high in the air to use gravity to move the water to where it is needed.

Greywater is wastewater harvested from handwash basins and showers. Using the table in the Green Building Handbook for South Africa (Gibbert, 2009), the production of greywater can be calculated. The amount of grey water produced by the handwash basins (168l) and showers (800l) adds up to a total of 968l. The water consumption of the flush toilets is considerably below total at 360l/day, indicating that there should be sufficient grey-water capacity to be used to flush toilets, with the excess being used for irrigation.

Rain water harvesting calculations:

Roof 1:

Summer rain fall 140mm/sqm

$$140 \times 462,5 = 64\ 750\ l$$

$$140\text{mm}/\text{m}^2 = \text{sqr root of } 64\ 750 \\ = 254,46 \text{ gutter size}$$

The gutters will be over sized by half what is needed, to prevent any unpredictable flooding situation

gutter size: 450mm x 450mm

Down Pipe:

$$462,5 \times 0,5 = 231,25$$

$$231,25 \times 100\text{mm}/\text{m}^2 = 23\ 125$$

Diameter of gutter = 170mm

Gutter size:

Roof 2: 300mm X 300mm

Roof 3: 300mm X 300mm

Roof 4: 250mm X 250mm

Roof 5: 300mm X 300mm

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Rainwater harvesting:

Tanks are used to catch and store rainwater that is harvested from the roofs of the building (fig: 105). The tanks are placed three meters high in the air to use gravity to move the water to where it is needed.

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Roof 2: 300mm X 300mm

Roof 3: 300mm X 300mm

Roof 4: 250mm X 250mm

Roof 5: 300mm X 300mm

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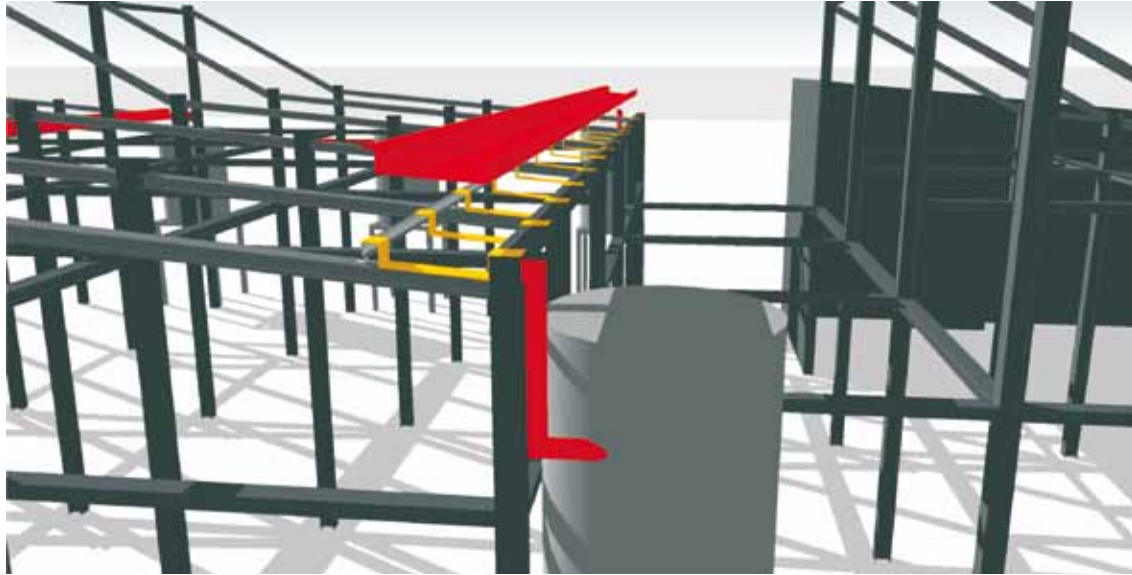
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3 GALVANIZED STEEL BEND PLATE
GUTTER IN 5m LENGTHS ,WELDED
AND SUPPORTED BY GUTTER
BRACKETS WITH FALL OF 1:200

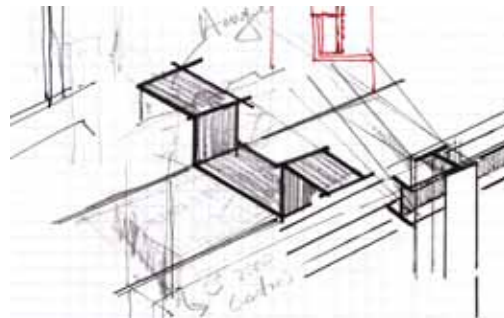
175 DIAMETER DOWNPIPE OF 0.6
CONTINUOUS HOT-DIP ZINC
COATED CARBON STEEL SHEET

STEEL GUTTER BRACKET @ 1250
CENTRES, WILL ACCOMMODATE
THE 1:200 FALL

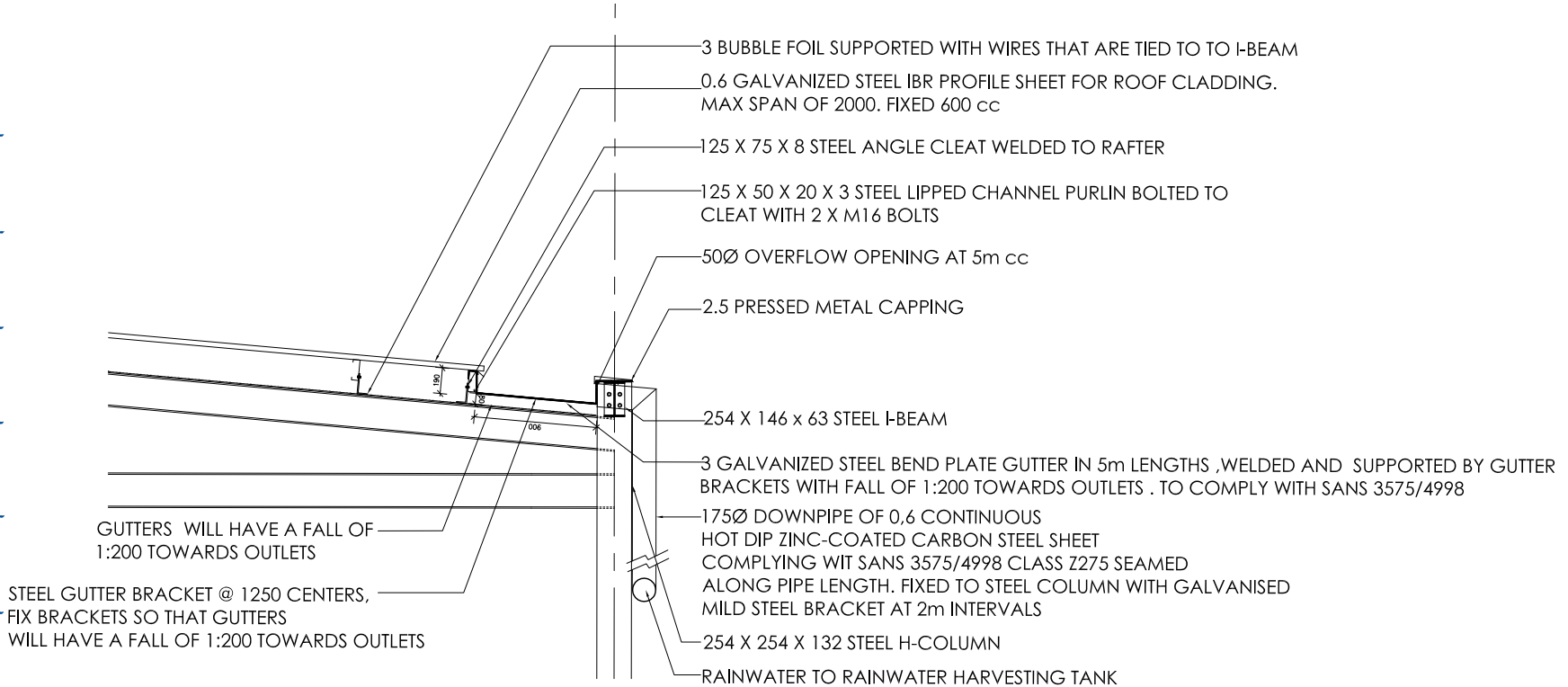
50 DIAMETER OVERFLOW OPENINGS AT 5m cc



perspective view of gutter



exploration of gutter detail



DETAIL A: gutter detail 1:50

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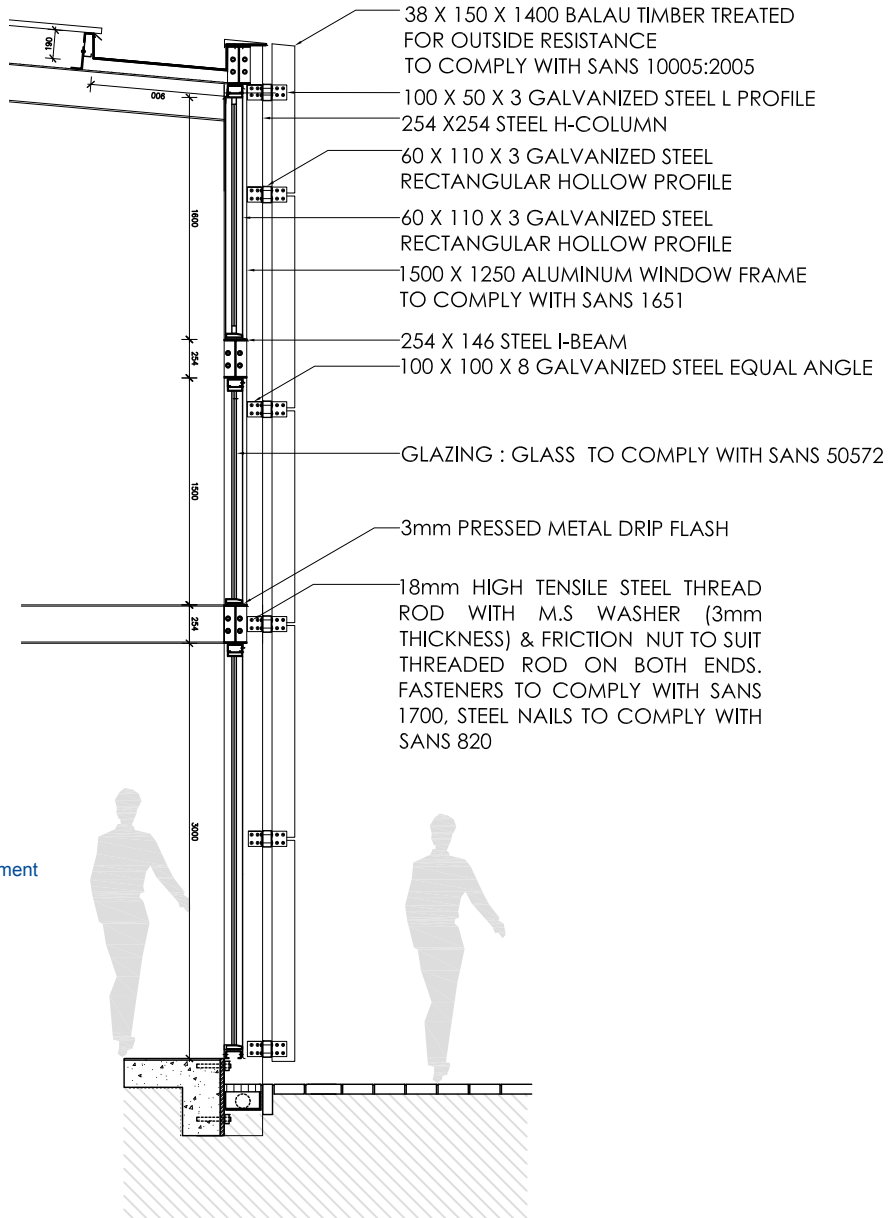
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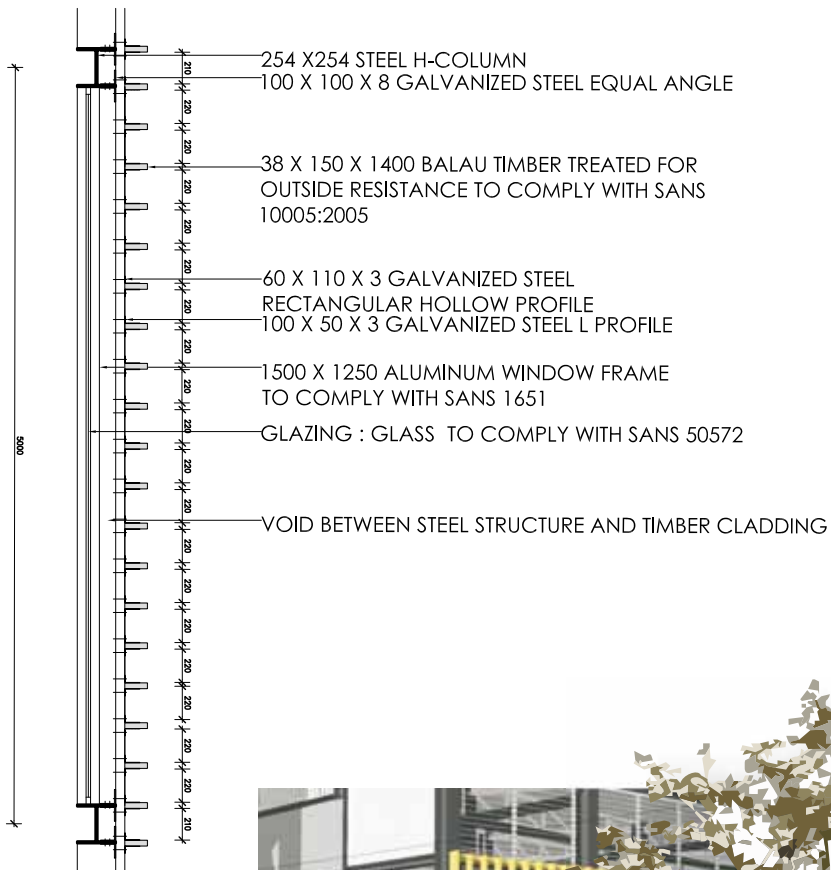
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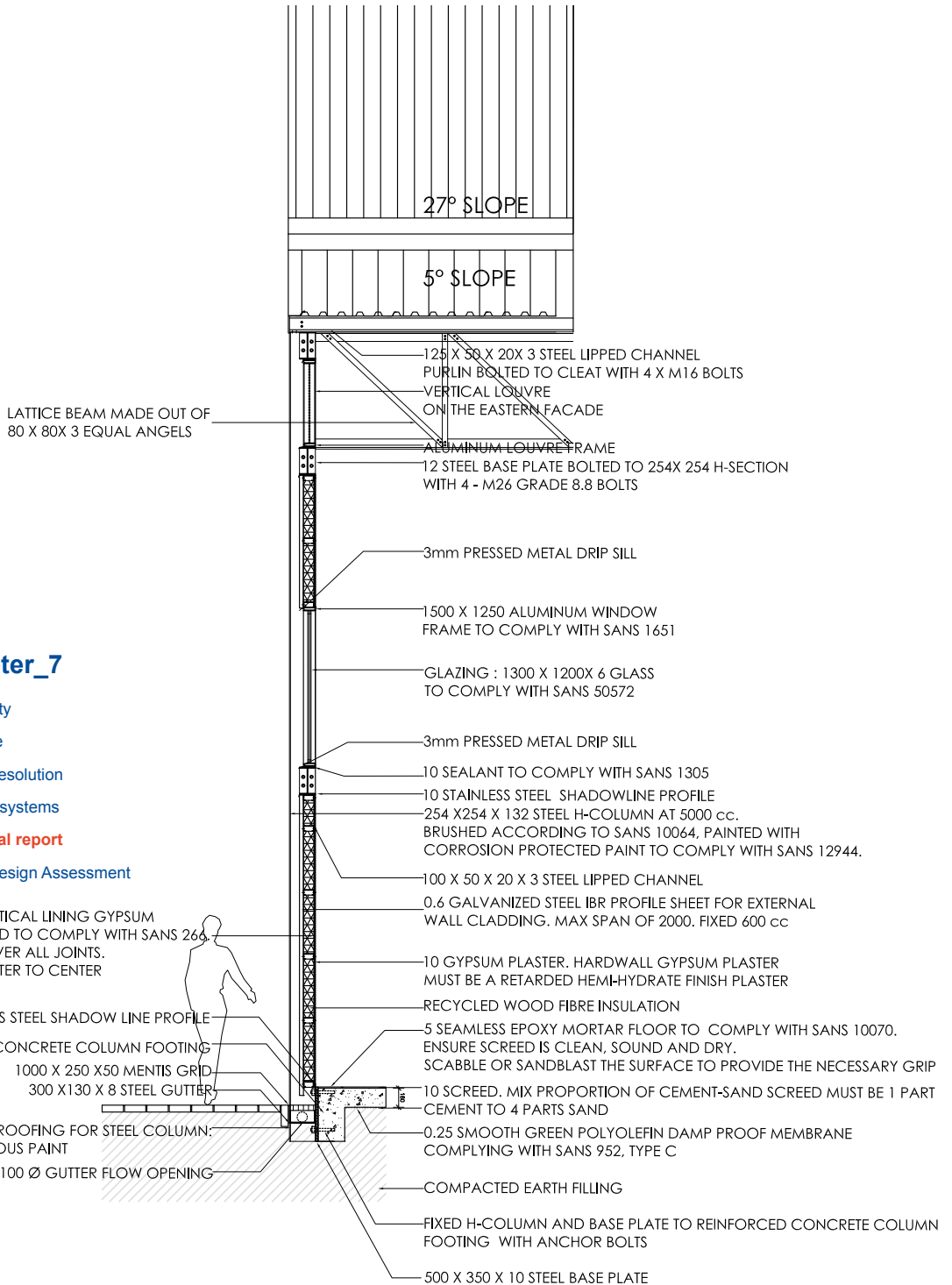
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DETAIL E: timber wall cladding plan 1:50



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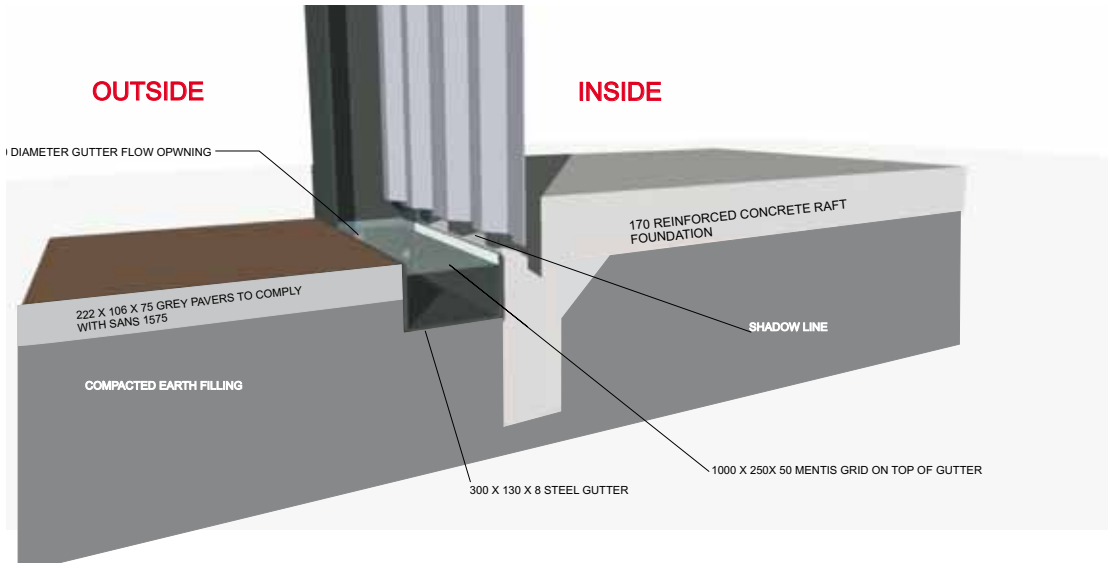
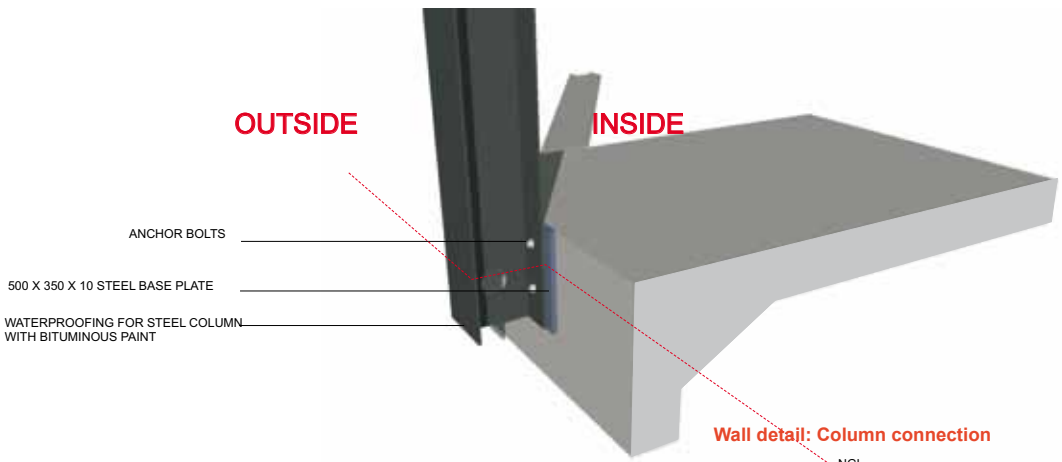
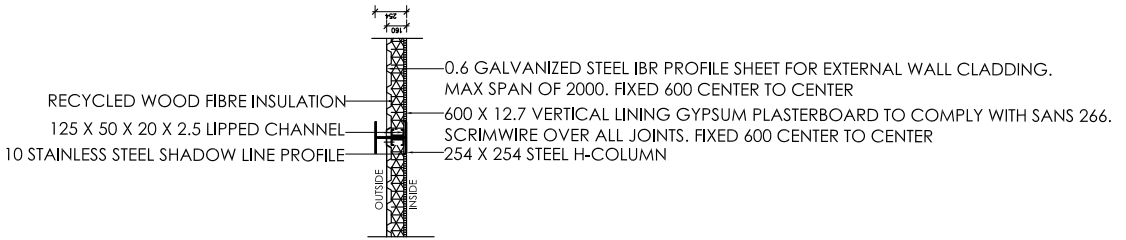
Design resolution

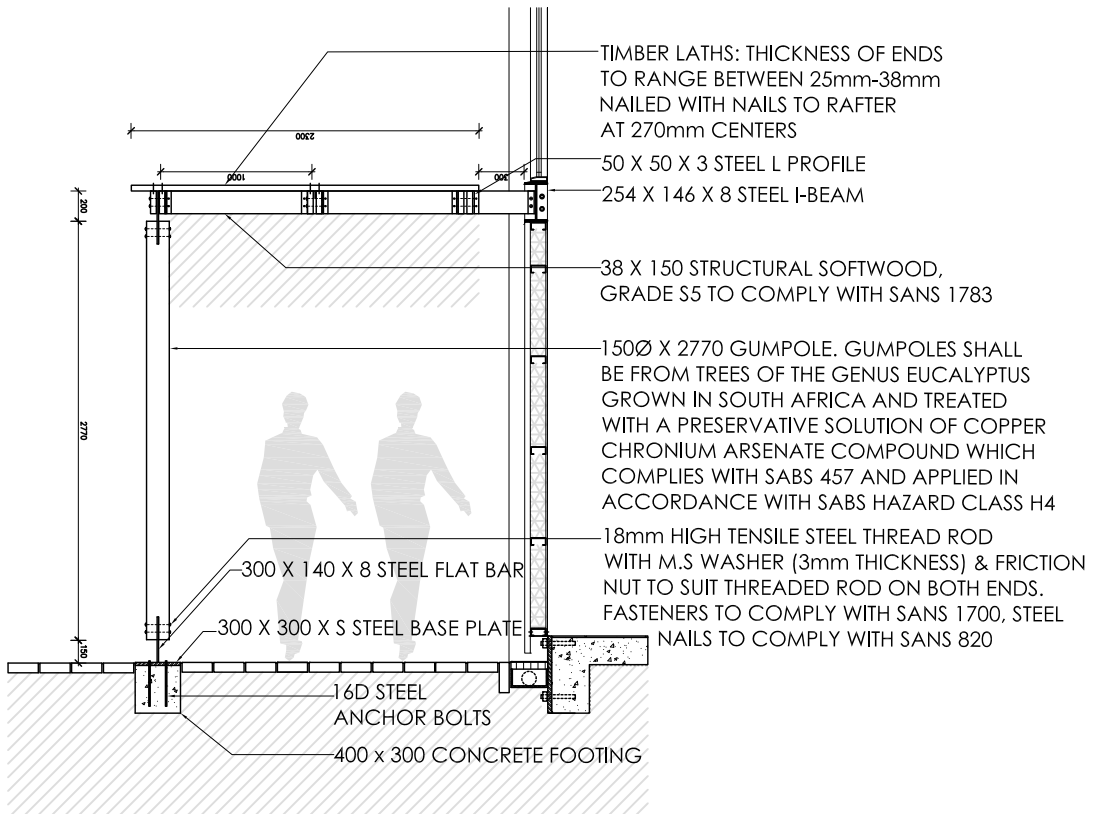
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DETAIL C :typical wall section [nts]





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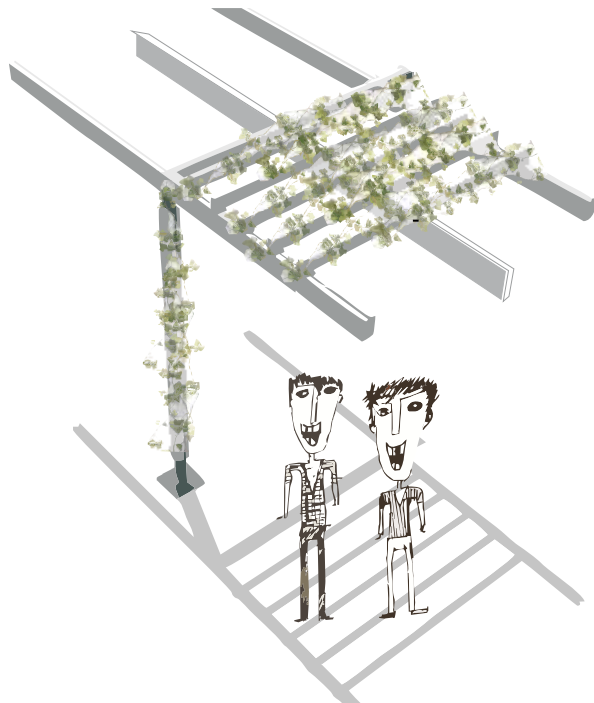
Design resolution

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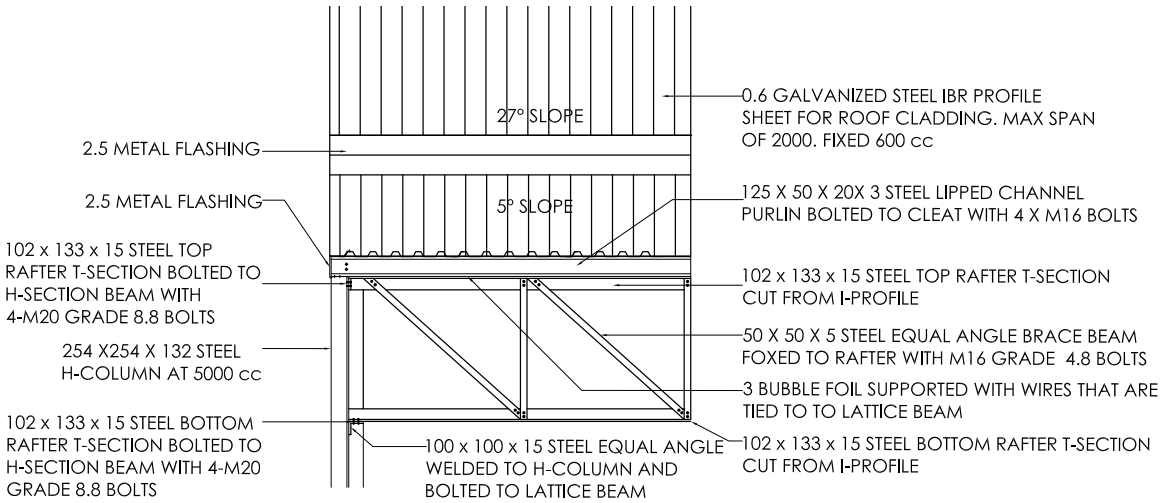
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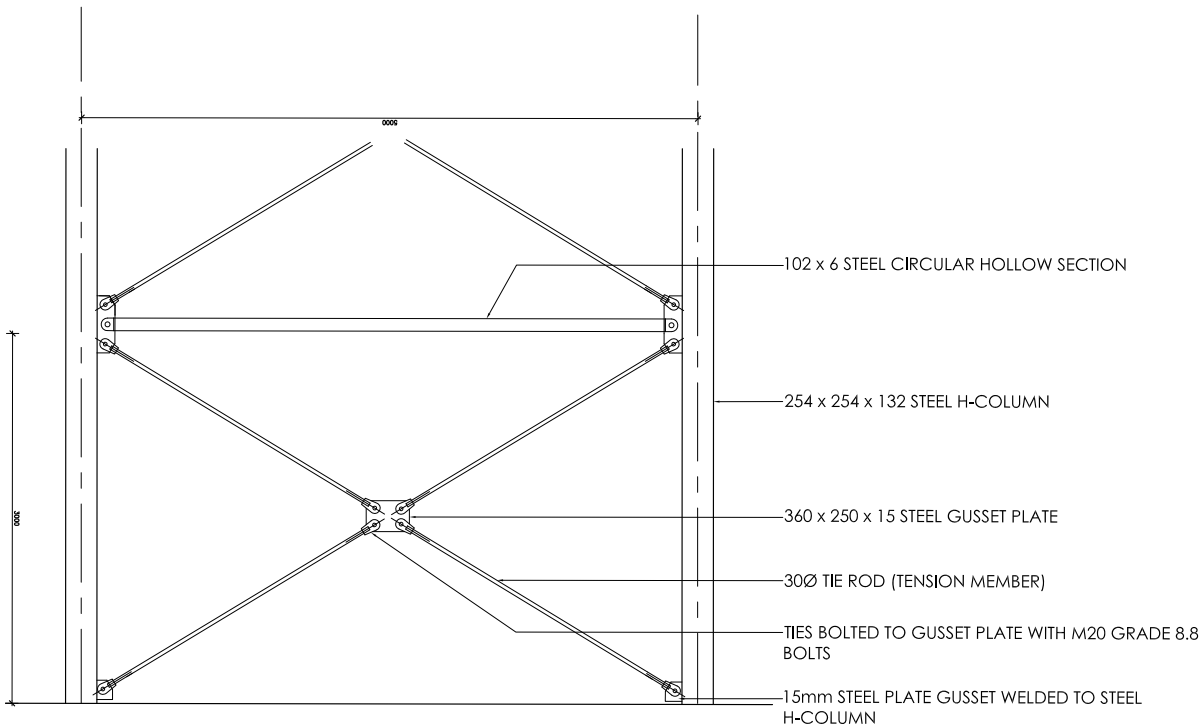
DETAIL D: timber pergola structure 1:50



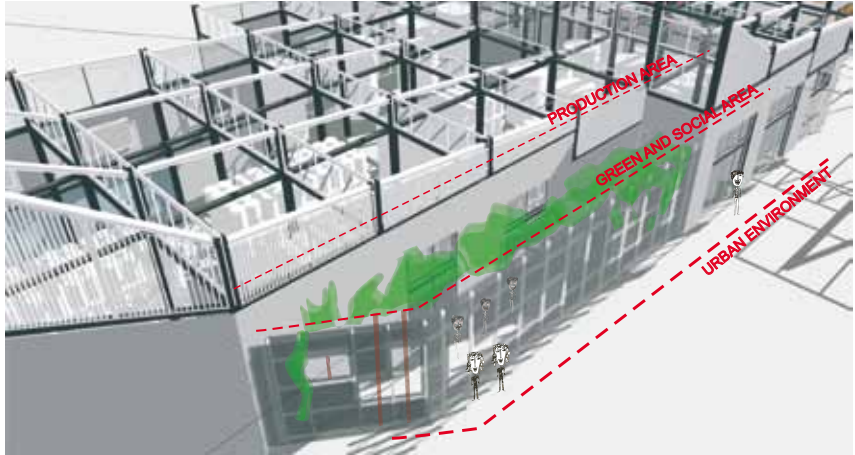
perspective view of timber pergola with vines



DETAIL E roof lattice beam detail [nts]



DETAIL F: bracing [nts]



perspective view of green and social space between production space and adjacent urban environment

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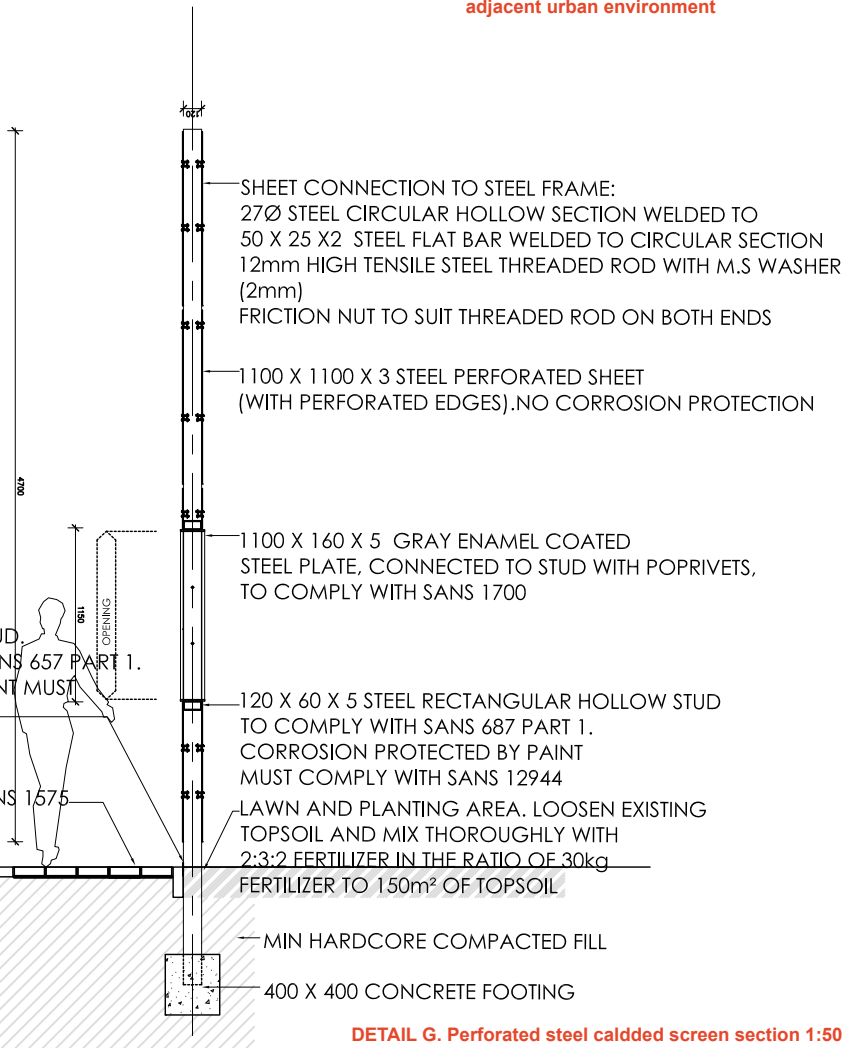
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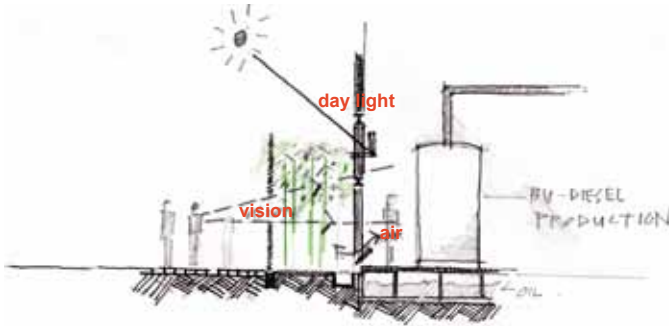
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90 X 3 STEEL PLATE WELDED TO STUD
WELDING MUST COMPLY WITH SANS 657 PART 1.
CORROSION PROTECTION BY PAINT MUST
COMPLY WITH SANS 12944

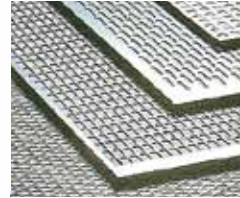
222X106X75 GRAY
CLAY PAVERS IN
COMPLYING WITH SANS 1575



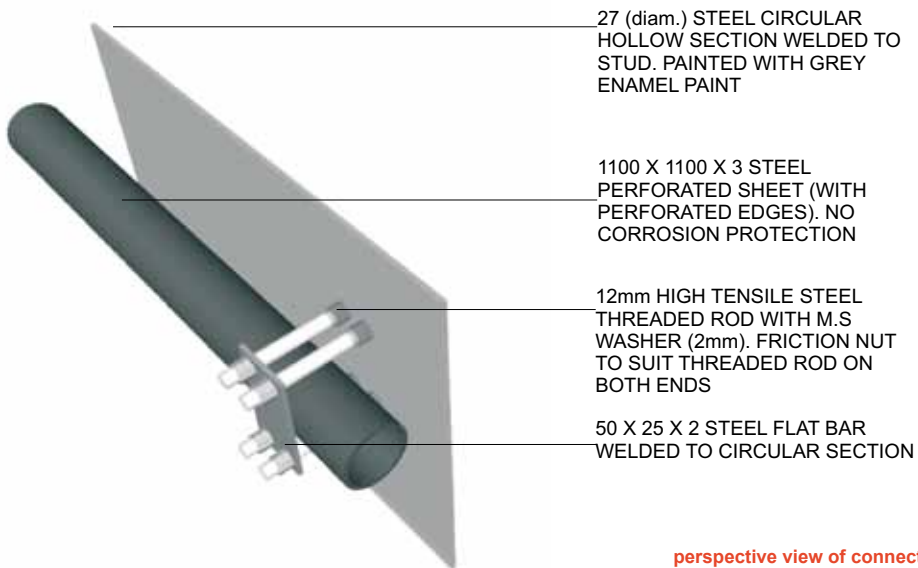
DETAIL G. Perforated steel caldled screen section 1:50



conceptual exploration of perforated steel screen



perforated steel sheets



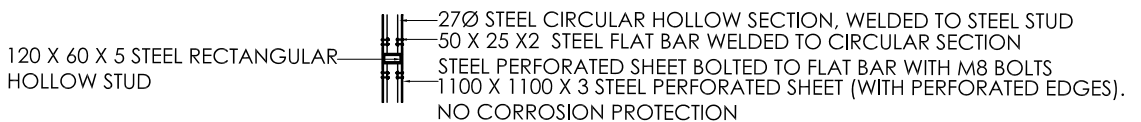
27 (diam.) STEEL CIRCULAR HOLLOW SECTION WELDED TO STUD. PAINTED WITH GREY ENAMEL PAINT

1100 X 1100 X 3 STEEL PERFORATED SHEET (WITH PERFORATED EDGES). NO CORROSION PROTECTION

12mm HIGH TENSILE STEEL THREADED ROD WITH M.S WASHER (2mm). FRICTION NUT TO SUIT THREADED ROD ON BOTH ENDS

50 X 25 X 2 STEEL FLAT BAR WELDED TO CIRCULAR SECTION

perspective view of connection detail



120 X 60 X 5 STEEL RECTANGULAR HOLLOW STUD

27Ø STEEL CIRCULAR HOLLOW SECTION, WELDED TO STEEL STUD
50 X 25 X 2 STEEL FLAT BAR WELDED TO CIRCULAR SECTION
STEEL PERFORATED SHEET BOLTED TO FLAT BAR WITH M8 BOLTS
1100 X 1100 X 3 STEEL PERFORATED SHEET (WITH PERFORATED EDGES). NO CORROSION PROTECTION



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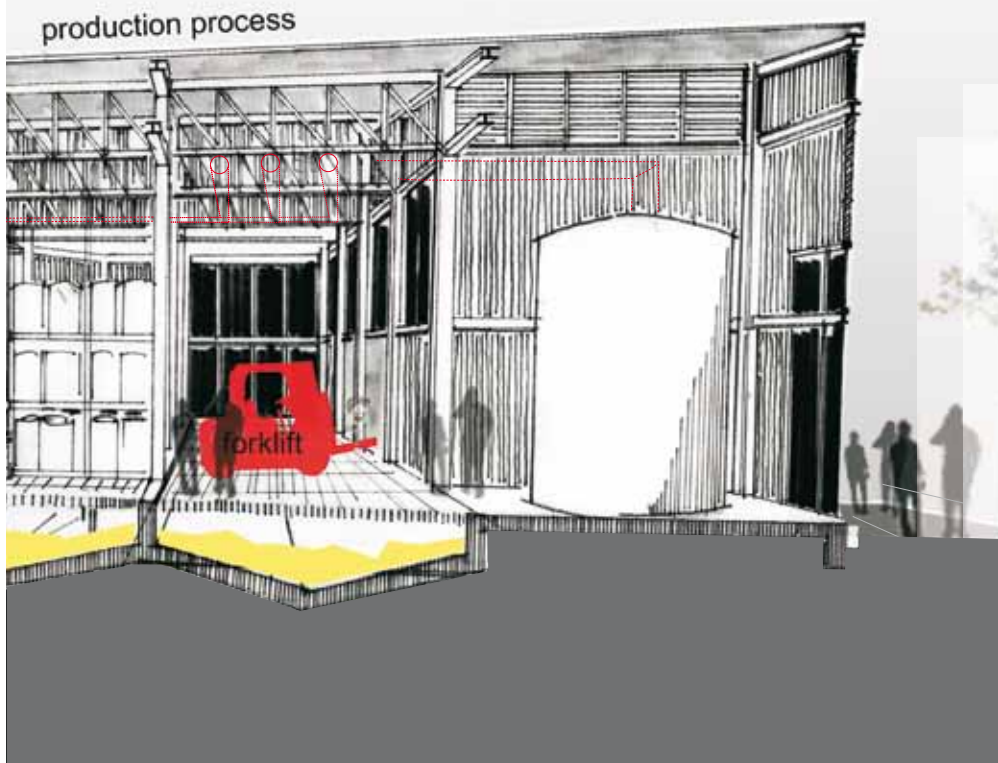
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Figure 93. The production area section shows the relationship between the urban fabric, threshold space and Bio-diesel plant. The threshold space will have a visual connection to the street, function as a spill out area for the workers, and the openings will allow ample day light and fresh air into the building: Author 2010.





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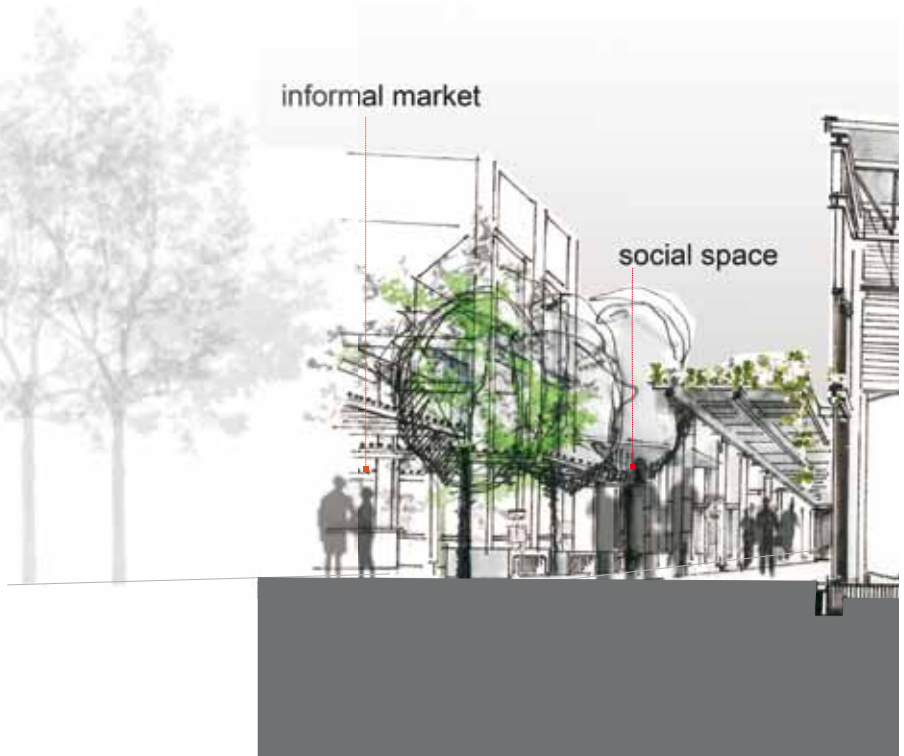
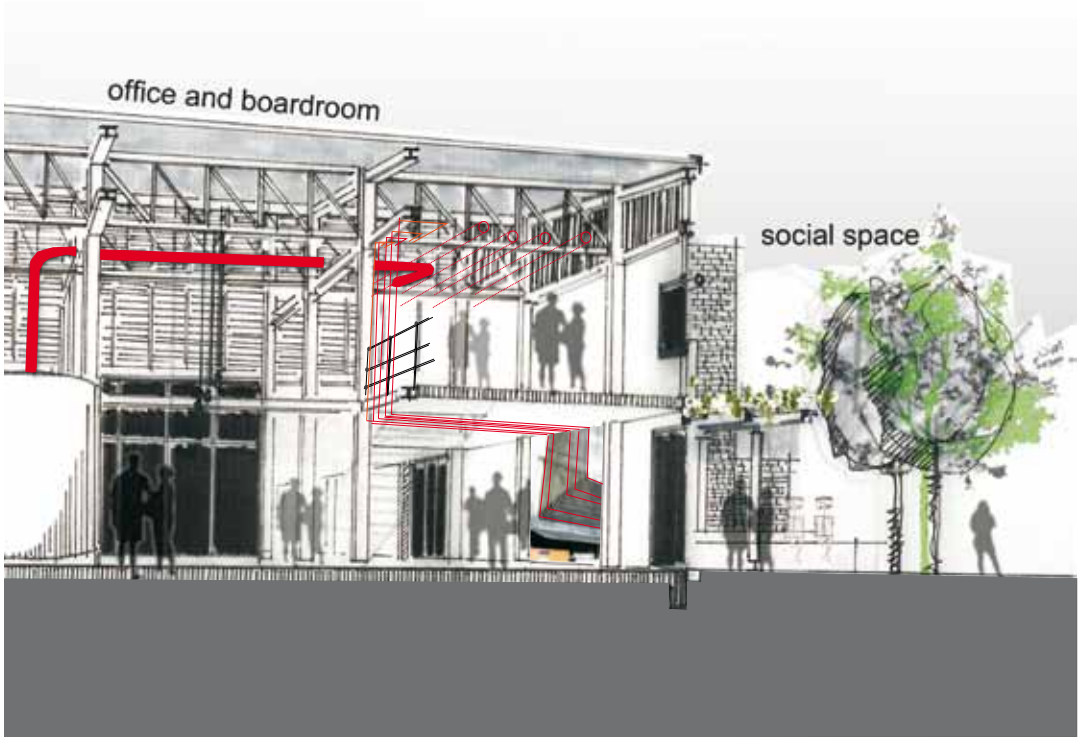


Figure 94. The office area section shows the stitching between the urban activities (informal market at the ash bunkers) and industrial building (Bio-diesel plant); through the integrated social space - the social space is a light structure to strengthen the human scale to that of the industrial scale that is associated with the solid concrete ash bunker structure. The ash bunkers are retained because of their position on the street edge and ability to accommodate an urban activity (informal market): Author 2010.



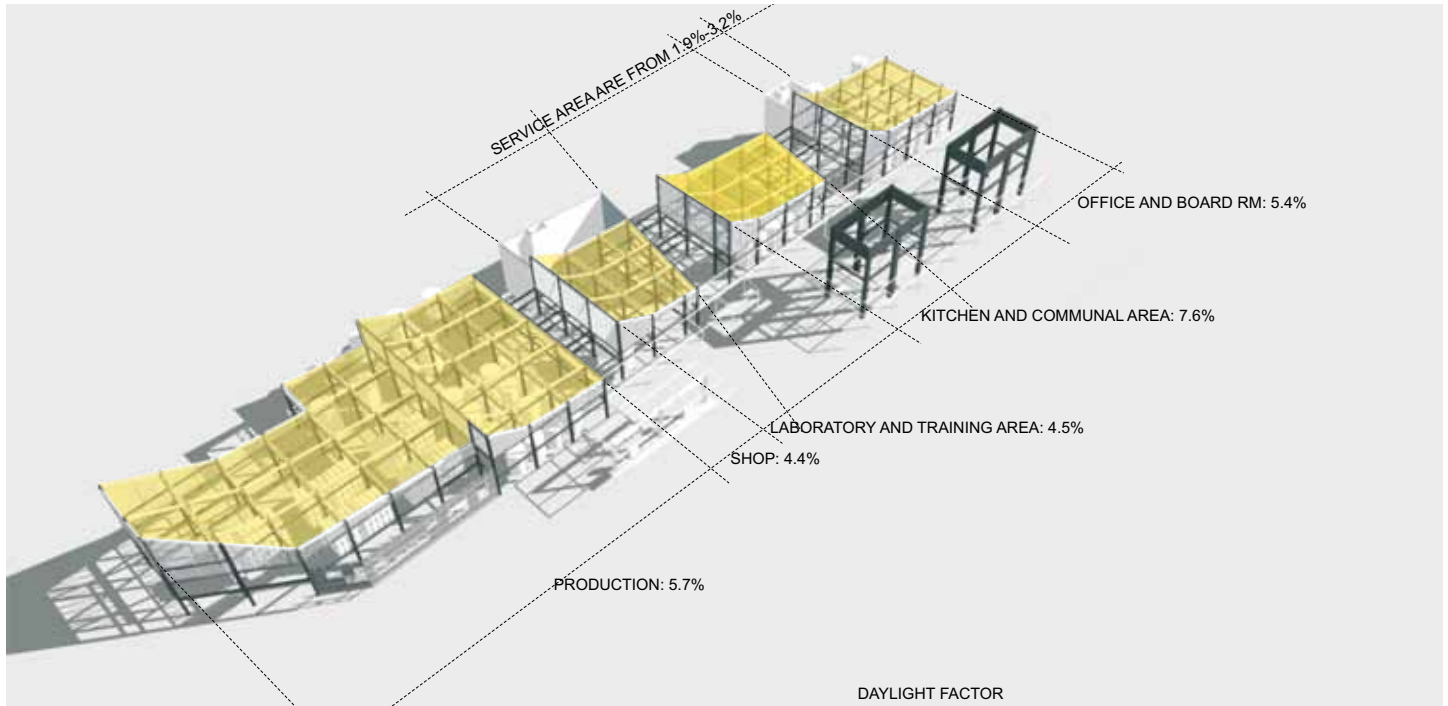


Figure 95. Pretoria West Bio-diesel plant: Daylight factor. From: Author 2010.

Key performance objectives according to the Green Building Handbook for South Africa (Gibbert, 2009)

7.1. Daylight:

Performance objective: The design of the building envelope ensures that an average daylight factor (DF) of 2.5% is achieved in all occupied (living and working) areas in the building.

A simple rule of thumb can be used to approximate the daylight factor:

$$D = 0.1 \times P$$

Where: D = Daylight factor

P = Percentage glazing to floor area

e.g. given a room of 100 m² floor area with 20 m² of glazing

$$D = 0,1 \times (20 \div 100) \times (100 \div 1) = 2\%$$

Pretoria West Bio-diesel plant (fig: 108):

Office and Boardroom:

$P = 319,6\text{m}^2$ floor area to 174m^2 of glazing (112m^2) and louvers (62m^2)

$D = 0,1 \times 0,54 \times 100 = 5,4\%$

Kitchen and Communal space:

$P = 248,6\text{m}^2$ floor area to 189m^2 of glazing (79m^2) and louvers (110m^2)

$D = 0,1 \times 0,76 \times 100 = 7,6\%$

Laboratory and Training room:

$P = 323\text{m}^2$ floor area to $146,9\text{m}^2$ of glazing ($36,9\text{m}^2$) and louvers (110m^2)

$D = 0,1 \times 0,45 \times 100 = 4,5\%$

Shop:

$P = 50\text{m}^2$ floor area to 22m^2 of glazing

$D = 0,1 \times 0,44 \times 100 = 4,4\%$

Production:

$P = 711\text{m}^2$ floor area to 408m^2 of glazing (132m^2) and louvers (276m^2)

$D = 0,1 \times 0,57 \times 100 = 5,7\%$

W/C:

The w/c and shower room DF range from 1,9% - 3,2%

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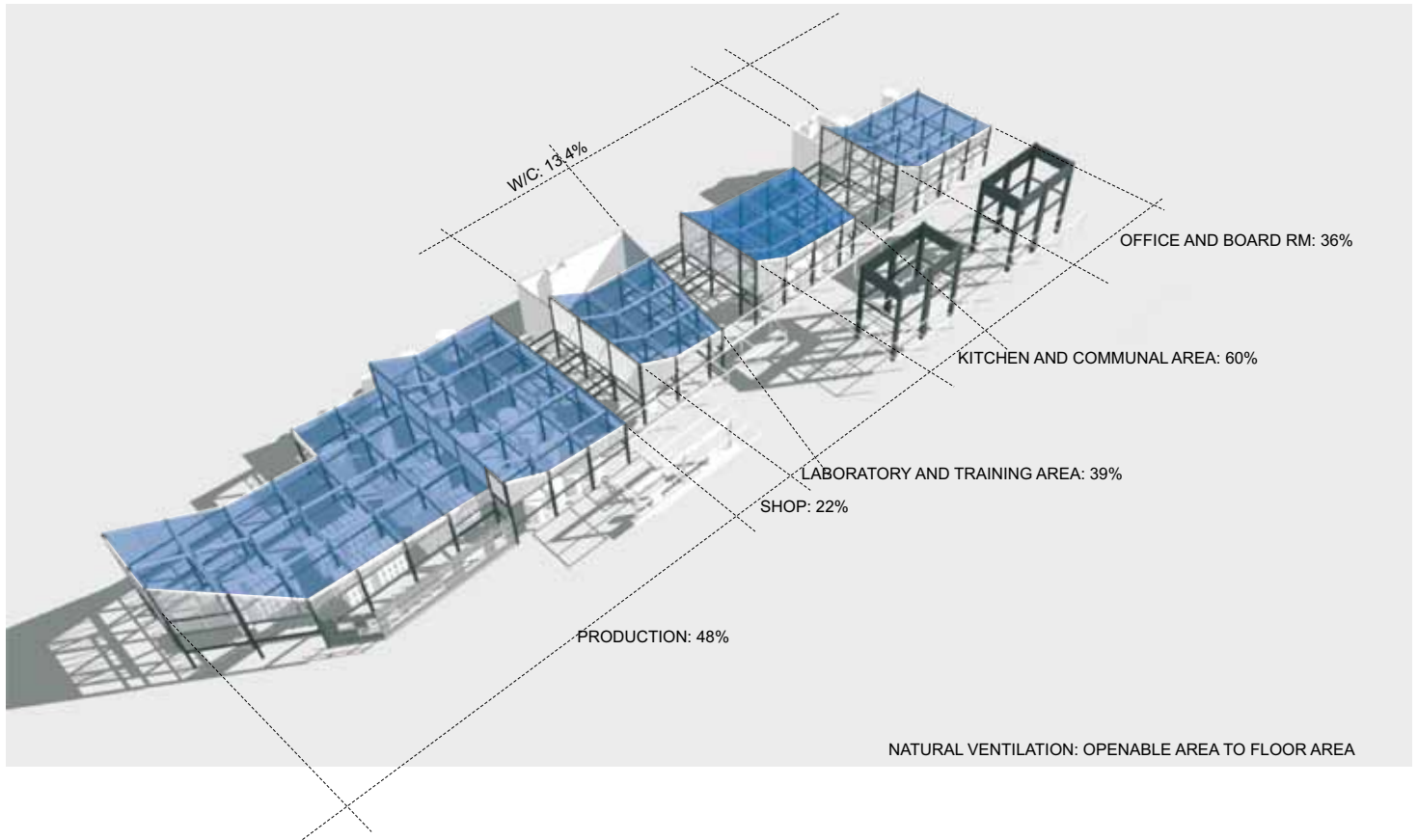


Figure 96. Pretoria West Bio-diesel plant, natural ventilation, indicating the openable area to floor area. From: Author 2010.

7.2. Ventilation

Performance objective: The design of the building ensures that spaces can be naturally ventilated. A minimum openable area within the external envelope of at least 5% of internal floor area is provided for natural ventilation.

Pretoria West Bio-diesel plant (fig: 109): The openable area will be calculated on the louver area and on a conservative amount of 50% of the glazed area

Office and Boardroom: Openable area: 118m²/ Floor area: 319,6m²
Thus 36% openable area in external envelope for natural ventilation

Kitchen and Communal space: Openable area: 149,5m² /Floor area: 248,6m²
Thus 60% openable area in external envelope for natural ventilation

Laboratory and Training room: Openable area: 128,45m² /Floor area: 323m²
Thus 39% openable area in external envelope for natural ventilation

Shop: Openable area: 11m² /Floor area: 50m²
Thus 22% openable area in external envelope for natural ventilation

Production: Openable area: 342m² /Floor area: 711m²
Thus 48% openable area in external envelope for natural ventilation

W/C (Male w/c and shower room at ground floor): Openable area: 2,95m² /Floor area: 22m²
Thus 13,4% openable area in external envelope for natural ventilation

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7.3. Sunlight

Performance objective: Direct sunlight is avoided in office working environments. Sunlight access into the building is only allowed into the building as part of a direct gain passive solar strategy where this plays a useful role in warming the building in winter.

Pretoria West Bio-diesel plant: The timber pergola structure with vines will provide shade and block direct sun from entering in the summer and heating up the space. In winter the vines loses their leaves and will allow sunlight to enter into the interior space, passively warming the building.

7.4. Air tightness:

Performance objective: The building envelope is air tight in order to avoid unwanted infiltration of cold or hot air through the building envelope. Air tightness standards exceed the minimum standards required by SANS 204.

Pretoria West Bio-diesel plant: According to SANS 204; roofs, external walls, and floors that form the building envelope and any opening such as windows and doors in the external fabric shall be constructed to minimize air leakage when it forms part of the external fabric of a conditioned space or habitable room in climate zones 1, 2, 4 and 6. The City of Tshwane is in climate zone 2 according to SANS 204 (temperate interior). The building sealing will be done by methods such as silicone sealing around the window frames and foam/rubber compressible strip around doors. In the office/boardroom, kitchen and laboratory/training areas the walls will be constructed with an extra layer of recycled wood fibre insulation and gypsum plasterboard.

7.5. Noise:

Performance objective: Obtrusive external noise from traffic etc is not experienced in the building and internal noise levels do not exceed good practice standards (ie ambient sound levels not exceed 45dBAeq in open plan offices).

Pretoria West Bio-diesel plant: The sustainable strategies that are implemented to exclude intrusive noise from the building are to move the habitable areas (office/ boardroom, kitchen/communal area and laboratory/training) as far back from the street as possible. Natural air are obtained through earth tubes, this will minimize the need to open windows; that will allow intrusive noise from the outside into the building.

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7.6. Habitat and vegetation:

Performance objective: At least 10% of the external building envelope has vegetation cover. This may be provided in the form of green roofs, window boxes, planted terraces and balconies and wall creepers. This is also used to support the creation of wildlife habitat.

Pretoria West Bio-diesel plant (fig: 110): Vegetation cover is provided in the form of the planted timber pergola, planters and trees. The vegetation is incorporated in the design to bring the industrial scale down to a more human related scale. 60% of the building envelope has vegetation cover.



HETEROPYXIS NATALENSIS [LAVENDER TREE]: Joffe, 2005

CUSSONIA PANICULATA [MOUNTAIN CABBAGE TREE]: Joffe, 2005

CELTIS AFRICANA [WHITE STINKWOOD]: Joffe, 2005



Figure 97. Potential trees that will be appropriate to climate and architectural design intend, and indigenous to local environment: Author 2010.

7.7. Renewable energy:

Performance objective: The building envelope includes renewable energy generation such as photovoltaics, wind turbines and solar water heaters and 10% of the building's energy requirements are generated from these sources

Pretoria West Bio-diesel plant:

Solar energy:

The Bio-diesel plant will be in the shade for most of the afternoon, due to the scale of the adjacent building. Part of the roof of the Bio-diesel plant is at an angle of 27° to accommodate photovoltaic panels and solar heating system; that will be sufficient to provide enough electricity for the lighting and heating for the showers and basins. This roof pitch will allow ample daylight and air flow into the building.

Wind energy:

This area is not conducive to high wind generation, so the building is designed to accommodate airflow to assist in the natural ventilation of the building.

Bio-fuels:

Bio-diesel is produced that can be used to power some of the machinery, for example the generator.

7.8. Views:

Performance objective: All working spaces are within 7m of a window and have a direct view of the outside.

Pretoria West Bio-diesel plant: All working spaces are within 4,5m and have a direct view of the outside.

7.8. East and West elevations:

Performance objective: Windows on east and west elevations are minimized and appropriate solar shading is provided where this exists to avoid unwanted solar gain.

Pretoria West Bio-diesel plant: Windows on the west side will not be influence, due to the scale of the adjacent building. The east elevation is shaded with the timber pergola structure at the office, kitchen and laboratory. The production area is shaded with a perforated steel screen and vegetation (detail D).

7.9. Openable windows:

Performance objective: Openable windows are provided where they can easily be controlled by people near them. At least one openable window per 5 running metres of building envelope is provided in occupied areas.

Pretoria West Bio-diesel plant: Openings will be assigned according to this regulation.

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7.10. Rainwater harvesting:

Performance objective: Roofs are used for harvesting rainwater and a target of a 50% reduction in mains potable water consumption (relative to conventional buildings) is achieved.

Pretoria West Bio-diesel plant: The objective in the Pretoria Bio-diesel plant is to harvest rainwater and reduce the target of a 50% in water consumption that is used in the production process. The total water consumption related to the production process is 81468 litre and the rain water harvesting that is stored in tanks will be able to supply in this need (see fig:95).

7.11. Cool roofs:

Performance objective: Roofs and large external balconies and terraces are constructed of a material with an absorptance value of under 0.55 (are light coloured) to avoid unwanted heat gains.

Pretoria West Bio-diesel plant: The roof will be a light grey with a typical absorptance value of 0,45 as prescribed by SANS 204-2.

7.12. Passive environmental control:

Performance objective: The building envelopes support passive environmental control strategies as described in the passive environmental control chapter by providing correctly located and sized openings and thermal mass etc.

Pretoria West Bio-diesel plant:

- The workforce (people) is the most important energy resource of the Bio-diesel plant and the use of passive design strategies will give form and spatial quality to the building (natural ventilation, daylight and fresh air into the building)
- Minimize energy required for heating and cooling. In the production process discarded used cooking oil is washed with water, the cool air that is a by product of this process will be used to cool down the building. Heat on the other hand is generated in the production process; in the summer the heat is allowed to dissipate out of the louvers; in the winter the heat will be used in the office, boardroom, laboratory and training room.
- The timber pergola structure with vines will provide shade and block direct sun from entering in the summer and heating up the space. In winter the vines loses their leaves and will allow sunlight to enter into the interior space, passively warming the building.
- Night flushing is implemented through the louvers; typically the night air is blown through for about an hour or two just before sunrise. This should delay the time in which active air conditioning is required.
- Rainwater harvesting: The roofs will be used to harvest the rain water and be stored in tanks that are elevated 3m high in the air, to make use of gravity. The rainwater will be used to wash the discarded used cooking oil; this process will double up as a cooling strategy for the building. Rain water will also be used in the showers and grey water will be used in the w/c.

CONCLUSION

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There exists a growing migration from the rural environment to the urban context in search of economical empowerment and opportunities. The city street is the host of economical and social activities; a street needs to be a pleasant and integrated place to live and create.

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The industrial production place is an archetype of creating new possibilities and opportunities. It is the laboratory that explores the process to generate. The current industrial production facilities hold the opportunity to integrate into the urban fabric; and not function as an isolated object that only focus on the product.

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It is essential that the industrial production facility function as an ecosystem that will establish connections to the local urban context. These emerging connections will yield integration between live and create.

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The Bio-diesel plant is therefore an expression of the production process that functions as an industrial ecosystem. It showcases and facilitates the integration of the production process into the urban fabric to contribute to the well-being and character of the area.

A building profile follows as summary:

Building Profile

ID: Pretoria West Bio-diesel Plant

Location: Buitenkant Street, Pretoria West Industrial Area, City of Tshwane,

Client: Private investors

Users: Workforce, local community buying bio-diesel with a small convenience shop, Informal traders using the market space at the ash-bunkers and consumer buying goods at the informal market.

Purpose:

To advance the principles of sustainable living through production (industrial process) and urban integration. The emphasis is on the process of production and not the product, in order to change the mindset of a linear production process to a cyclical process.

Aim:

To illustrate the production process of the bio-diesel incorporating low-energy architecture, energy production and sustainable community integration.

Building systems:

- The workforce (people) is the most important energy resource of the bio-diesel plant and the use of passive design strategies will give form and spatial quality to the building (natural ventilation, daylight and fresh air flowing into the building).

- Minimising the energy required for heating and cooling of the building. In the production process discarded used cooking oil is washed with water, the cool air that is a by-product of this process will be used to cool down the building. Heat, on the other hand, is generated in the production process; in summer the heat is allowed to dissipate out of the louvers and in winter the heat will be redirected and used in the office, boardroom, laboratory and training room.
- The timber pergola structure with vines will provide shade and block direct sunlight from entering in summer and heating up the space. In winter the vines lose their leaves and will allow sunlight to enter into the interior space, passively warming the building.
- Night-flushing is implemented through the louvers. Typically the night air is blown through for around an hour or two just before sunrise.
- The roofs of the building will be used to harvest rainwater and be stored in tanks that are elevated three meters high in the air, to make use of gravity. The rainwater will be used to wash the discarded used cooking oil; this process will double up as a cooling strategy for the building. Rainwater will also be used in the showers and grey-water will be used in the w/c.

Building material:

To gain consistency throughout the project and minimal material weight material is assigned to the functions of the building.

Steel:

Steel is used as the primary load bearing structure and in the secondary structure as façade cladding. Steel is associated with the functions of the production process.

Timber:

Timber will be used to differentiate the social areas from the industrial areas, and to relate the human-related scale to that of the industrial scale. Timber is associated with the functions of the social process.

Masonry:

The two service areas at the back of the bio-diesel plant will consist of masonry to relate to the adjacent masonry power station building.

Energy systems:

Solar energy:

The bio-diesel plant will remain in the shade for most of the afternoon, due to the scale of the adjacent building. A part of the roof of the bio-diesel plant is at an angle of 27° to accommodate photovoltaic panels and a solar heating system to provide enough electricity for the lighting and heating of the showers and basins. This roof pitch will allow ample daylight and airflow into the building.

Wind energy:

The Pretoria West Industrial Area is not conducive to high wind generation, therefore the building is designed to accommodate airflow to assist in the natural ventilation of the building.

Bio-fuels:

A proportion of the produced can be used to power some of the machinery, for example the generator.

Affluent from the water closets (w/c) will be pumped to the proposed urban agricultural centre on the site of the Pretoria Power Station, here it will be used in the production bio-gas.

is to introduce a mixed-use development to complement the existing uses and establish a development destination. The site's unique features (landmark qualities), its close proximity to the City of Tshwane CBD and strategic connections present an opportunity to establish it as a hub for retail, commercial, light industry, transport node and recreational activities. This would serve as a drawing-card for business activities and aid in densifying the area.

Building as an ecosystem:

The proposed Pretoria West Bio-diesel Plant will function as part of the industrial ecosystem. Waste from another process (discarded cooking oil) is used to produce an energy resource (bio-diesel). Similar waste (glycerol) from the bio-diesel production process will be used in the manufacturing of soap. Other by-products such as heat (production process) and cool air (from washing the discarded cooking oil) will be used in the heating and cooling strategies of the building.

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Addendum A

The aim of the local news paper analysis is to determine the hierarchy of themes that currently prevail in this area. The method the author applied was to quantify the information. For example: different themes were identified (crime, relocation of people, education, poverty etc.), and a point is assigned to a theme so each time it is published it obtains a higher value. Pictures published with articles were also taken into consideration and their value quantified. The last consideration was the amount of articles on the front page with three or more equalling zero, two articles equalling one point and one article, two points). The aim was to identify various themes and to assign a numerical value to each in order to determine their representative social value of importance.

On page two of the newspaper is the 'let's clean up' campaign, whereby awareness of different recycling programs, initiatives to clean up suburbs, reporting on illegal dumping sites, water-saving strategies and taking ownership of your area are covered. These themes were identified and numerical values were assigned to each. Advertising was also analysed according to different products and services and quantified by looking at the amount of advertisements placed related to a specific product or

service.

The newspaper is community focused with a strong emphasis on local news. The author divided the newspaper into four parts: the front page, page two with the "let's clean up" campaign, page three to five of the newspaper, and the advertisements. These four parts were used to determine the themes prevailing in the community and then quantified as previously described.

When the author started identifying the themes it became evident that the challenges faced by this community are not isolated but intensely integrated, where one influence the other. From the front page (fig: 111) and page three to five, the removal of illegal squatters and crime scored the highest (18.3%). Lack of service delivery by the City of Tshwane Metropolitan Municipality scored third-highest with 15.8%. Other themes such as education (12.1%), illegal dumping (8.5%), poverty (6%) and public transport (6%) were also identified. A network of context was established enabling the author to relate meaning to the themes and identify opportunities for emergence.

For example the removal of illegal squatters is a major problem in this community, indicative of a high level of poverty with people not being able to afford their own homes, most likely unemployed, so their basic need for shelter and food aren't provided for. This implies a lack of stability keeping the community from developing and evolving.

Crime was also identified as a major challenge and there are various reasons why people participate in crime. This kind of action breaks down any sense of community and spreads a sense of fear amongst people. The third theme in the analysis was the poor services that are provided by the City of Tshwane Metropolitan Municipality (illegal dumping is a result of this). The novelty that architecture can become self-sufficient and not rely on external energies to maintain itself, is a model where waste equals food (Capra, 2002: 234), and must be investigated. Education in this area is marked by instability; almost every newspaper had an article regarding students being unsatisfied with the management of their colleges: "We will vandalise and destroy campuses to send out a strong message. We will not stop until the minister of Higher Education comes here" said the chairperson of the Student Representative Council on the March 12th 2010 in the Pretoria West Record. This sort of educational environment will not generate any creative thinking or skill.

The last theme that was identified is the unreliability of the public transport:

Between 2008 and 2010 I lost about R3750 because buses never pitched and I had to pay for alternative transport. My employer has deducted money from my salary for being late. At times I have had to apply for unpaid leave at work because the bus drivers were on strike. My job is on the line as a result of this', said Bonny Bennet (54) in the Record of March 26, 2010.

The second analysis focused on the 'let's clean up' campaign (fig: 112) that received a great deal of attention, judging by the bright heading on the front page: 'clean up ... let's clean up ... let's clean'. The entire page two is dedicated to articles relating to this topic. The initiatives implemented through recycling programs are mostly focused on schools, and combined with education to establish a way of thinking. In an article published on January 22, 2010, schools had to collect bottles and cans in order for them to win FIFA soccer world cup soccer tickets. Jack Mwale, a pupil from Stanza Bopape High School made the following statement:

Before this competition we did not know about recycling. When we were collecting the bottles and cans in the neighbourhood, people laughed at first but we told them that these bottles and cans can be used again and should not litter our streets. We said by collecting used items we would win tickets to see the World Cup.

The children probably only participated because they could win tickets to the World Cup, but the important argument here is one that BIG Architects (2010:51) also makes in their book, Yes is More: ecological initiatives will only prosper in the real world if they work as viable economic models, and to these children a World Cup ticket was a very important and viable economic model. Ownership is also advocated to get residences involved in cleaning up their own suburbs. These community initiatives are published in the newspaper as a call-to-action invitation and to report on the good work done. Another identified challenge is illegal dumping sites due to a lack of service delivery from the City of Tshwane Metropolitan Municipality. This sort of activity can do a lot of harm to the identity of the community. On the February, 26, 2010 an article was published on the spot program, a door-to-door campaign that will spreading the message to stop dumping, and to develop a team to deal with problems of service delivery. The author is of opinion that this is just a strategy to philosophise about service-delivery; in non of the newspapers are there any reports on practical strategies to solve this problem.

The last analysis was focused on advertising (fig: 113) and confirm that this is predominantly car related industry focus of the area with 25,6% of the advertisements being car related.

The aim of this analysis (fig: 114) was to discover the emerging opportunities that the architecture could respond to. Hamdi (2004) and Capra (2002) argue that emergence is born out of instability and challenges; which generates opportunities for development, learning and evolution. The themes identified in this analysis will be further analysed according to the inherent emerging opportunities that they present, to ultimately become informative to the architecture. Hamdi describes it as small beginnings:

This philosophy of acting in order to induce others to act, of offering impulse rather than instructions, and of cultivating an environment for change within, starts at the ground and often with small beginnings which have emergent potential (Hamdi, 2004: xx)

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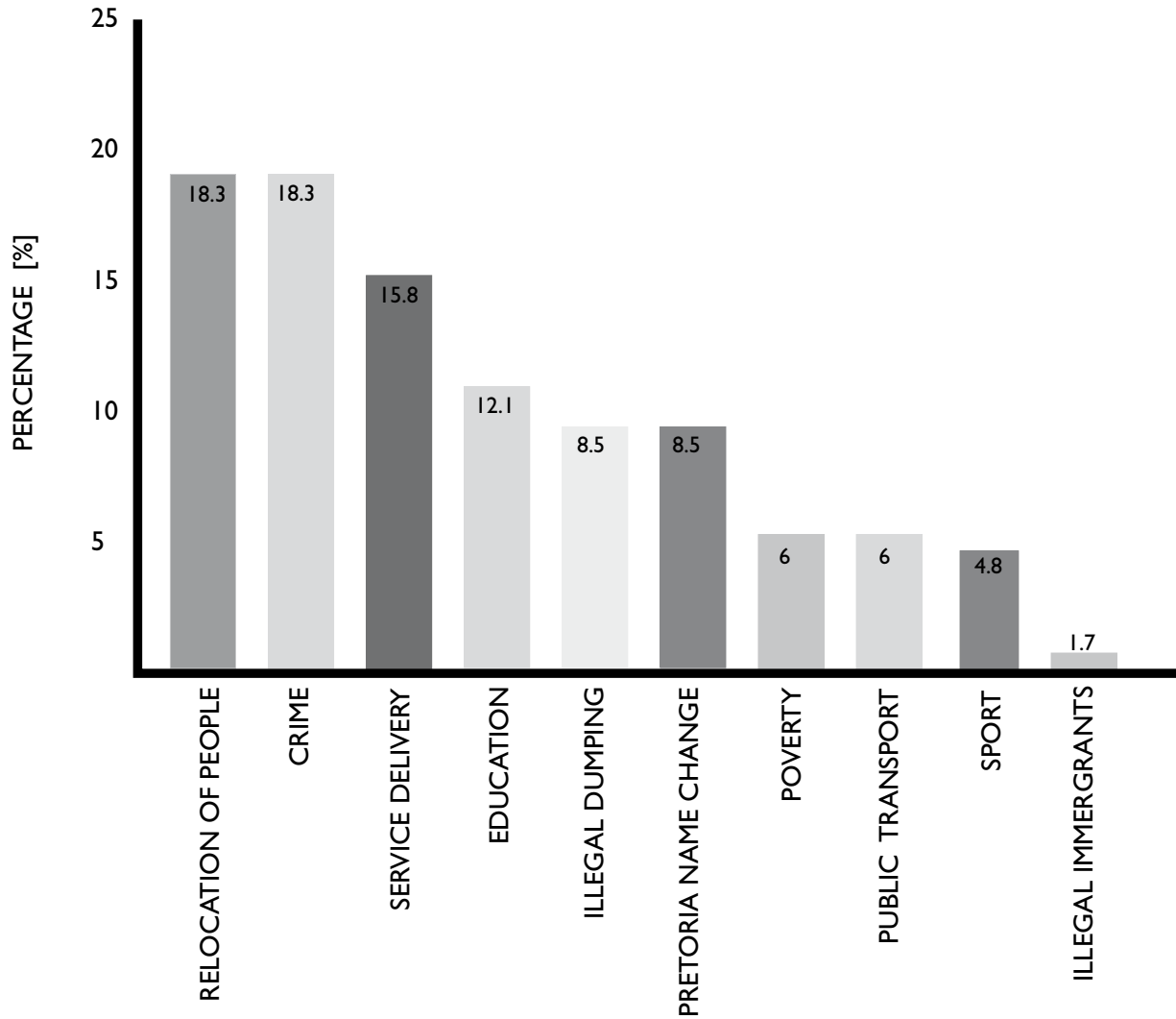
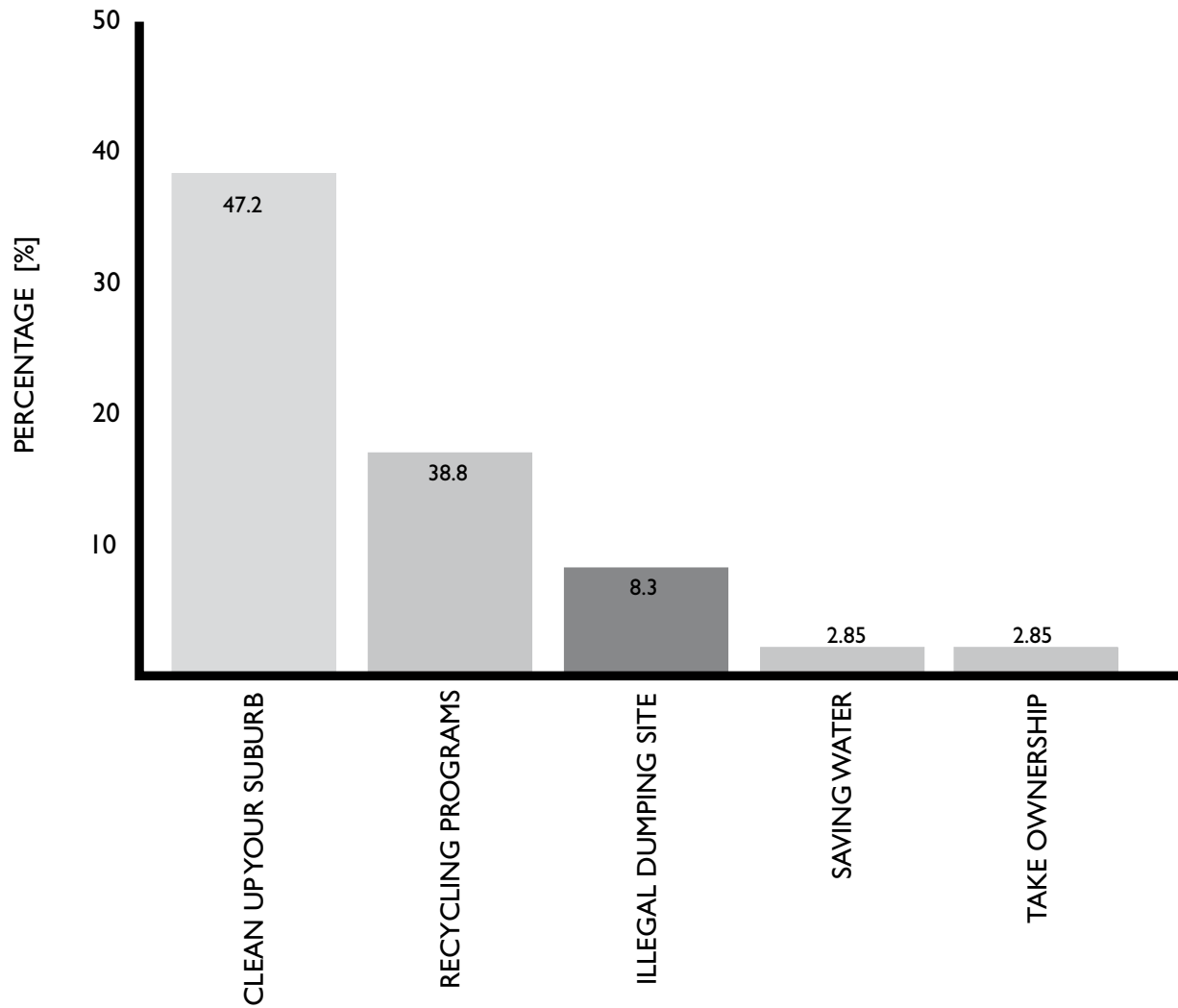


Figure 98. Themes from the front pages and community news section: Author 2010.



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Figure 99. Themes from 'let's clean up' section: Author 2010

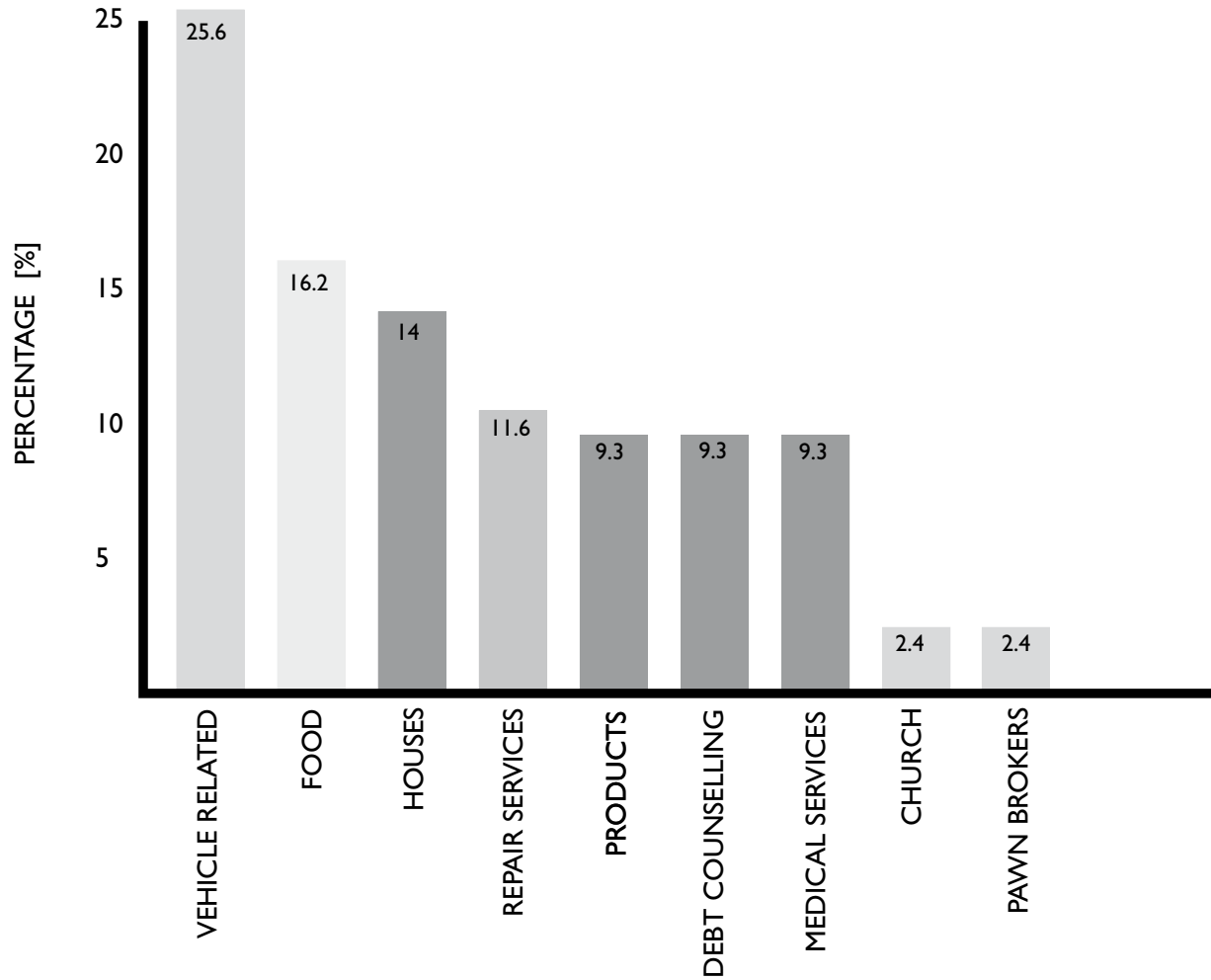


Figure 100. Themes from the advertisement: Author 2010.

THEMES		QUALITATIVE [emergence]	QUANTITATIVE [industrial architecture]
-RELOCATION OF PEOPLE		-IDENTITY AND COMMUNITY economics /work	-HOUSING + JOB CREATION
-CRIME	PROVISION	-SELF RESPECT economics and community	-MANUFACTURING AND CREATING job creation
-SERVICE DELIVERY	DEPENDENCE	-SELF SUSTAINED government, economics -taxes	-PASSIVE DESIGN economics + job creation
-EDUCATION	EMPOWERMENT	-ENTREPRENEUR social change, economics	-TRAINING FACILITY/BUSINESS job creation and empowerment
-ILLEGAL DUMPING		-SELF REGENERATIVE community/ ownership/ education	-RECYCLING PLANT community/ education
-POVERTY		-DIGNITY awareness/ economics / education / identity/	-CREATIVE SKILLS TRAINING education
-PUBLIC TRANSPORT	DEPENDENCE	-STABILITY services, government, economics	-TRAIN AND BUS STATION services: economics / dependency: job creation
-SPORT		-CHARACTER, ENDURANCE health, entertainment, recreation	-SPORT FACILITY health/ recreation
-ILLEGAL IMMIGRANTS	LOCAL IDENTITY	-DIVERSITY community, identity, economics	-TRANSFER OF SKILL local identity/ community/ job creation
-RECYCLING PROGRAMS		-WASTE EQUALS FOOD education , economics , job creation	-RESEARCH + EXPERIMENT - REGENERATIVE PRODUCTION job creation
-CLEAN YOUR SUBURB		-OWNERSHIP, RESPECT identity/ education / community	-GREEN SPACE/RECREATIONAL SPACE communal social space
-SAVE WATER		-RESPECT AND VALUE economics / education	-WATER RECYCLING PLANT education + job creation

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Figure 101. Emerging themes that came out of the newspaper study: Author 2010.

Addendum B

TYPES OF FORMAL FOOD PREMISES	TOTAL NUMBER
1. Bakeries	450
2. Butcheries	599
3. Cafes	1 147
4. Canteens	53
5. Dairies	54
6. Deli	54
7. Food manufacturer	150
8. General dealer(food)	1 500
9. General dealer(other)	98
10. Resturant	1 631

Total number of food premise: 6552

INFORMAL FOOD PREMISES

1. hawkers	109
2. informal food	196
3. mobile vehicle	8
4. occasional food handling premise	15

(Mathalanto, 2010)

Danie Derick Konrad
Labot Johan Andrew Jan
Dad Ma Ella Marlise
Gerhard **Dankie** Ida Nadia Tracey
Neda Ilse Ardi Izaan
Werner P6 Marlet Johan Henry
Arthur Johan Salma
Talita
[Dankie vir jul passie]

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Model photo's



