



© University of Pretoria

A train station and intermodal freight warehouse in Pretoria West



Submitted in fulfillment of part of the Requirements for the degree of Master of Architecture (Professional) in the faculty of Engineering, Built Environment and Information Technology

University of Pretoria 2010

By Danie Joubert

Studio Master - Arthur Barker Study Leader - Arthur Barker Study Leader - Gary White



Izaan, my parents, Arthur Barker, Gary White, Fio the engineer [Pretoria West Power Station], Allan Paton [Bombela TKS Contractor on Gautrain], Calayde, Mias, PG, Jaco, Tracy, Morné and Marguerite Pienaar [MOMA] and Prof. Schalk Le Roux, previous head of department, for accepting me into the architecture department.

Acknowledgements



	List of Cor	ntents
1	Introd	uction
2	Site + C	ontext
43	Urban	Vision
7	Design Develo	pment
1;	Technical Investig	gation
10	Model	<sup>5</sup> hotos
17	Conc	lusion
17	List of Refer	rences
12	App	pendix



List of Figures	fig. 19- Diagram illustrating the integration of goods and people: image by author
fia. 01- Market in Mombasa. Kenya: photoaraph by author	fig. 20- Diagram illustrating the site as catalyst for the productive precinct: image by
fig. 02- Decaving urban environment in Buitenkant Street: photograph by Izgan Pauw	Izaan Pauw
fig. 0.3- Decaying urban environment in Carl Street: photograph by Izaan Pauw	fig. 21- Image illustrating the integration of freight and people: image by Calayde
fig. 04- Pretoria [western region] gerial photograph; image by guthor	Davey and author
fig. 05- Pretoria West aerial photograph, indicating location of new train station; image	fig. 22- Photograph of existing railway track on site: photograph by author
by author	fig. 23- Global shipping frequency, available at: http://www.newscientist.com/data/
fig. 06- Gautena Rail Map. available at: http://www.metrorail.co.za/maps/GALL Rail-	images/ns/cms/dn18370/dn18370-1 500.jpg
Man ndf	fig. 24- Site location: image by author
fig. 07-People exiting station, available at: http://svdnevwebcam.blogspot	fig. 25- Grain silos in Mitchell Street: photograph by Izaan Pauw
com/2005_06_01_ archive html vv	fig. 26- Photograph of ISCOR taken from Proclamation Hill: photograph by Izaan Pauw
fig. 08- People hanging on side of train 'Train surfing' available at: http://www.railpic-	fig. 27- The urban grid and boundaries: image by author
tures net/viewphoto php?id=201572	fig. 28- Diagram illustrating larger context: image by author
fig. 09- Child worker in the mills, available at: http://britlitwiki.wikispaces.com/	fig. 29- Aerial photograph indicating residential areas in context: image by author
The+Industrial+Revolution	fig. 30- Aerial photograph illustrating Church Street connecting culture and heritage:
fig. 10- Image of the polution created by industries in the 1800s, available at: http://	image by author
www.web-books.com/elibrary/ON/B0/B52/37MB52.html	fig. 31- Rebecca train station [platform]: photograph by author
fig. 11- Image of the first locomotives in the early 1800s, available at: http://www.	fig. 32- Rebecca train station [entrance]: photograph by author
web-books com/elibrary/ON/B0/B52/37MB52 html	fig. 33- Aerial photograph illustrating the division of Pretoria West: image by author
fig. 12- Thomas Edison's electric lamp. 1880. available at: http://explorehistory.com/	fig. 34- Street pnaoramic of Mitchell street: image by Tracy Clark
displayingge php?imgld=5666	fig. 35- Aerial photograph illustrating the location of site: image by author
fig. 1.3- The Eleese Inn. a station terminus from which the railway coaches used to start	fig. 36- Aerial photograph of study area: image by author
1823, available in: SAHGB Publications Itd. "The Inception of the English Railway Sta-	fig. 37- Panoramic photograph of site showing buildings on site: image by Tracy Clark
tion "Architectural History 4 (1961): 63-76	fig. 38- Aerial photograph illustrating built and unbuilt areas: image by author
fig. 14- The first railway ticket office in Stockton, 1830, available in: SAHGB Publica-	fig. 39- Photograph illustrating the rail on site: image by author
tions Itd. "The Inception of the English Railway Station." Architectural History 4 (1961):	fig. 40- Photograph of coalbunker on site: image by Tracy Clark
63-76.	fig. 41- Photograph of structures on site: image by Tracy Clark
fig. 16- The Leeds station, 1834, available in: SAHGB Publications Ltd. "The Inception	fig. 42- Diagram of nodes as catalyst: image by Mias Claasens
of the English Railway Station." Architectural History 4 (1961): 63-76.	fig. 43- Diagram illustrating Pretoria West as sub-support for inner city: image by Mias
fig. 1.5- The Crown Street station, Liverpool, 1830, available in: SAHGB Publications	Claasens
Ltd. "The Inception of the English Railway Station." Architectural History 4 (1961): 63-	fig. 44- Section through Pretoria West: image by Calayde Davey
76.	fig. 45- Site acting as catalyst: image by Izaan Pauw
fig. 17- Cité Industrielle: Seperation of industrial from residential areas by Tony Garni-	fig. 46- Diagram illustrating current density: image by author
er, 1917, available at: http://www.urbanamente.net/bloa/2010/04/18/novidades/	fig. 47- Diagram illustrating future density: image by author
fig. 18- The Three Magnets by Ebenezer Howard in the 'Garden Cities of Tomorow'.	fig. 48- Diagram illustrating current densities of Tshwane: image by author
1902, available at: http://www.urbanamente.net/blog/2010/04/18/novidades/	fig. 49- Diagram illustrating the integration of peri-urban environments with the inner

city: image by author

fig. 50- Figure ground of Pretoria illustrating the densities of people: image by Calayde Davev

fia. 51- Diagram illustrating rail and road network of Tshwane: image by author fig. 52- Photograph of truck accident on N1, available at http://www.news24.com/ SouthAfrica/News/N1-highway-closed-overnight-20100310 [Accessed 27 April 2010] fig. 53- Diagram illustrating the distance between large stations, available in CSIR,

2000. Chapter 3: Spatial and Structural Principles for Settlement-making. In Guidelines for Human Settlement Planning and Design. Pretoria: CSIR Building and Construction Technology, p.1.

fig. 54- Diagram illustrating current and future edge conditions: image by author

fig. 55- Diagram illustrating the current process of producing electricity: image by author fig. 56- Flow diagram illustrating inputs and outputs of the existing process in section

and on plan: image by author

fig. 57- Pretoria West Power Station, photograph by author: image by author

fig. 58- Diagram illustrating the input and output of people: image by author

fig. 59- Diagram illustrating the input and output of goods: image by author

fig. 60- Diagram illustrating [supply chain] adapted from South African Container Depot website: available at: http://www.sacd.co.za/services/import.html

fig. 61- Diagram illustrating the integration of programmes: image by author

fig. 62- Diagram illustrating the exchanges of new and old, industrial process and people: image by author

fig. 63- Diagram illustrating the exchanges on site: image by author

fig. 64- Diagram illustrating points of possible integration between the process and people: image by author

fig. 65- Diagram illustrating integrated exchanges: image by author

fig. 66- Diagram illustrating the input and output between process and/or people: image by author

fig. 67- Diagram illustrating exchanges in section: image by author

fig. 68- Diagram illustrating the peak travel times of people arriving and departing by train: image by author

fig. 69- Diagram illustrating the exchanges between the peak travel times and the arriving and departing trains: image by author

fig. 70- Diagram illustrating exchanges in section along the length of the train station platform: images by author

fig. 71- Conceptual design development: images by author

fig. 72- People exposed to process and industry: image by author

fig. 73- Intensity of activities [energy exchange], one day: image by author

fig. 74- Intensity of activities [energy exchange], one week: image by author

fig. 75- Variety of people exposed to manufacturing process: image by author

fig. 76- Beirut's House of Arts and Culture: Artist impression of internal space, image from archdaily, available at http://www.archdaily.com/20351/nrja-proposal-for-beiruts-house-of-arts-and-culture/ [Acessed on 6 August 2010]

fig. 77- Beirut's House of Arts and Culture: Spatial diagram, image from archdaily, available at http://www.archdaily.com/20351/nrja-proposal-for-beiruts-house-of-artsand-culture/ [Accessed on 6 August 2010]

fig. 79- Beirut's House of Arts and Culture: Section indicating relationship of inside to outside: image from archdaily, available at http://www.archdaily.com/20351/nrjaproposal-for-beiruts-house-of-arts-and-culture/ [Accessed on 6 August 2010]

fig. 78- Beirut's House of Arts and Culture: image by NRJA, available at http://www. archdaily.com/20351/nrja-proposal-for-beiruts-house-of-arts-and-culture/[Accessed on 6 August 20101

fig. 80- Diagrams illustrating the existing process: image by author

fig. 81- Diagram illustrating the imminent demise of the process: image by author

fig. 82- Diagram illustrating the proposed process respecting the memory of the existing process: image by author

fig. 83- Storage process illustrating flow and visual connection: image by author fig. 84- ERCO P3 Automated Warehouse: photograph from schneider+schumacer: availible at http://www.schneider-schumacher.de/print.php?id=4abe13d6d36f9a665 d456598e54f765f&lang=en [Accessed on 6 August 2010]

fia. 87- ERCO P3 Automated Warehouse: drawing from schneider+schumacer: available at http://www.schneider-schumacher.de/print.php?id=4abe13d6d36f9a665d45 6598e54f765f&lang=en [Accessed on 6 August 2010]

fig. 88- ERCO P3 Automated Warehouse: photograph from ERCO, available at http:// www.erco.com/projects/industry/erco\_p3\_aut\_2221/en/en\_erco\_p3\_aut\_intro\_3.php [Accessed on 6 August 2010]

fig. 85- Diagram of product flow in Erco P3 Warehouse: image by author

fig. 86- Diagram of high bay storage structure in Erco P3 Warehouse: image by author fig. 89- ERCO P3 Automated Warehouse, Illuminated transluscent shell: photograph from schneider+schumacer, available at http://www.schneider-schumacher.de/print.ph

p?id=4abe13d6d36f9a665d456598e54f765f&lang=en [Accessed on 6 August 2010]

fig. 92- The Horse on the Ceiling: public interaction, illustration from DeZeen

available at http://www.dezeen.com/2010/07/29/the-horse-on-the-ceiling-byzauberschoen/#more-89335 [Acessed on 6 August 2010]

fig. 93- The Horse on the Ceiling: heritage response, photograph from DeZeen



available at http://www.dezeen.com/2010/07/29/the-horse-on-the-ceiling-byzauberschoen/#more-89335 [Acessed on 6 August 2010]

fig. 91- The Horse on the Ceiling: ilustration of heritage response, illustration from DeZeen available at http://www.dezeen.com/2010/07/29/the-horse-on-the-ceiling-byzauberschoen/#more-89335 [Acessed on 6 August 2010]

fig. 90- The Horse on the Ceiling: old and new: photograph from DeZeen available at http:// www.dezeen.com/2010/07/29/the-horse-on-the-ceiling-by-zauberschoen/#more-89335 [Acessed on 6 August 2010]

fig. 94- The Horse on the Ceiling, image from dezeen, available at http://www.dezeen. com/2010/07/29/the-horse-on-the-ceiling-by-zauberschoen/#more-89335 [Accessed on 6 August 2010]

- fig. 95- Diagram illustrating access to site and station entry points: image by author
- fig. 96- Diagram illustrating access to and site: image by author
- fig. 97- Diagram illustrating fixed boundaries: no access to site, image by author
- fig. 98- Flexible boundary, access to site at certain points: image by author
- fig. 99- Station access attached to public access of site: image by author
- fig. 100- Shanahai Metro Map: image from explore shanahai, availible at http://www. exploreshanghai.com/metro/[Accessed on 6 August 2010]
- fig. 101- Shanghai metro logo: photograph by JPK at http://picasaweb.google.com/lh/ photo/-ZpoqVsLC3Vm7EnM1F0O7Q [Accessed on 6 August 2010]
- fig. 102-Diagram illustrating concourse and public areas on plan: image by author
- fig. 103- Diagram illustrating concourse and platform areas in section: image by author
- fig. 104- Concept sketch of site plan illustrating the possible location of intervention; image by author

fig. 105- Concept sketch of site plan illustrating the possible location of intervention on following existing tracks and on grade: image by author

fig. 106- Concept sketch of site plan illustrating the location of intervention, passenger railway platform integrated with freight and storage warehouse: image by author

fig. 107- Concept sketch of site plan illustrating the location of intervention, passenger railway platform elevated freeing up the ground plain: image by author

fig. 108- Concept sketch plans illustrating floor finish: image by author

fig. 109- Concept sketch plan illustrating articulation of public and private space; image by author

fig. 110- Exploration sketches of roof becoming facade: image by author

fig. 112- Concept sketch elevation: image by author

fig. 111- Perspective mass exploration: image by author

fig. 113- Section illustrating development of platform roof and facade structure: image by author

fig. 114- Section illustrating shading from east and west sunlight as well as permeable structure

for natural ventilation; image by author

fig. 115- Section illustrating permeable facade treatment [fragmented elements]: image by author

- fig. 116-Section illustrating vies necessary from platform: image by author
- fig. 117- Conceptual section: images by author
- fig. 118- Conceptual perspective: images by author
- fig. 119- Conceptual sections of freight and logistics [introvert/contain]: images by author
- fig. 122- Conceptual design development of platform roof wrapping over to become the fa-
- cade, opening up at access points: images by author

fia. 121- Conceptual design development of platform roof and facade becoming more open to reveal the platform, allow for views and break the monotonous facade.: images by author

fig. 120- Conceptual design development of platform roof and facade acting as containing element: images by author

- fig. 123- West elevation: images by author
- fia. 124- East elevations: images by author
- fig. 125- Site plan: images by author
- fia. 126- Site plan: images by author
- fig. 127- Ground floor plan: images by author
- fig. 128- First floor plan: images by author
- fig. 129- PLatform level: images by author
- fig. 130- Section through length of platform: images by author
- fig. 131- New east elevation: images by author

fig. 132- Existing east elevation indicating the history of the buildings on site and relationships

- in scale and age: images by author
- fig. 133- West elevations: images by author
- fig. 134-Perspective section: images by author
- fig. 135- Entrance perspective: images by author
- fig. 136-: Perspective of public walkway images by author
- fig. 137- Perspective of concourse: images by author
- fig. 138- Diagram illustrating technical concept: images by author
- fig. 139- Axonometric illustrating structural elements: images by author
- fig. 140- Detail of portal frame construction: images by author
- fia. 141- Detail of steel frame connection where movement will occur to prevent vibration: images by author
- fia. 142- Exploration of facade structure connection to platform: images by author
- fig. 143- Exploration of shape and permeability of platform entry and exit enclosure; images by author
- fig. 144-Wire mesh specification and weaving detail: images by author
- fig. 145- Platform entry and exit enclosure connections: images by author

images by author by author images by author

- fig. 146- Detail of platform enclosure: images by author
- fig. 147- Sketches of staircase: images by author
- fig. 148- Images of polyethelene sheets: photograph available at http://www.supplierlist.com/
- products/category/1014/101426/p-0/Waterproof.htm [Accessed on 30 August 2010]
- fig. 149- Sketches of kiosks illustrating materiality: images by author
- fig. 150- Section: images by author
- fig. 151- Diagram illustrating rain water harvesting system: images by author
- fig. 152- Image of underfloor heating pipes: photograph available at http://www.beodom.
- com/en/quality/heating-system [Accessed on 30 August 2010]
- fig. 153- Diagram illustrating the heating and cooling system: images by author
- fig. 154- Diagram illustrating the distribution of services through the elevated railway platform
- fig. 155- Section illustrating the natural light provided to the ground plane by punching openings into the elevated railway platform.: images by author
- fig. 156- Section illustrating the natural ventilation due to the open structure above the railway platform: images by author
- fig. 157- Section illustrating the natural light provided to the inside of the freight and logistics warehouse by implementing light and ventilation chimneys: images by author
- fig. 158- Section illustrating natural ventilation through light and ventilation chimneys: images
- fig. 159- Diagram illustrating the distribution of services through the elevated railway platform
- fia. 160- Cross section: images by author
- fig. 161- Details images by author
- fig. 162- Development of the city of Pretoria: available in, Jordaan, J. J., 1989. Pretoria as 'Urbs Quadrata'. Architecture SA, May/June, pp.26-29.



- Station.

## Abstract

The thesis is about the programmatic exchange and confluence between production processes, public transportation and people.

The proposed intervention would be developed to fit in with the City of Tshwane Spatial development framework and an industracity vision and framework for the location in Pretoria West, developed by the framework group. The new intervention will deal with both production process and public activity in the design of a train station and intermodal freight warehouse. The site location is in Pretoria West, a mixed use suburb with restricted industry, business, retail, flats and single residential areas. The site is the Pretoria West Power Station an intersect fir existing infrastructure and public transportation routes.

The aim of the investigation is the integration of public functions with industrial functions in ways that contest monotonous urban environments, preserving the heritage of the site in the outcome. The research questions what can be done to facilitate the return of lost production, increase the interaction of people and processes and address the decaying historical fabric of the Pretoria West Power The study examines the history of production and railway stations, uses descriptive survey methods, precedent studies and architectural and urban theory to inform the intervention.

The aim of the design is to transform an industrial site into a vibrant integrated environment, introducing programmes that will attract people, but keep the industrial character intact. The character of the site will be conserved through the introduction of new light industries, keeping the memory of process.

The design concept links into the idea of electrical input and output exchanges of a power station.

It focuses on the exchanges of energy, physical and visual exchanges between heritage, people and products, service exchanges and exchanges in function between freight and passengers and in context - heritage and production.

The design objectives are to extend the railway line as a suspended platform to provide access and exchange for freight and passengers and to depart from the introverted nature of the existing buildings to encourage public interaction with the history of the site and the production processes. The railway track infrastructure will serve multiple purposes



The proposed project is a freight logistics and storage facility combined with a commuter rail station, situated on the western edge of Pretoria West.

The exchange of goods/material on site will be dealt with through the handling and packaging of products for shipping/export on an existing rail network. The new architectural intervention will act as a conduit for material to be delivered to production facilities as well as the distribution of finished products from these facilities for export to local, national and global markets.

The exchange of people through the rail network to and from Pretoria West Power Station is equally important to facilitate an exchange of energies. The integration of a public transport facility will provide a visual exchange between

## Preface

The thesis is about the programmatic exchange between production processes and public transportation and how these two functions meet. It will address the issues of boundaries, production and energy flow.

the viewer [commuter] and the production activities along with a physical exchange between people and the rich industrial heritage of the site.

The aim is to design spaces that will encourage people to interact with the entire process of production, thus allowing passive participation through visual connection.

The historical importance of the site cannot be neglected. The heritage strategy will be to adapt the existing process of producing energy (electricity) of the site - conducting a new flow of energy through regeneration of production facilities after the site has been decommissioned

These new interventions will provide renewed energy for the site by converting the introverted, monotonous industrial nature of the Pretoria West Power Station into an extroverted and inviting public place.