Fig 6.1: Concept collage, Illustrated by Author 2011

06 design development

Fig 6.2: View of exterior skin and interior workshop, Zahner Factory Expansion: Crawford Architects 2011 (ArchDaily 2011)

6.1 Introduction

This chapter will illustrate the design development through the investigation of the aims set out in this dissertation. It will define the project and the site as well as how the concept is developed and translated into a building.

Due to the nature of the project, the design development process is separated into two main categories:

• Technical Development:

Exploring the functional design guidelines regarding the process of automotive disassembly.

The investigation was conducted in collaboration with Industrial Engineer, Gerhard le Roux, who has considerable experience regarding industrial processes.

• Spatial Development:

Integrating the functional design guidelines to appropriate spatial qualities between the process (Disassembly plant) and the surrounding urban fabric, demonstrating sustainable urban integration.

6.2 Technical Design Development

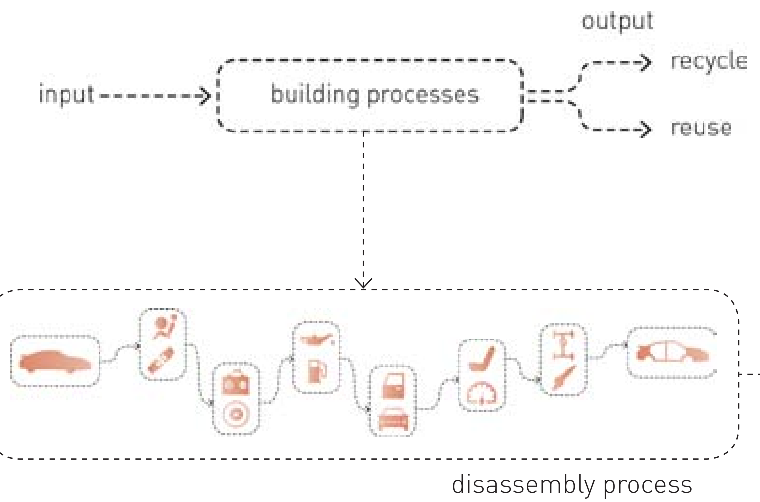
The technical design development will be discussed first as it was important to determine the technical requirements before moving on to the actual design of the site and building.

6.2.1 Input & Output Cycle:

The aim of the dissertation is to maximise the possibilities of the industrial building such that it operates less as an isolated process and more as an integrated ecosystem in the urban fabric; addressing 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.

Due to the industrial nature of the proposed building, an input and output cycle forms the foundation from where the design will be developed - a constant inflow of resources (automobiles) and dispatch of products for re-use or recycling is active.

At the core of the input/output cycle lies the seven stages of disassembly. These seven stages are investigated and applied in-depth to ensure the project functions economically.



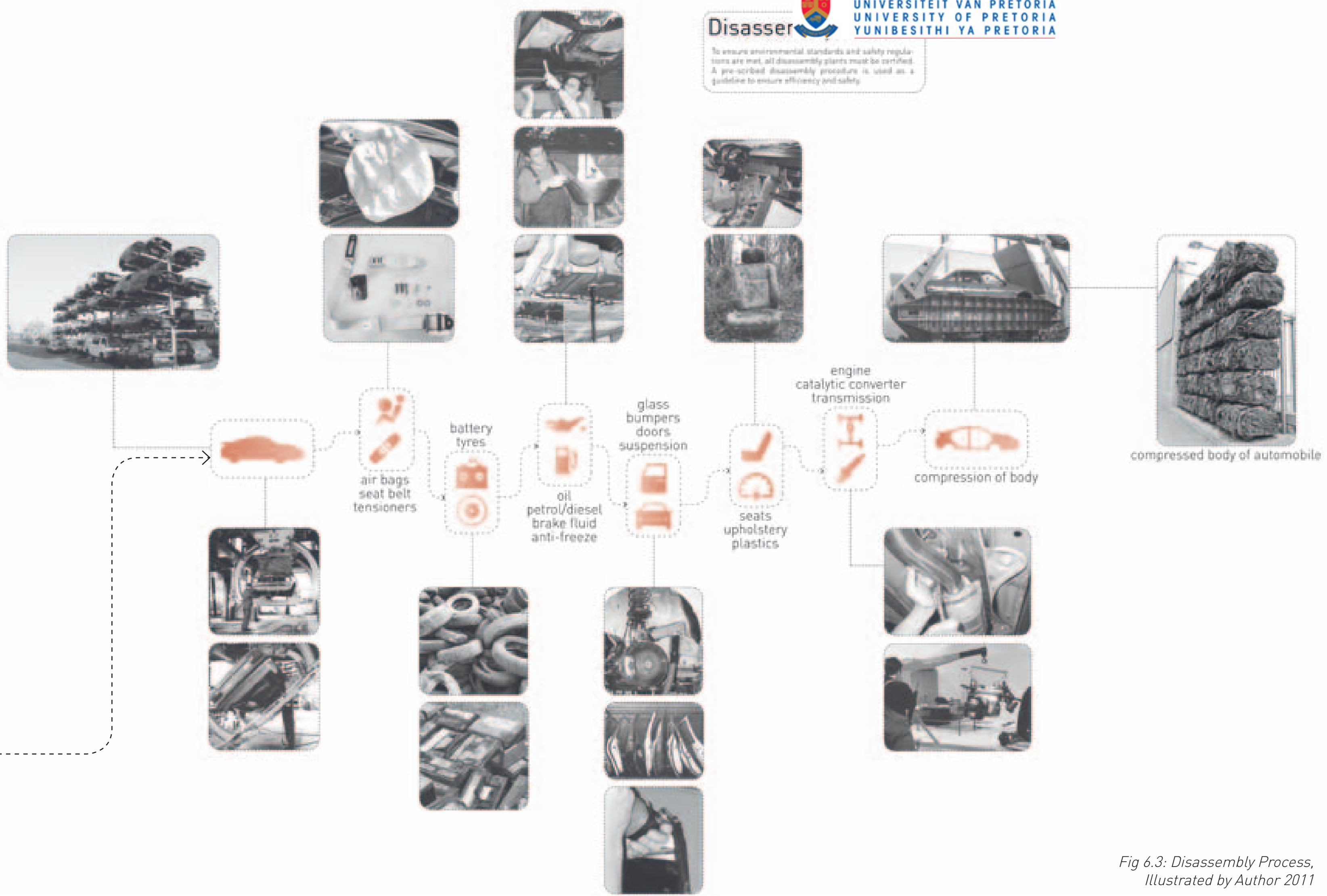


Fig 6.3: Disassembly Process, Illustrated by Author 2011

6.2.2 Process Needs:

The seven stages of disassembly form the backbone of the process (and building) as a whole. Each one of these stages has specific requirements to ensure optimal performance as a process and as a work space.

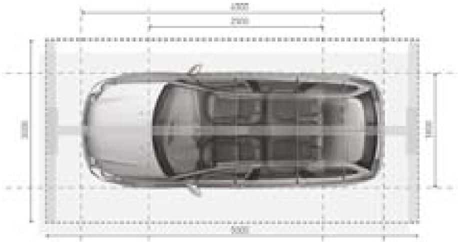
Each stage is influenced by:

- The type of equipment used in order to disassemble the specific part/parts of an automobile
- Appropriate floor area for circulation of parts and workers
- Number of workers per stage to ensure each step take an equal amount of time to complete, avoiding bottlenecks (refer to 6.2.4 Process Timing)
- Risks regarding the disassembly of certain parts
- The overall needs of a stage
- Valuable materials obtained from certain stages

(Le Roux 2011)

	1 explosive parts treatment (air bags, seat belt-tensioners)	2 pre-treatment (batteries, tyres)	3 fluid collection (oil, petrol/diesel, brake fluid, anti-freeze)
equipment	basic hand-operated tools	basic hand-operated tools	pressure drill & pump; storage tanks system
work area size	140 m^2	170 m^2	150 m^2
number of workers	4	4	3
risks	volatile substances	improper disposal of batteries	flammable liquids
overall needs	explosion control chamber	ventilation	drainage system with oil trap and tank; ventilation of fumes
valuable materials	none	nickel (batteries)	none - oil is recycled by the *R.O.S.E foundation

Vehicles are mounted on a 'C-Arm', enabling workers to manipulate vehicles in any position for better ergonomics. The 'C-Arm' mechanism is situated at the centre of stage 4-6. The first three stages will be fitted with a normal vertical hydraulic lift (le Roux 2011).



	4 exterior parts dismantling (glass, bumpers, doors, suspension)	5 interior parts treatment (seats, upholstery, plastics)	6 mechanical parts treatment (engine, catalytic- converter, transmission)	7 compression (compression of body)
equipment	inductive coil; grinder; basic hand-operated tools	basic hand-operated tools	basic hand-operated tools; grinder; pressure drill; hydraulic cutter	compression machine
work area size	180 m^2	175 m^2	160 m^2	145 m^2
number of workers	5	4	5	2
risks	dangerous equipment; heavy components	fragile electronic components	dangerous equipment	dangerous equipment
overall needs	hand-operated crane for heavy components		hand-operated crane for heavy components	forklifts
valuable materials	aluminium; steel	expensive electronics	platinum; rhodium	large amounts of steel

Fig 6.4: Process Needs table, Illustrated by Author 2011

R.O.S.E

* R.O.S.E Foundation - Recycling Oil Saves the Environment: The foundation manages the environmentally acceptable collection, storage and recycling of used lubricating oil in South Africa

6.2.3 Disassembly Rate:

In order for the project to be feasible, a suitable process rate for automotive disassembly must be formulated to provide adequate labour resources.

Time is the most important factor of the process rate. According to Gerhard le Roux (2011) it would be appropriate for each stage to take forty minutes to be completed.

The number of disassembled automobiles per month must be determined to calculate the number of workers and floor area per stage required.

Capacity:

The following calculations have been formulated according to the optimal performance of the plant.

The number of cars disassembled per month (4 x five day working weeks):

On the first day of every month the disassembly line will contain no automobiles, which means that it will take 280 minutes/ 4 hours & 40 minutes (40 min. x 7 Stages) for the first automobile to reach the end of the process (Fig. 6.#)

This means that on the first day (8 hours of every month only 6 automobiles will be disassembled.

However, once the disassembly line has been filled up, the plant is able to disassemble 12 automobiles per day after that (producing a disassembled and compressed vehicle every 40 minutes).

Calculation:

Working minutes per day / stage duration = number of automobiles disassembled per day

» 480 minutes / 40 minutes = 12 automobiles

Week 1:

Day 1: 6 automobiles (due to empty disassembly line - Fig. 6.#)
Day 2-5: 12 automobiles each day (12 x 4 days = 48 automobiles)
Total: 48 + 6 = 54 automobiles

Week 2-4:

Day 1-5: 12 automobiles each day (12 x 5 days = 60 automobiles)
Total: 60 automobiles x 3 weeks = 180 automobiles

Total number of disassembled automobiles per month:
54 + 180 = 234 automobiles

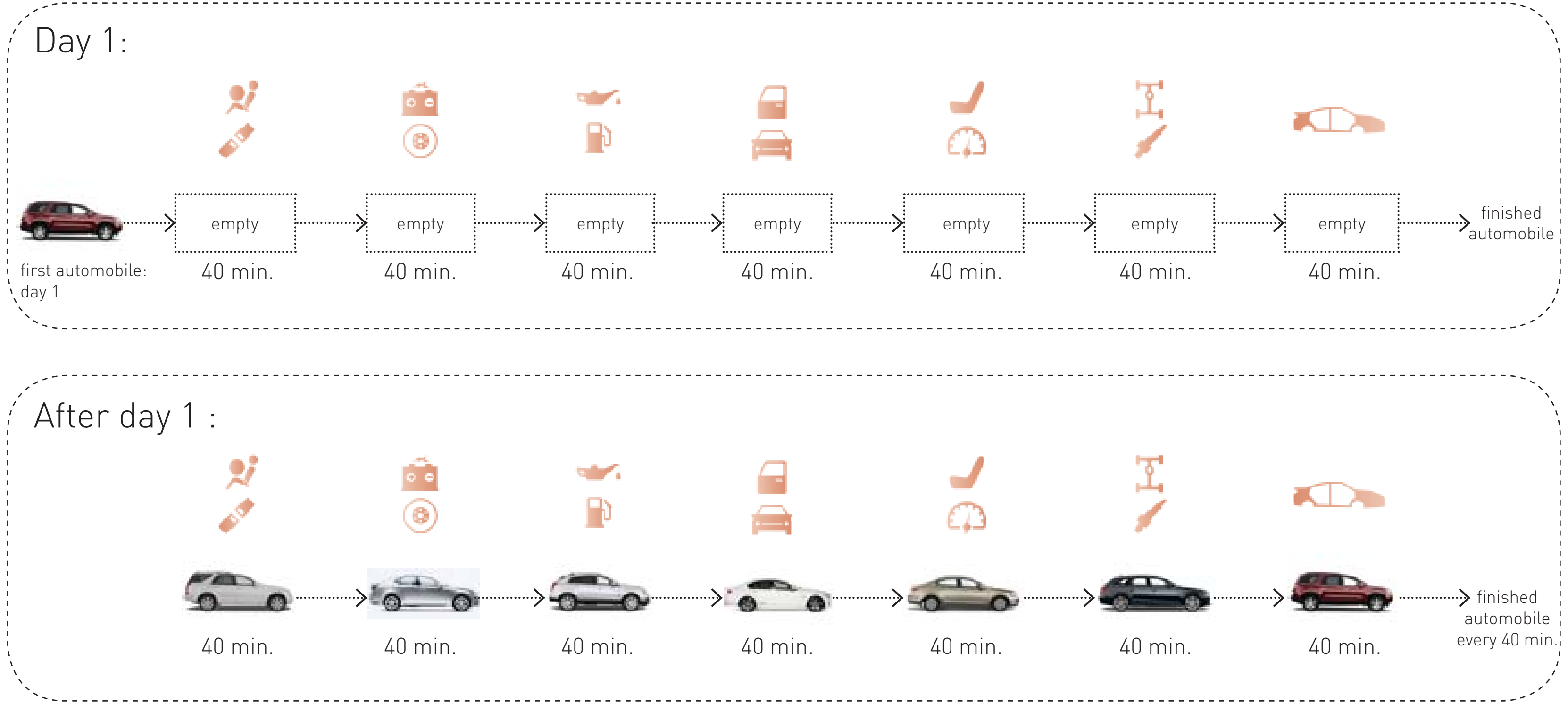


Fig 6.5: Disassembly Rate diagram, Illustrated by Author 2011

»time per process (minutes)

number of workers	1	2	3	4	5
1	85min.	70min.	55min.	40min.	25min.
2	100min.	70min.	50min.	40min.	30min.
3	70min.	55min.	40min.	30min.	20min.
4	100min.	80min.	65min.	50min.	40min.
5	80min.	65min.	50min.	40min.	25min.
6	120min.	90min.	70min.	55min.	40min.
7	40min.	40min.	30min.	30min.	30min.

6.2.4 Process Timing:

Although the plant consists of a number of different machines and equipment, the most important part is the workers who wield the equipment.

The stages of disassembly require a certain amount of labour to be completed. According to Gerhard le Roux (2011) each stage must be assigned a specific number of workers in order for all the stages to be completed in the same amount of time, ensuring a constant flow of automobiles.

The number of workers in the disassembly workshops could be accurately determined once a time/process table was formulated.

Total number of workers (disassembly workshops): 27

Fig 6.6: Process Time table, Illustrated by Author 2011

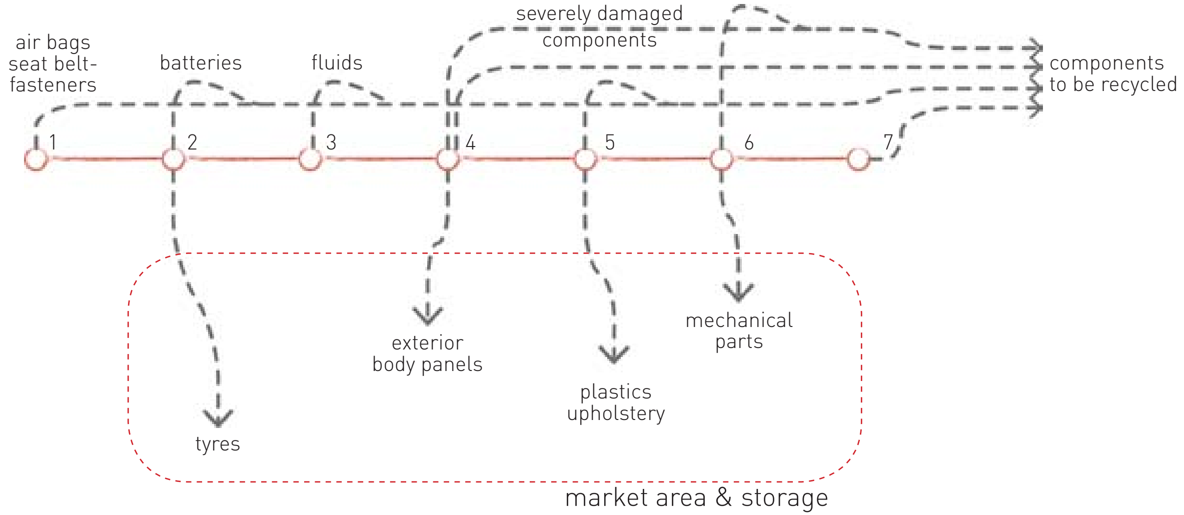


Fig 6.7: Components Circulation diagram, Illustrated by Author 2011

6.2.5 Components Circulation:

Now that the parameters are set for the disassembly process (input), the components and parts from each stage needs to be attended to.

The building's output consists of two divisions:

• Recycling division: Components and parts failing the quality assessment test are sent away to appropriate recycling facilities via railway transport or transported by heavy automobiles.

• Reuse division (Market Area): After the quality assessment test has been passed by components and parts, they are moved to the storage (in existing warehouses on site) and market area, awaiting re-use.

6.2.6 Process Flow:

All the technical parameters are then fused together as a single system / machine.

According to Gerhard le Roux (2011) a process diagram should establish a solid basis when determining the circulation on the site and proposed building as a whole.

The diagram should be simple and clear, with no crossing of process routes, showing the entire system from start to finish.

The process diagram is the main technical design generator, influencing the form, layout, orientation and circulation of the proposed Vehicle Disassembly plant.

In essence, the technical development has formed the concept of the proposed building. The diagram is used as the genesis for the spatial design development, translating it into a building.

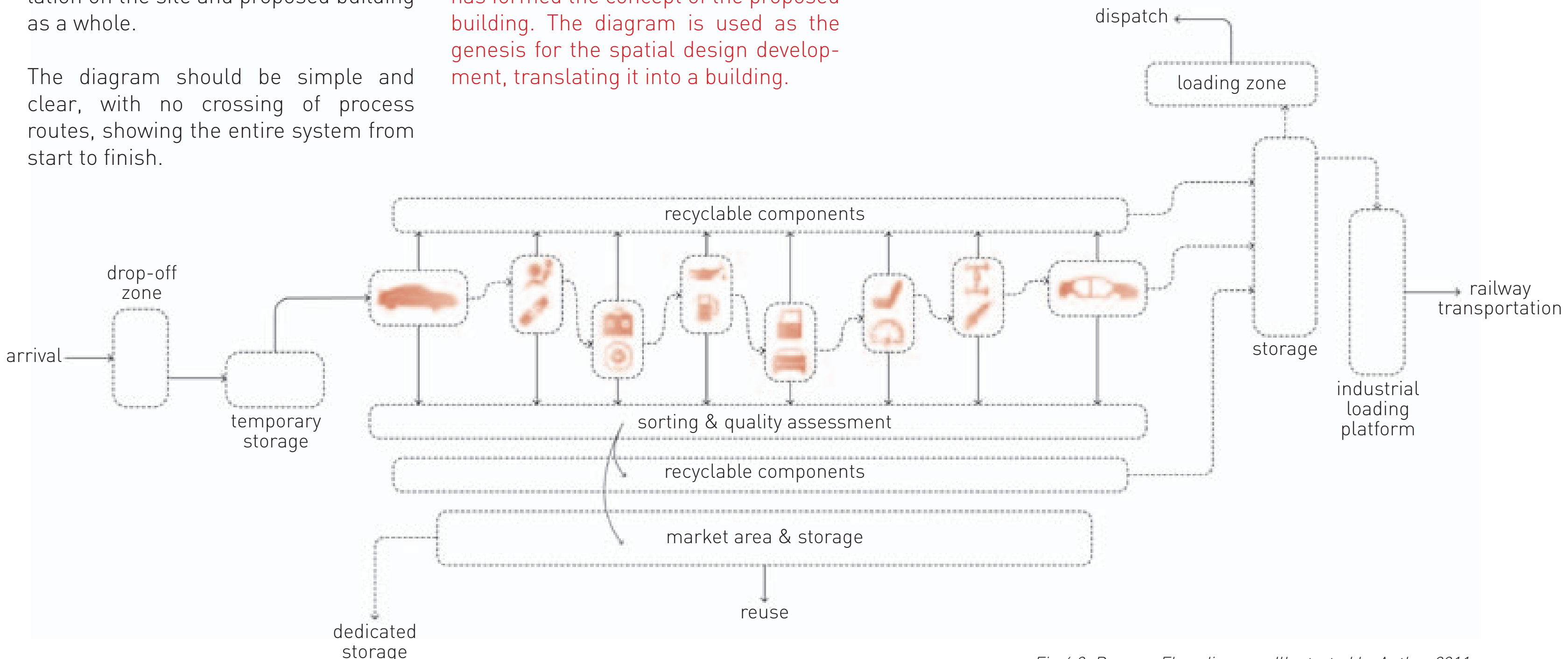
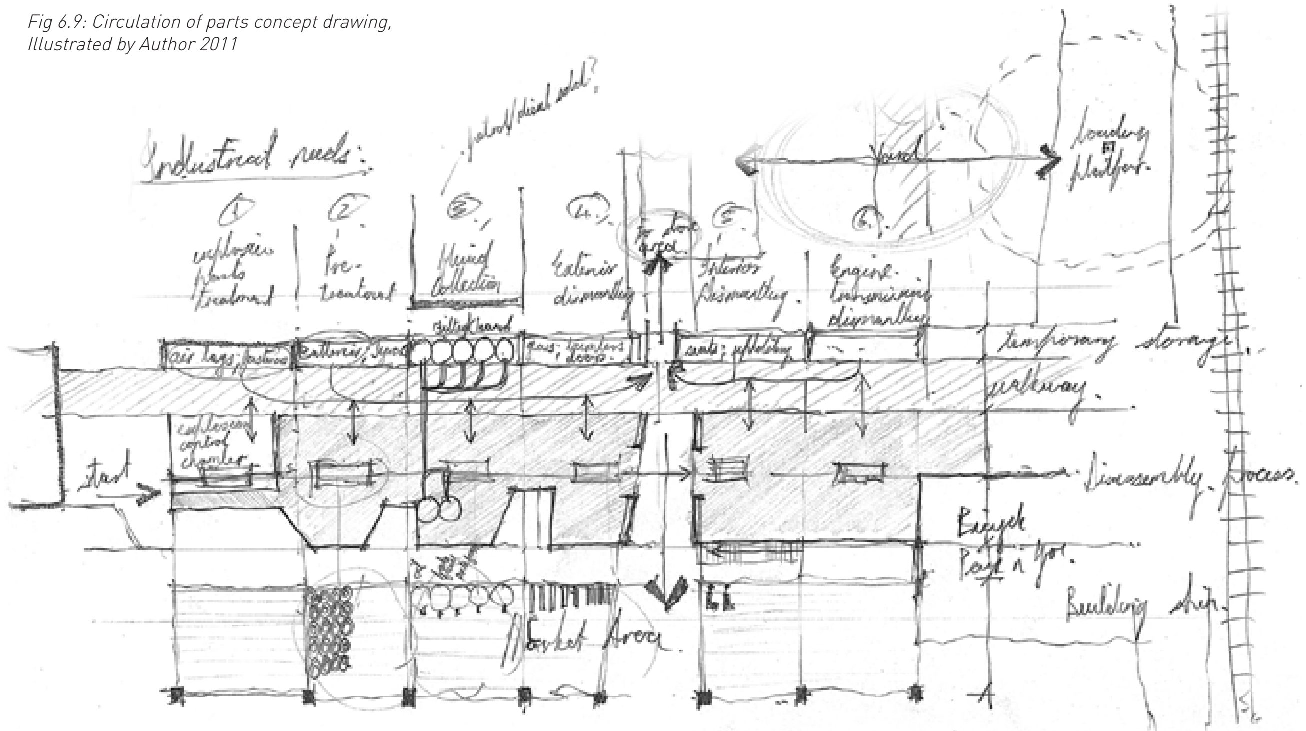


Fig 6.8: Process Flow diagram, Illustrated by Author 2011

Fig 6.9: Circulation of parts concept drawing, Illustrated by Author 2011



6.3 Spatial Design Development

6.3.1 Project Aims & Objectives:

The objective is the design of a Vehicle Disassembly Plant that responds to the historical context, addresses current cultural and social aspects, whilst adapting over time.

The structure aims to become a liaison between the social and industrial activities of the surrounding setting. Supporting programmes will be positioned alongside the main function (disassembly line) to ensure that the liaison becomes a catalyst for future growth and sustainability of Pretoria West.

This project aims to address the urban context, culturally and historically, by engaging with the local economy of automotive repairs, by adaptive reuse of discarded spaces and transport infrastructure.

As the site is of historic and cultural value to Pretoria West, the design should introduce not only new functions, but also reinstate the historic and existing functions of the site. Through this, the design should ensure the sustainability and adaptability for future functions.

The formulation of development guidelines to ensure lower greenhouse gas emissions will be informed by waste management and recycling strategies, as well as the Green Star SA technical manual (Version 1, 2008) to achieve an industrial building that will function efficiently within its context.

As proposed by studies of ecological construction approach, the materials used will be analysed in terms of life cycle performance and ease of assembly/disassembly on-site, informing the application of materials and the design of the structure. This approach will tie in with the building programme, the reuse and recycling of materials.

The design intends to minimize its embodied energy and carbon footprint, but at the same time, also adapt to the future functions and needs of the context it is placed in.

What will become of the structure in 50-100 years time if the issue regarding end-of-life automobiles has been addressed?

The construction method and detailing of the structure ties in with the theory of products which are designed for disassembly – the entire structure will be designed for easy disassembly.

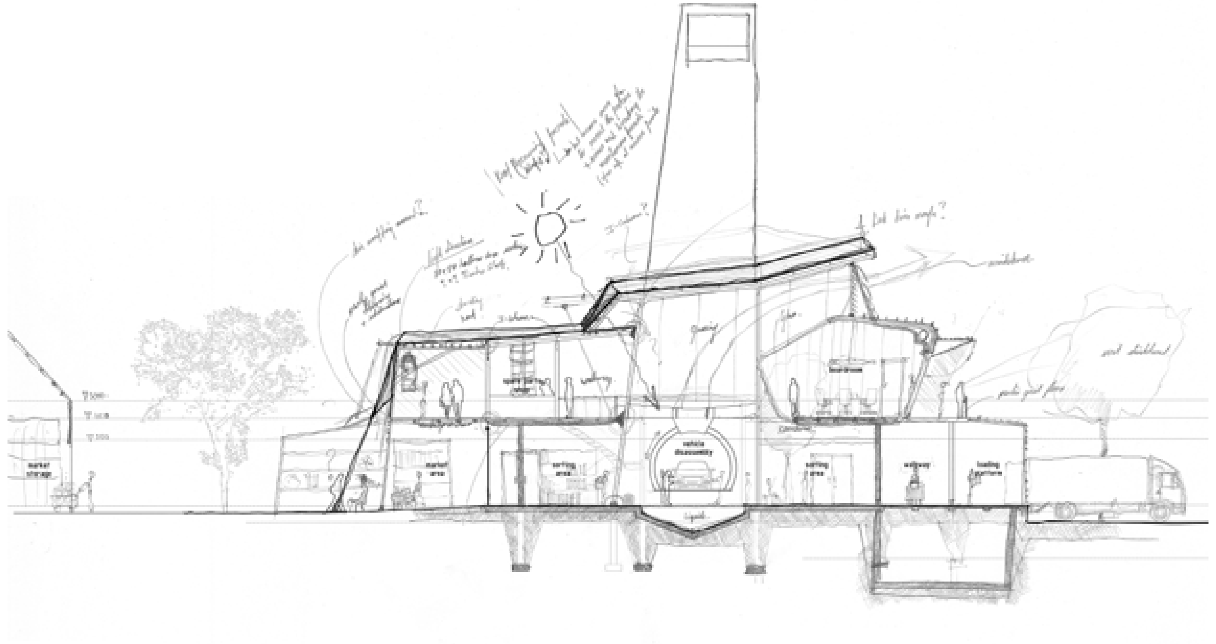


Fig 6.10: Spatial investigation :section drawing, Illustrated by Author 2011

6.3.2 Accommodation & Function:

The design of the plant aims to accommodate major waste management and recycling systems of the surrounding context. The structure will focus on the recycling of automobiles, but the intervention also aims to restore the historic function of the site by providing an important railway transport link for the waste recycling centres of the surrounding area.

The functions of the proposed intervention will be chosen to support one another to ensure economic and social diversity. These functions will stretch further than merely an industrial building, introducing additional functions to enable coherence.

The structure should be able to adapt to different future functions and users, ensuring a generative life-cycle for the building.

6.4 Design Generators

The spatial development process is constructed by a series of inter-connected design generators and investigations:

• *Technical design development*

• *Urban Investigation/Site development:*
-Influences of the existing urban fabric on the site and its surroundings; proposed vision for the area

• *Concept Model Investigation:*
-Development of the building's structure, scale, orientation, layout and circulation

• *Energy efficiency, sustainability: Passive Design Strategies:*
-Including sustainable systems from the start of the design process, opposed to attaching them on the structure after the design process is complete

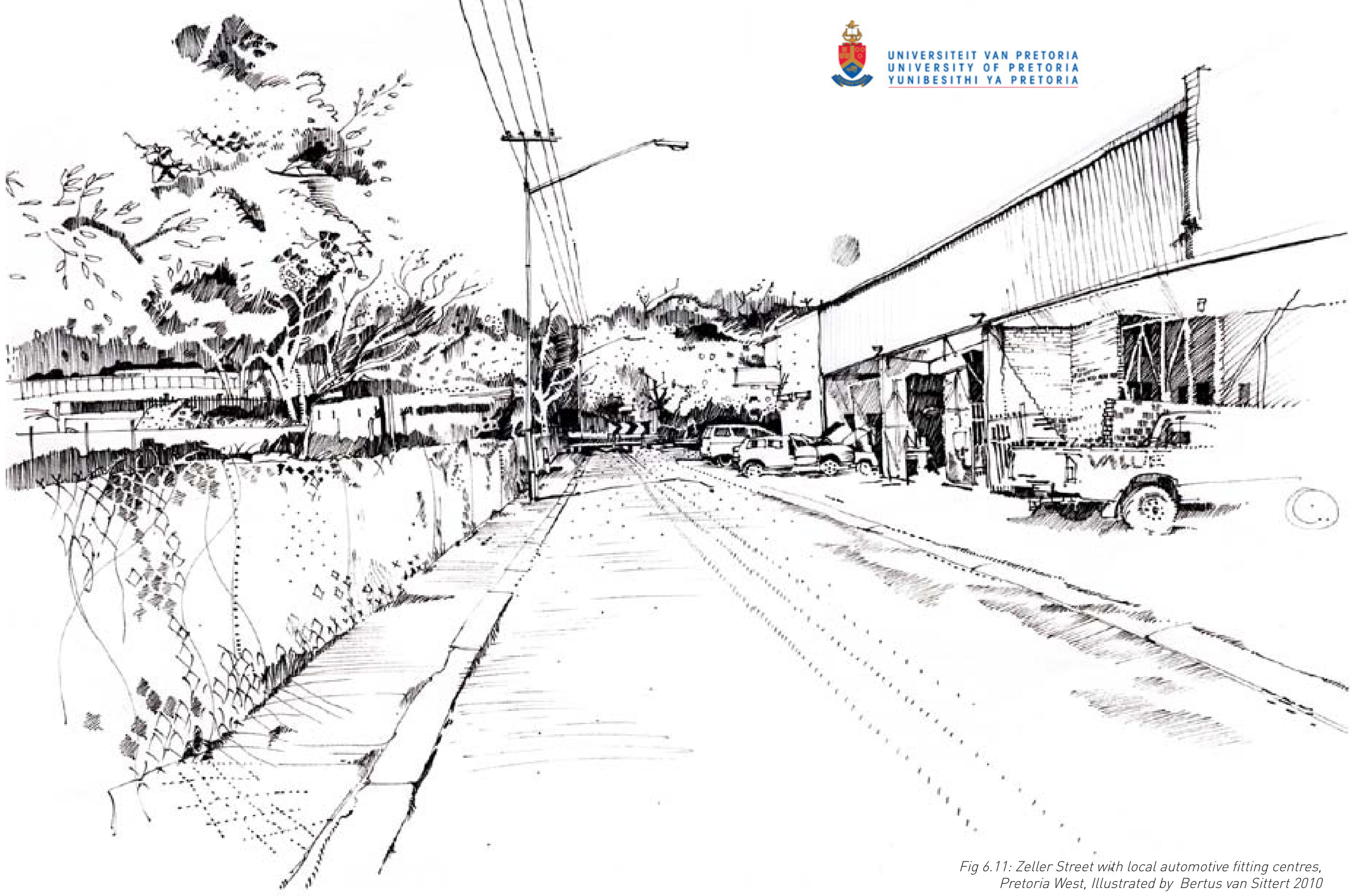


Fig 6.11: Zeller Street with local automotive fitting centres, Pretoria West, Illustrated by Bertus van Sittert 2010

6.5 Site Development

6.5.1 Study Area:

Due to the character of automotive repairs and industrial processes of the area, the context plays an important role as a design generator.

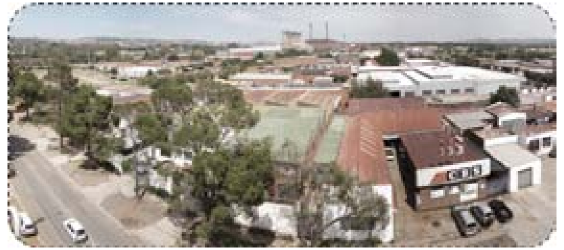
The study area proved to have numerous urban problems. The investigation of the site and its surroundings gave birth to new opportunities and interventions.

The proposed site plays host to two dissertation projects:
- The Vehicle Disassembly Plant and
- A Production Facility (Gerhard Janse van Rensburg), where automotive parts and components are used to create art forms.

The two projects are seen as one system of inter-depending programmes, working as a whole on one site, rather than two buildings on two separate sites next to each other (refer to Fig 6.59).

Fig 6.12: Pretoria West study area, Pretoria West Group Framework 2011

Fig 6.13: (Opposite) Proposed site with surrounding points of interest, Pretoria West Group Framework 2011



Site in Industrial Context:

The industrial area of Pretoria West can be characterised as a small to medium sized industrial zone, with most of the businesses focussing on repair and maintenance work rather than production.

Proposed Site:

The selected site is currently owned by the Municipality of Tshwane and is used as temporary storage for waste containers.

Goede Hoop Houses:

Once occupied by workers of the railway and industrial area, these houses are dominated by industrial buildings due to the development of the industrial sector.

Railway Service Station:

The site consists of warehouses and materials for maintenance of the railway lines and trains.

Dilapidated Wareho

Re-use of the existing warehouses as spaces for production will be incorporated in the site programme and spatial connection.

Rebecca Station:

Able to serve more than 60% of the surrounding industrial area, Rebecca Station is under-utilised due to the lack of access.

Existing Concrete Platforms:

The concrete platforms indicate traces of the heritage of the site and the connection with the railway line due to the angle on the site. The position of the platforms informs the orientation of the proposed building.

Fig 6.14: Proposed site with surrounding points of interest, Photo collage by Author 2011

6.5.2 *Urban problems associated with the study area:*

1. Vacant Lots
adds to poor urban character of the area

2. Dilapidated Warehouses
structures are no longer in use

3. Rebecca Station
the station is cut off from the precinct & the railway line is no longer used for industrial purposes

4. Shunting Yards
taking up a large area of land

5. Workshops
structures remain empty and unused

6. Mixed Waste Recycling Facility
facility lacks access to appropriate transport

7. Old 'Goede Hoop' Houses
significance of historic houses not celebrated

8. Light Industrial Buildings
poor urban spaces and street edges

9. Department: Water Affairs
private government buildings - no pedestrian access

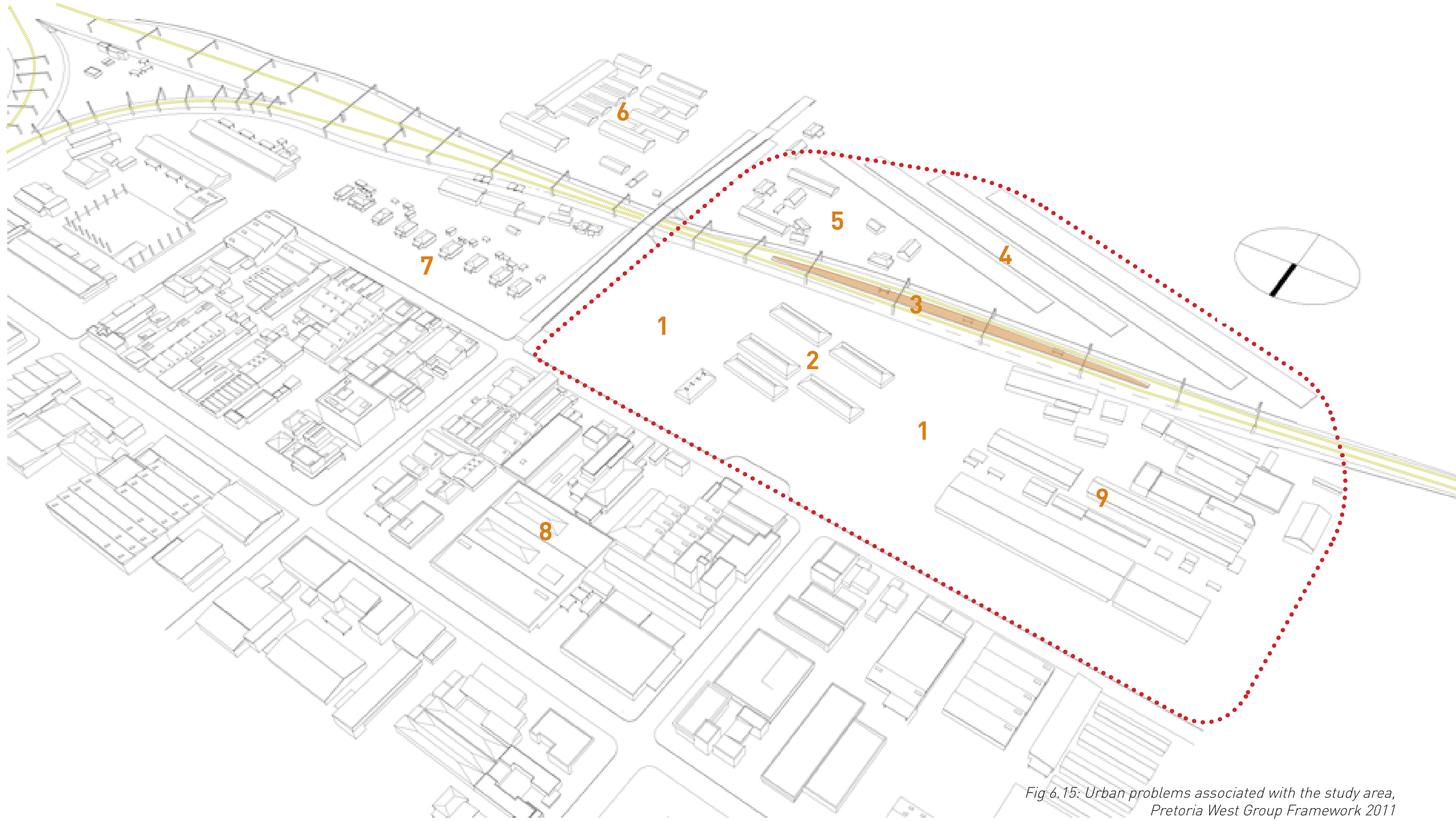


Fig 6.15: Urban problems associated with the study area, Pretoria West Group Framework 2011

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6.5.3 *Interventions & Opportunities:*

1_The vacant lot will play host to the proposed *Vehicle Disassembly Plant* with a new connection to the railway line for industrial transport purposes, as well as a link to the proposed pedestrian platform at Rebecca Station.

2_The dilapidated warehouses is transformed into a *Production Facility* by another Masters dissertation project (Gerhard Janse van Rensburg).

3_Rose-Etta Street is extended as a pedestrian boulevard, connecting Rebecca Station to the surrounding area.

4_Development of Park Rebecca as a green space for pedestrians who commute by train.

5_An additional pedestrian platform is proposed to connect with Park Rebecca.

6_Densification of the area by replacing existing workshops with mixed use buildings of an appropriate urban scale.

7_Development of urban agriculture for the proposed housing (part of 6), the proposed Vehicle Disassembly Plant and Produciton Facility.

8_Establish a transport relationship between the proposed industrial transport platform and the Mixed Waste Recycling Facility.

9_Development of active urban edges towards Carl Street.

10_Development of a second access route for the proposed *Vehicle Disassembly Plant (Market Area)* and as a pedestrian route, coming from the East.

11_Proposed new informal trading along the pedestrian boulevard towards Rebecca Station, the informal trading forms the edge of the site.

12_Landscape development of the eastern edge of the site, addressing the slope formed by the bridge crossing the railway line and covering the back yard area.

13_The proposed axis originates from an existing park in the precinct.

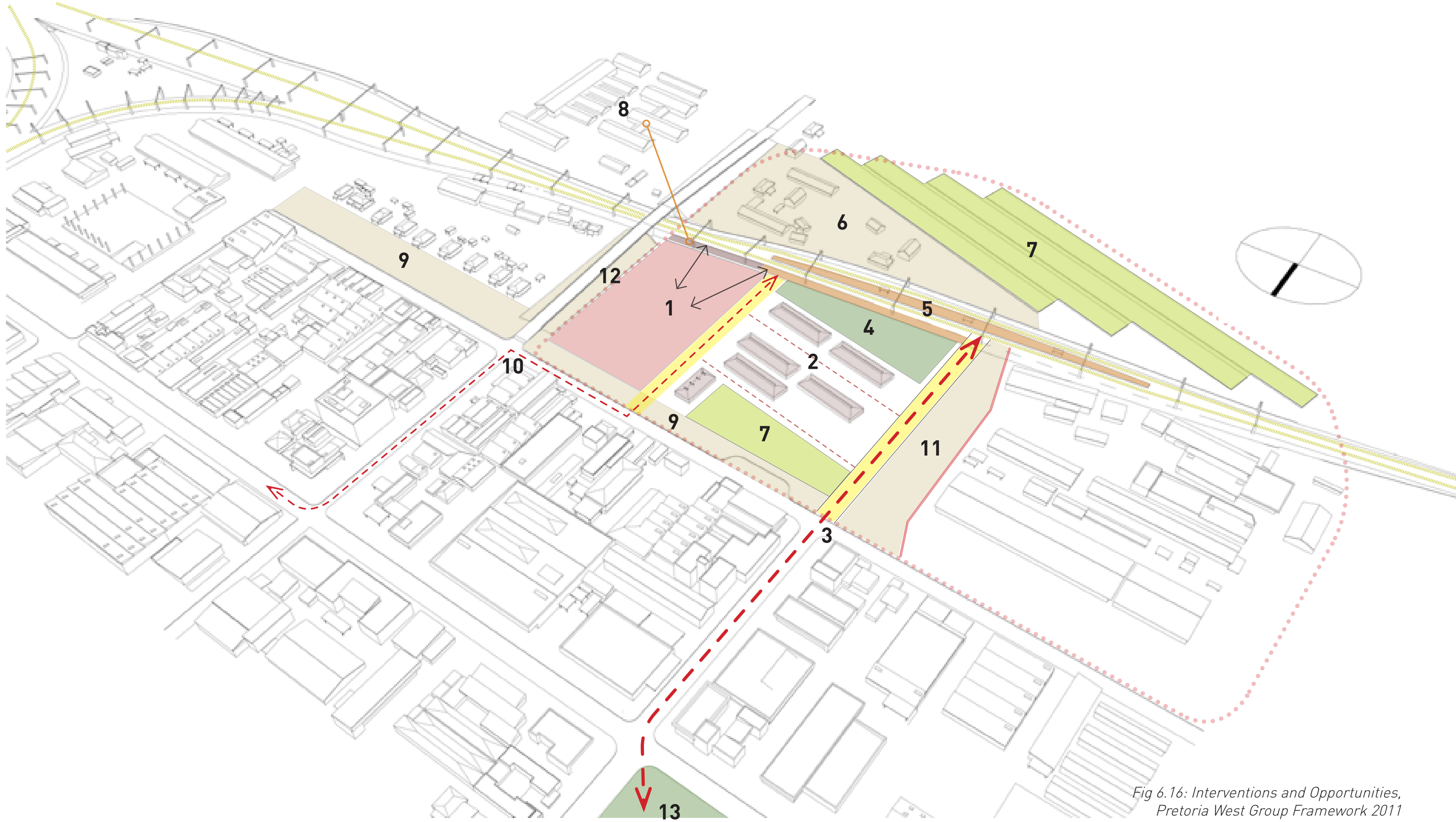


Fig 6.16: Interventions and Opportunities, Pretoria West Group Framework 2011

6.5.4 *Urban Design Development:*

1_Position of new proposed *Vehicle Disassembly Plant.*

2_ Warehouses to be transformed into proposed *Production Facility.*

3_Additional programs on street level part of proposed project.

4_Use existing warehouses as storage for proposed *Market Area.*

5_Proposed industrial platform for transport of materials and parts.

6_Existing Eucalyptus 'Blue Gum' Trees with additional landscaping.

7_Park Rebecca incorporated into proposed buildings.

8_Landscaping alongside pedestrian boulevard and informal market.

9_New proposed pedestrian platform to be incorporated with proposed buildings.

10_Proposed new mixed-use building footprints.

11_Agriculture ties in with the theme of production and self-sustainability of the site.

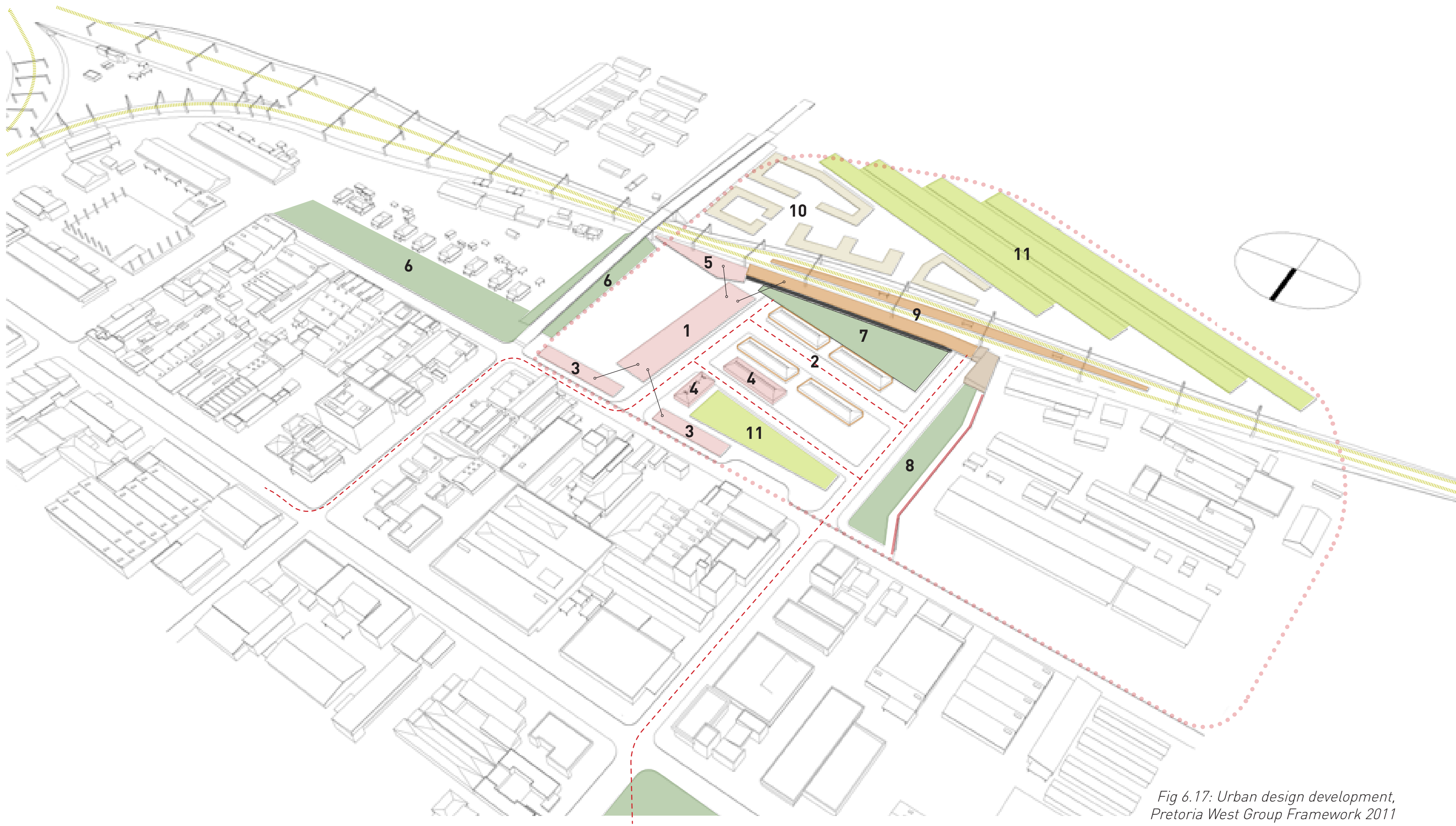


Fig 6.17: Urban design development, Pretoria West Group Framework 2011

6.5.5 *Massing & Scale:*

1_Development of proposed *Vehicle Disassembly Plant* position on site in relation the structures on site.

2_The design of the proposed *Production Facility* features an axis which connects the pedestrian platform (11) with the proposed taxi drop-off zone (14).

3_Activated urban edge on Carl Street.

4_The existing warehouses will be refurbished to accommodate storage of automotive parts for the *Market Area*.

5_The *Market Area* is located along the pedestrian access route between the two proposed projects.

6_The industrial loading platform.

7_Landscaped edge.

8_Park Rebecca.

9_Informal trading and pedestiran boulevard.

10_Station services: ticket sales; toilets; information.

11_Rebecca Station.

12_Mixed-use building between 3-6 storeys.

13_Agriculture.

14_Proposed taxi drop-off zone.

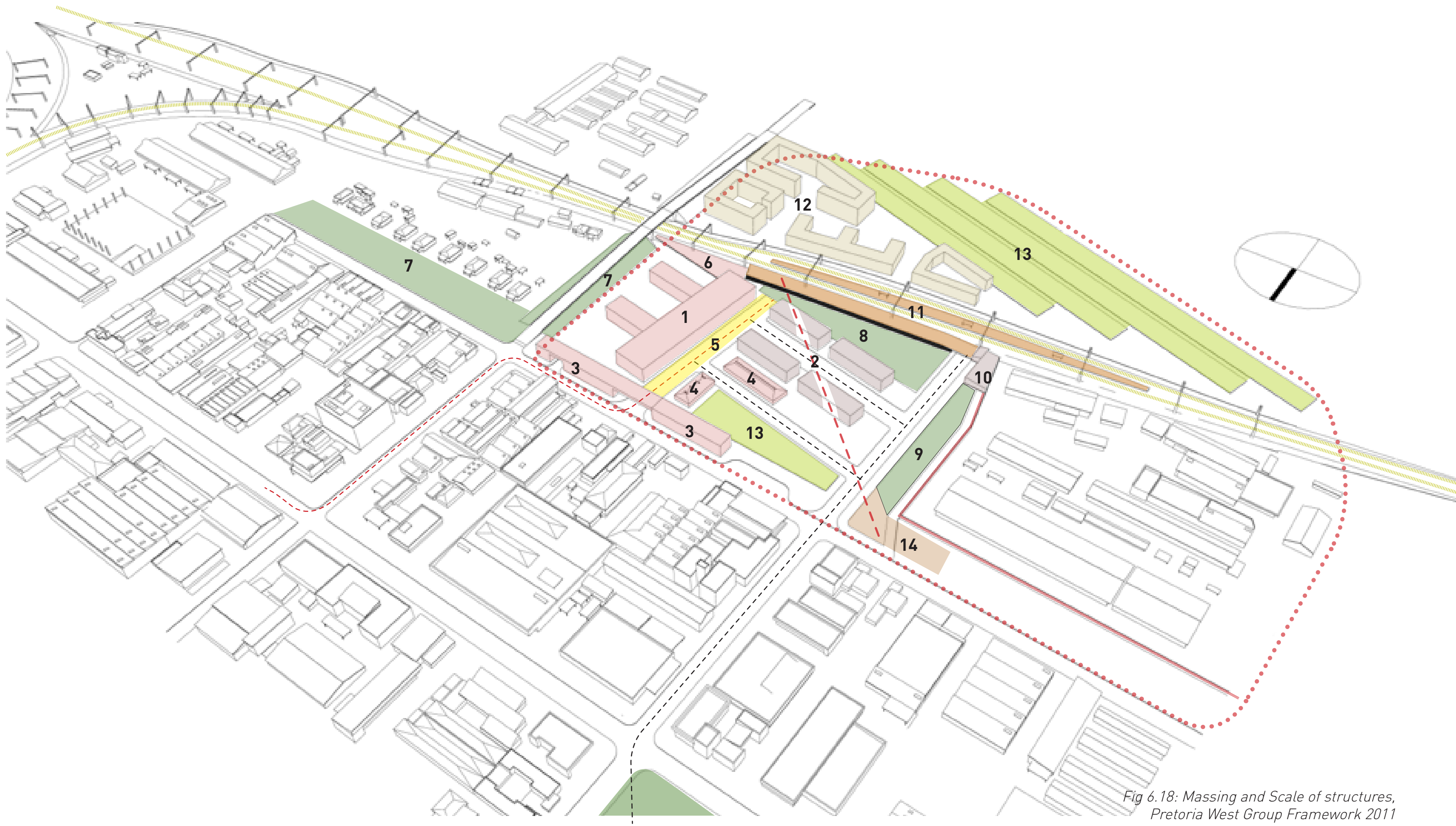


Fig 6.18: Massing and Scale of structures, Pretoria West Group Framework 2011

6.5.6 Site Spatial Development:

Due to the site size and orientation of the two interventions, the spaces between each intervention become an important spatial connector.

The synergy between the programmatic responses allows for the interventions to partly share functions and for users to move between buildings.

Both interventions relate to the recycling of automotive parts, collectively articulating the urban space through adaptive reuse of materials.

1_*Vehicle Disassembly Plant* (Marius Snyders)
2_*Production Facility* (Gerhard Janse van Rensburg)
3_Rebecca Station
4_Industrial Loading platform with crane structure
5_Back Yard area: Movement for trucks
6_Access to yard area
7_Market Storage: Refurbish existing warehouses
8_Agriculture: Utilising old tyres for planting purposes
9_Park Rebecca
10_Informal Trading
11_Building connected with pedestiran platform

Axis A-A_Pedestrian boulevard: Extension of Rose-Ette Street
Axis B-B_Market Area: Paved access road for pedestrians and automobiles (delivery/pick-up)

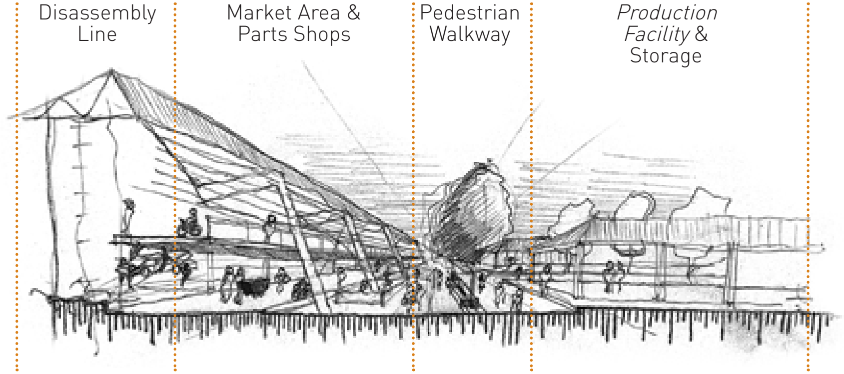


Fig 6.19: Conceptual section through market area, Illustrated by Author 2011

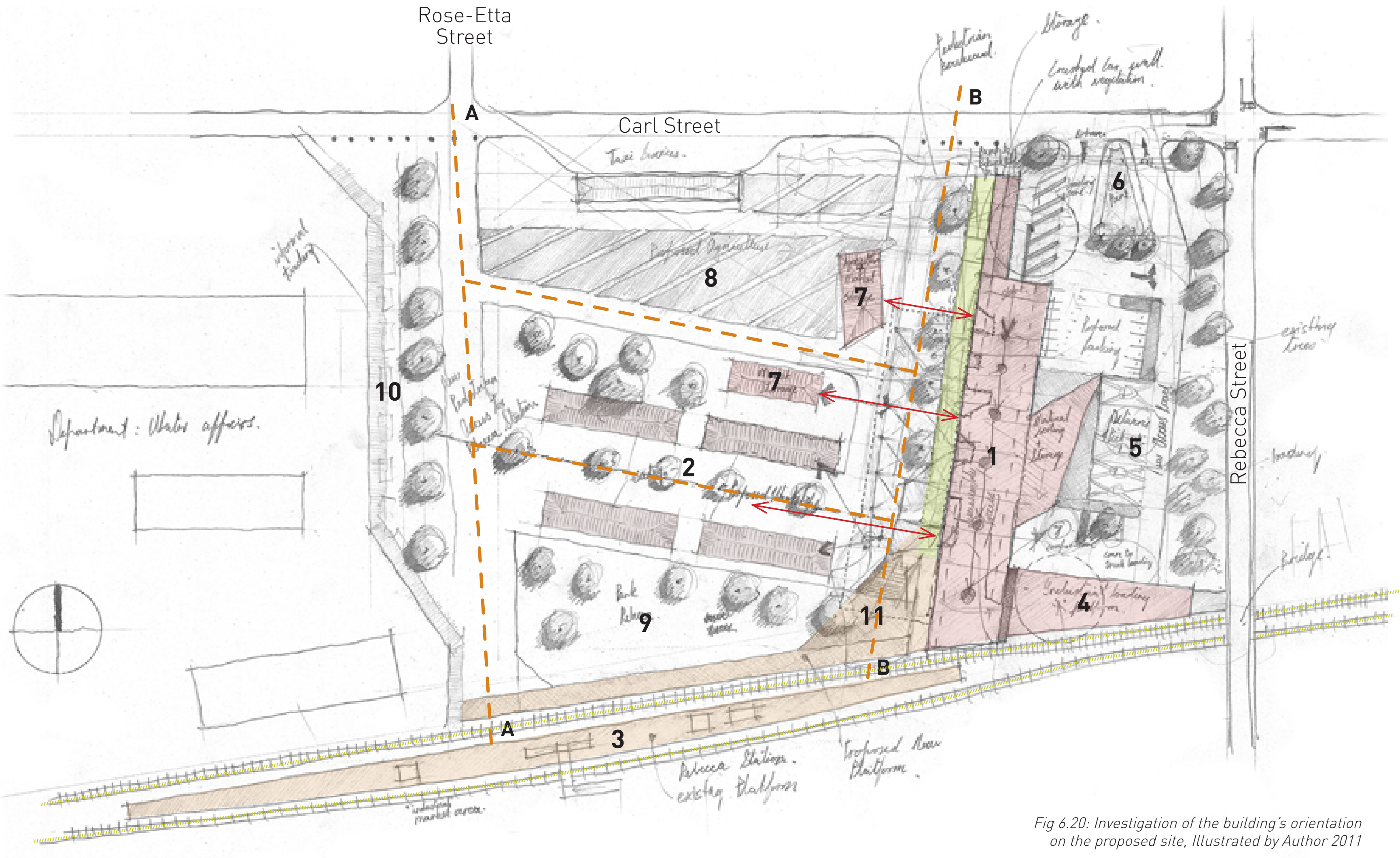


Fig 6.20: Investigation of the building's orientation on the proposed site, Illustrated by Author 2011

6.6 Concept Development

6.6.1 Building Core:

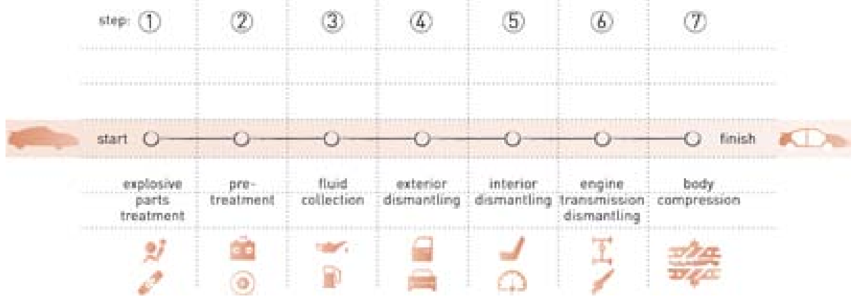
The long and linear form of the building is dictated by the disassembly process (7 stages), which forms the core of the building.

6.6.2 Industrial Circulation:

Each stage of disassembly acts as a point of distribution from where parts move (see 6.2.5 Components Circulation)

Fig 6.21: (Top) Disassembly line, Illustrated by Author 2011

Fig 6.22: (Bottom) Component circulation diagram, Illustrated by Author 2011



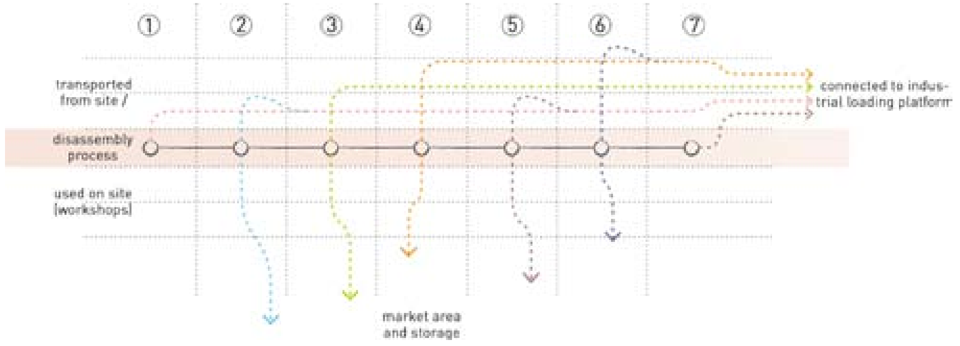
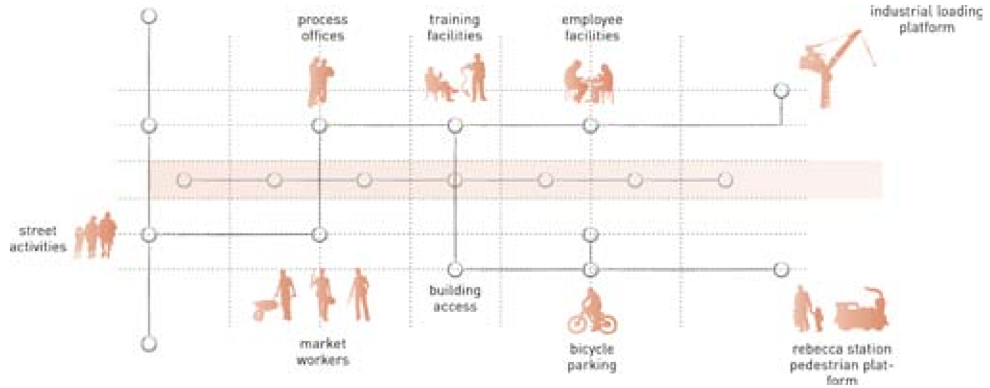
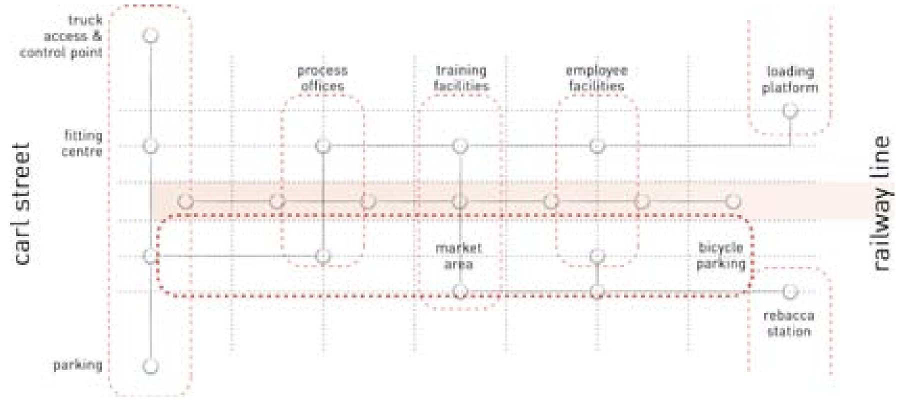


Fig 6.23: (Top) User circulation, Illustrated by Author 2011

Fig 6.24: (Bottom) Cross Programming, Illustrated by Author 2011





6.6.3 User Circulation:

Circulation of the building users (members of the public and the employees) is superimposed on the industrial process, determining public and private spaces within the structure.

6.6.4 Cross Programming:

Starting to orientate the social and administrative programs around the building core.

Concept Model 1

6.6.5 Imposing Structure:

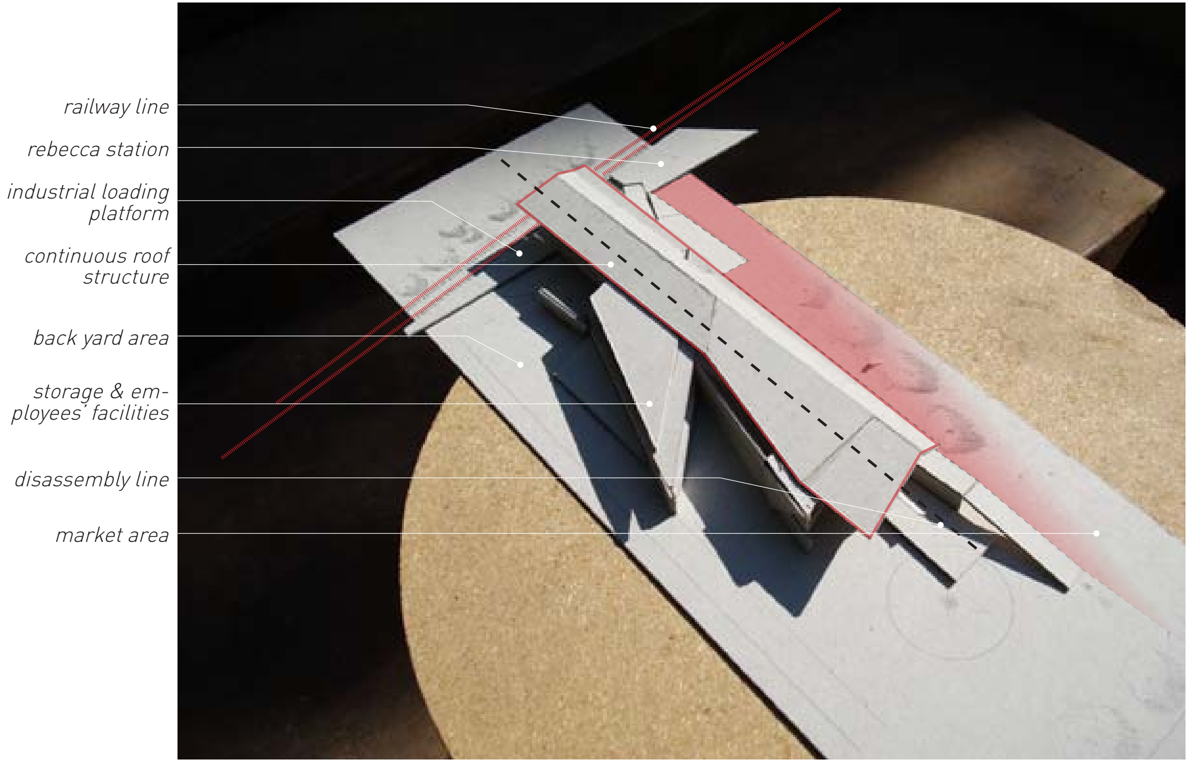
The first concept model aimed to transform the investigated technical flow diagrams and informants into a structure.

The structural approach was to design a building which stands out in its surroundings, a landmark in a context with little urban character. The form of the building was very brutal and imposing in its scale and sharp angles.

The structure consisted of the disassembly line at its core, covered with a single, continuous roof structure.

A separate volume extruding from the eastern façade was dedicated to storage, employees' facilities and other administrative programs on first level.

Fig 6.25: Concept model 1: basic layout, Model by Author 2011



The access route leading from street level towards the pedestrian platform at Rebecca Station aims to be connected by the market.

Movement along the western façade next to the market area would form visual connections with the disassembly process, and through this, generating conversation that would interweave the disassembly process into the urban fabric.

However, it was found that the building's edge was to linear. The process and social activities called for a threshold space to connect these two programs spatially.

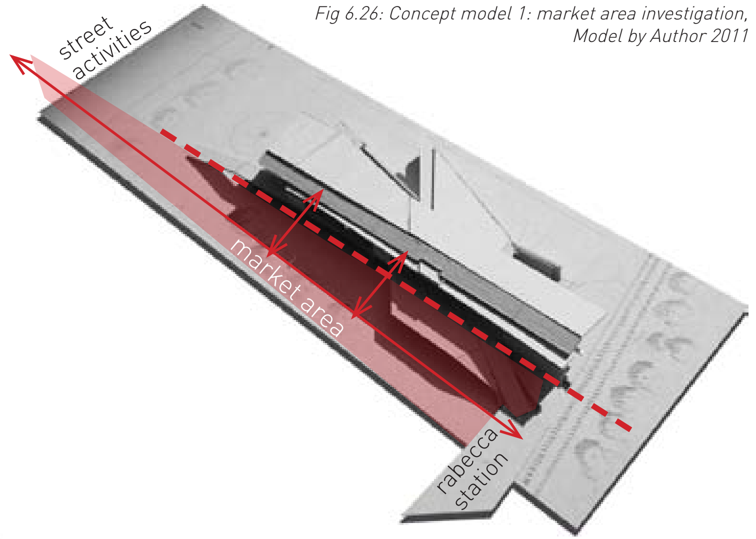
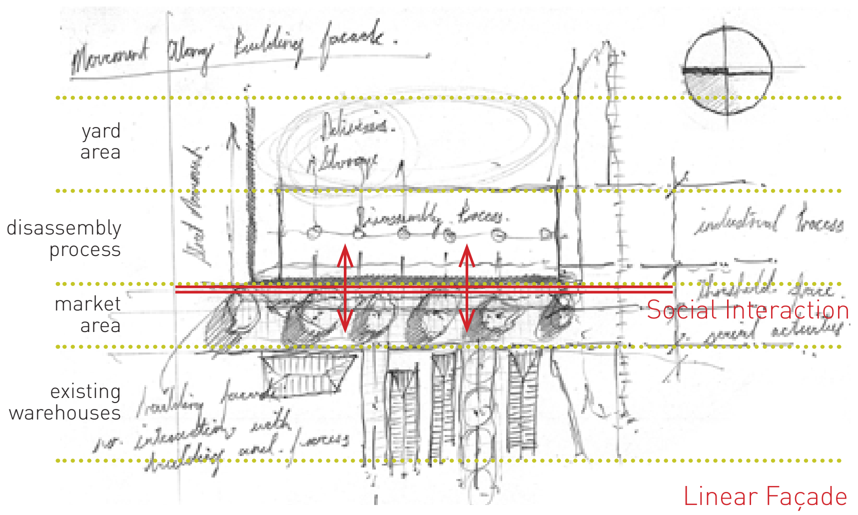


Fig 6.26: Concept model 1: market area investigation, Model by Author 2011



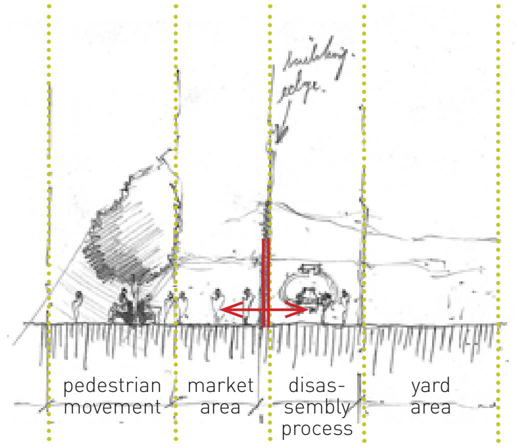


Fig 6.27 & Fig 6.28: Concept drawing of market area, Illustrated by Author 2011

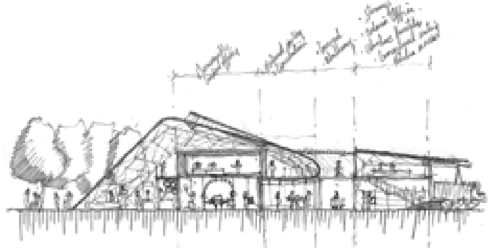
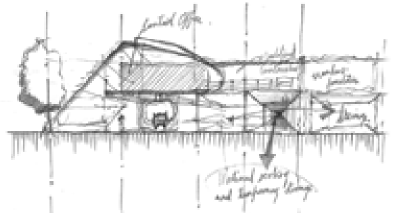



Fig 6.29: Investigating different roof structures, Illustrated by Author 2011

The model started to investigate the circulation within the structure. Access to the building was provided by a ramp stretching from the pedestrian platform into the structure, with another ramp connected to street level.

In order to prevent the building from becoming a 'factory' without any social interaction, additional programs like a café, green spaces and a bicycle parkade was added to the western edge of the disassembly plant.

The initial idea was to draw people who commute by train into the building by providing a bicycle 'park-and-ride' service. A day pass can then be bought to commute to the factories or business within the precinct and back to the plant/station by bicycle.

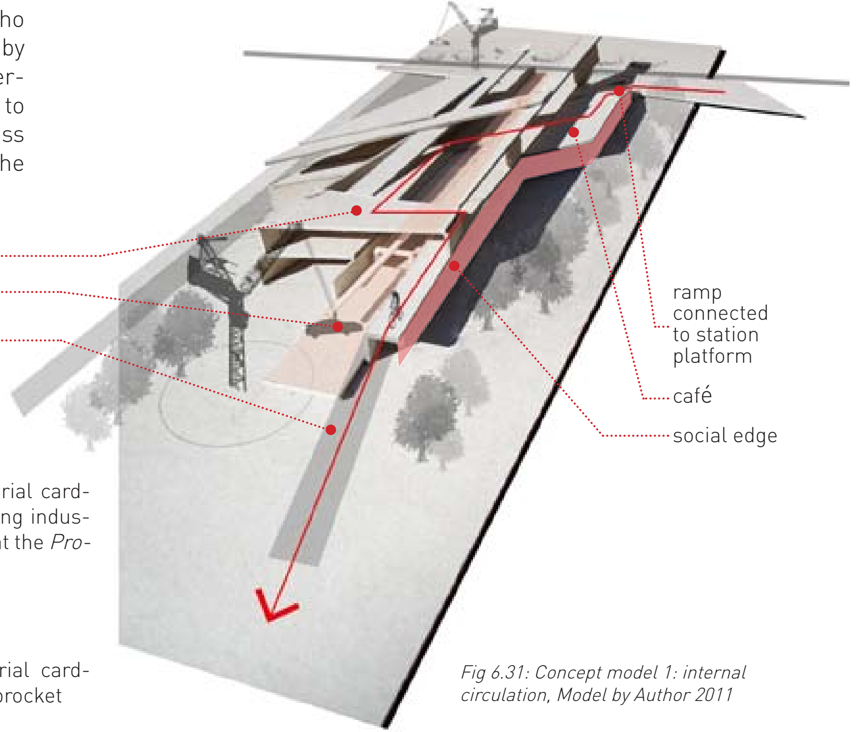


Fig 6.31: Concept model 1: internal circulation, Model by Author 2011

Industrial Cardboard Bicycle

Fig 6.30: Industrial Cardboard Bicycle (Inhabitat 2009)

Bicycles can be made from industrial cardboard obtained from the surrounding industrial warehouses and put together at the *Production Facility.*

Life expectancy: 6 months
Cost: R150
Material: Honeycomb core industrial cardboard; additional: wheels; chain; sprocket

The bicycle 'park-and-ride' would create a space within an industrial building where people move through on foot or bicycles, whilst, in the background, automobiles are disassembled.

Interplay between the disassembly line and the provision of a new sustainable and inexpensive transport mode starts to be created within the structure.

Fig 6.33: Conceptual section with threshold spaces, Illustrated by Author 2011

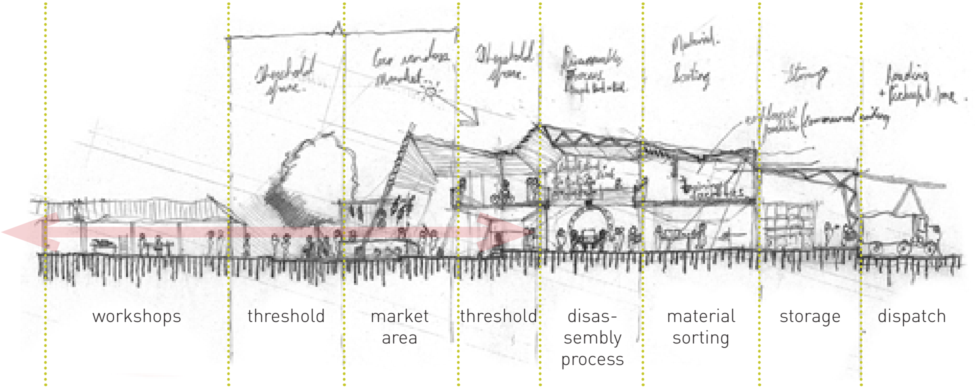


Fig 6.32: Industrial loading platform with crane structure, Illustrated by Author 2011

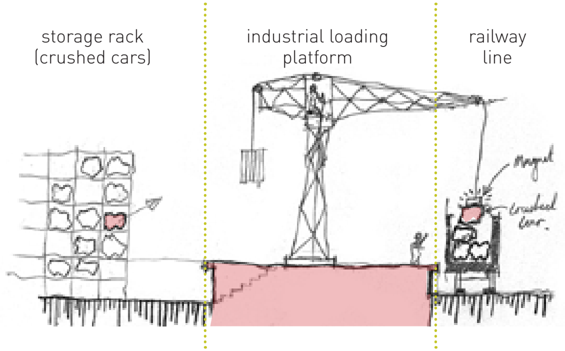


Fig 6.34: Concept model 1: internal circulation, Model by Author 2011

Concept Model 2

6.6.6 Fragmented Structure:

The second approach continued with a similar orientation on the site. However, the solid and brutal planes of Concept Model 1 have been fragmented into small, finer grained planes which wrap around the main structure.

The fragmented structure aims to tie in with the building program of disassembly by exposing the tectonics of the building.

The relationship between the social (yellow) and industrial (orange) circulation/programming were investigated.

With reference to the BMW Central Building precedent study (page 96), the internal organisation is designed to create a constant connection between the process and the social programs. Walkways and thresholds on different levels are designed to achieve this.

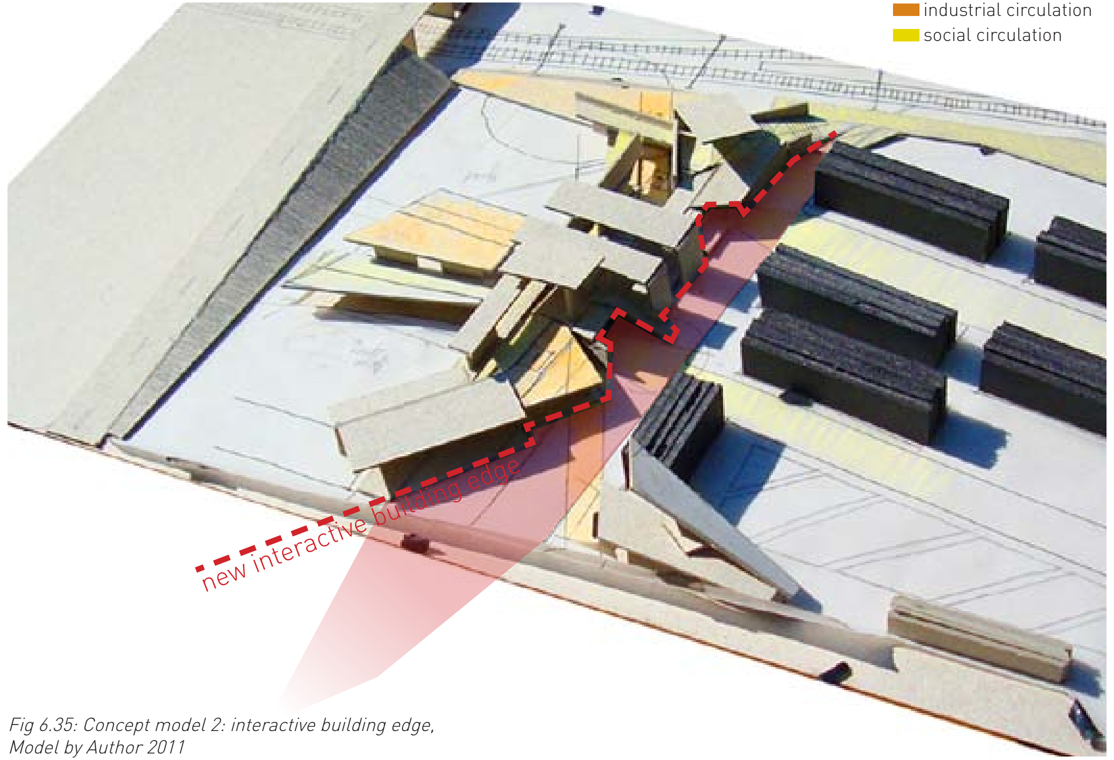


Fig 6.35: Concept model 2: interactive building edge, Model by Author 2011

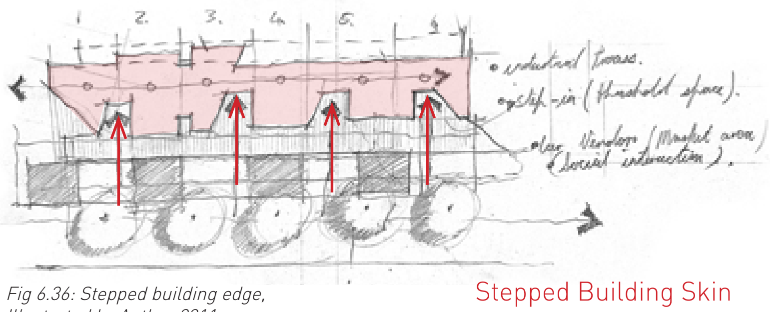
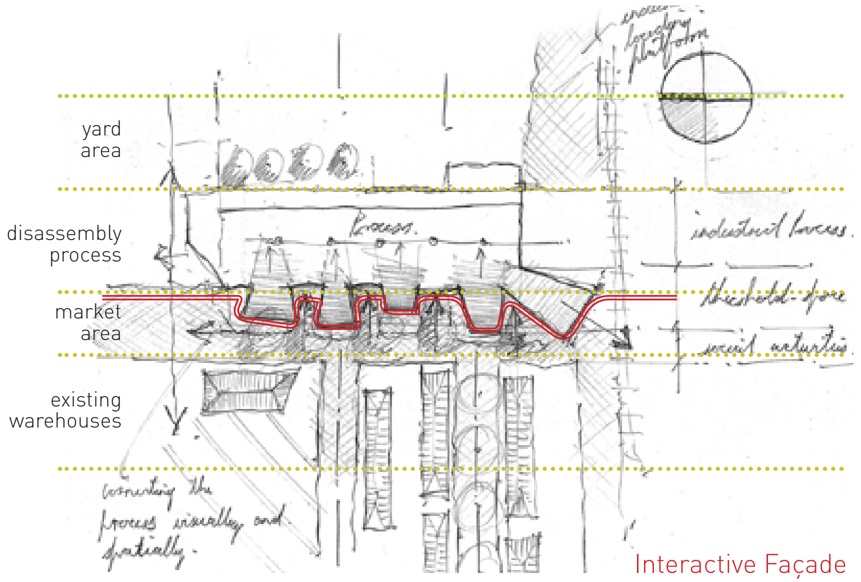


Fig 6.36: Stepped building edge, Illustrated by Author 2011



The building aims to expose the process of disassembly towards the market area by opening up the façade. Market users will constantly be aware of the processes taking place inside the structure.

The linear façade of Concept Model 1 towards the market area has been stepped to create a series of smaller spaces along the building's skin, drawing the outside spaces closer to the structure and disassembly process.

Some of these smaller spaces are dedicated to the market area, while others aim to open up as access cores to the building.

Fig 6.37 and Fig 6.38: Interactive façade as a threshold space, Illustrated by Author 2011

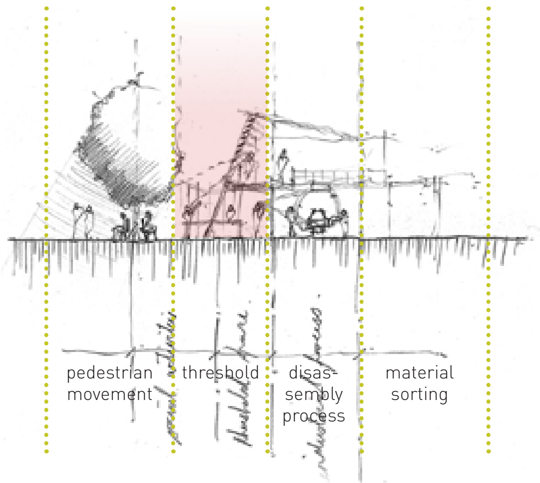


Fig 6.39: Fitting centres in Zeller Street, Pretoria West, Photos by Author 2011

The interaction between the street edge and the structure was investigated. The big industrial structure should connect to the street on a sensitive level with the appropriate scale and supporting programs.

A fitting centre was introduced to accommodate the market area if automotive parts needed to be installed on automobiles.

The urban quality of Pretoria West of fitting centres opening up onto the street is captured here, also forming/framing the entrance to the market area.

With reference to the Wannenburg Scrapyard precedent study (page 90), the administration offices and reception counter will be the first contact from street level.

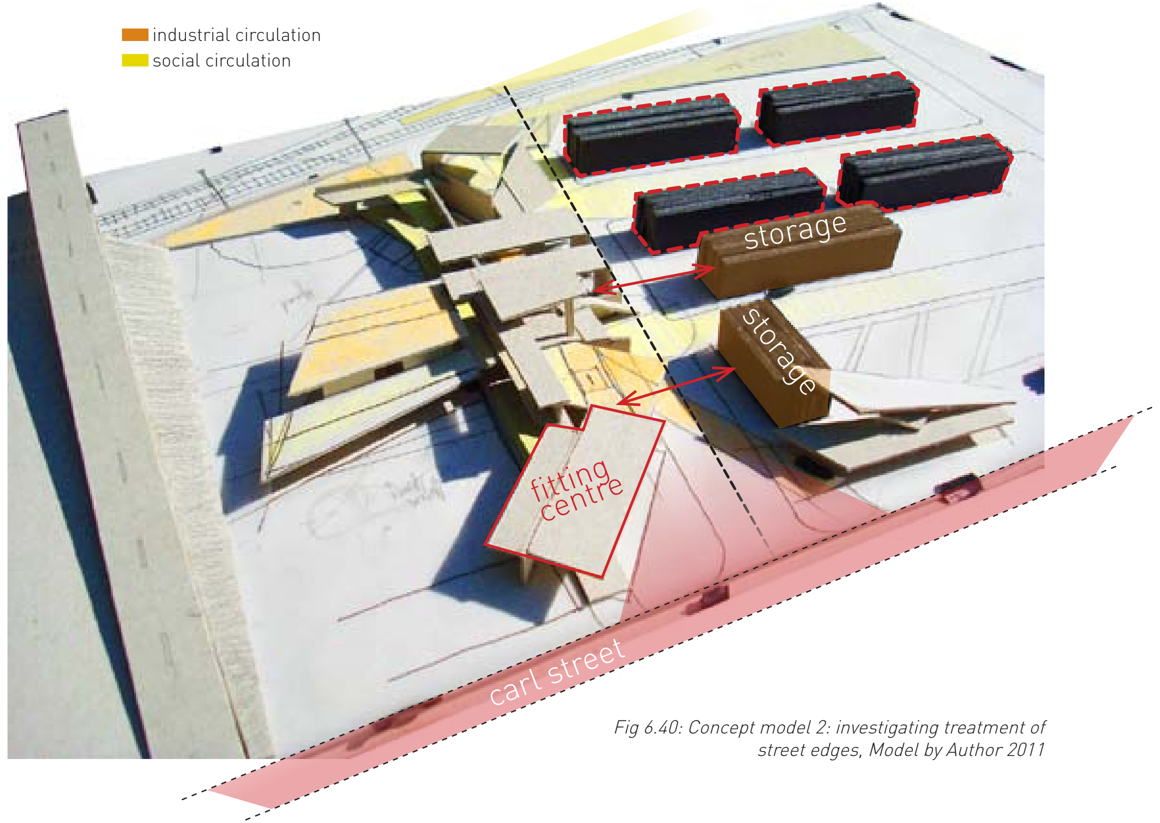


Fig 6.40: Concept model 2: investigating treatment of street edges, Model by Author 2011

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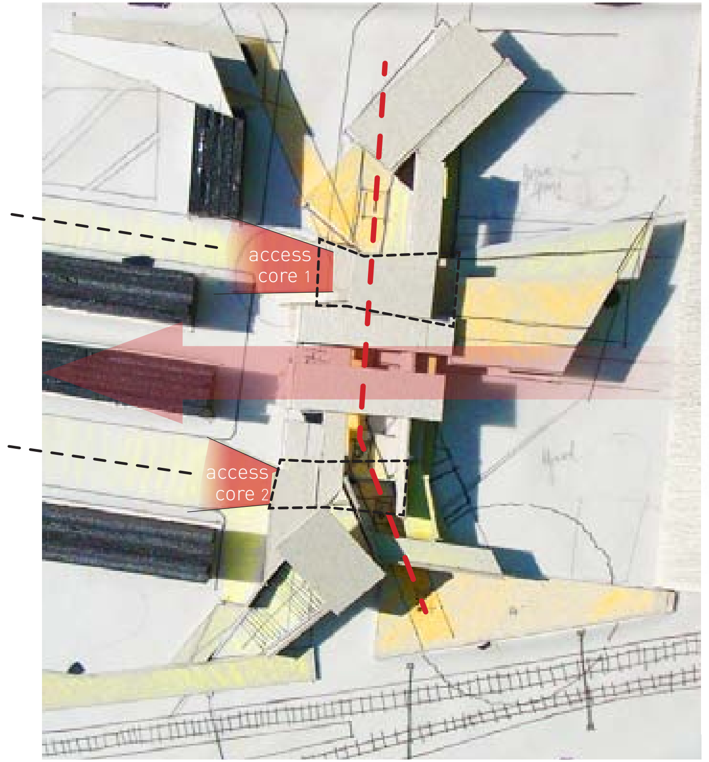
Fig 6.41: Concept model 2: building access cores, Model by Author 2011



The two access cores line up with the pathways formed by the existing warehouses. These cores are connected to a network of elevated walkways within the structure.

Threshold spaces are formed where the yellow walkways cross/connect to orange spaces - the industrial processes are not directly accessible to the general public due to safety regulations.

However, the structure is perceived as a transparent arrangement of spaces when moving through it due to the structure's steel construction (Chapter 7 - Technical Development).

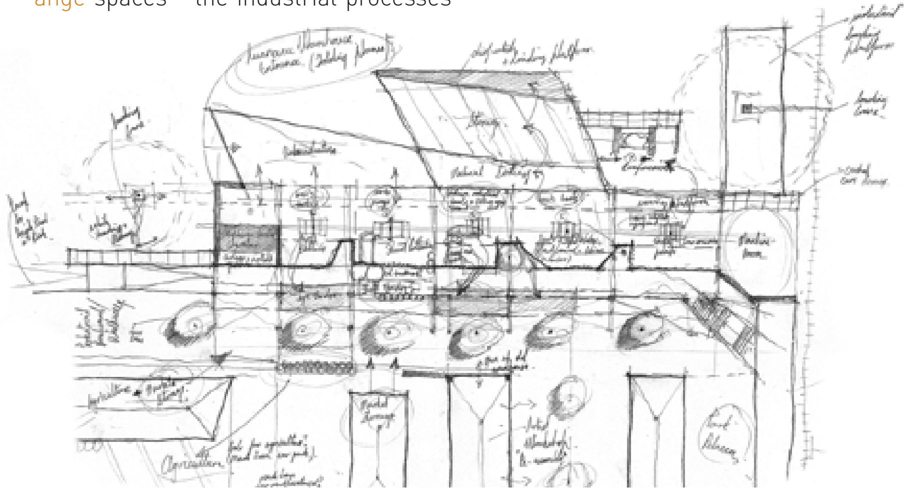


Fig 6.42: Concept drawing of the building layout, Illustrated by Author 2011

Concept Model 3

6.6.7 Combination of Structures:

The third approach aimed to combine valuable lessons learned from Concept Models 1 and 2:

The building as a landmark within its context has been maintained, however the imposing structure proved to hinder the functionality of the process. The sharp edges and angles of the structure resulted in awkward spaces for a process inside the building. A more conservative approach has been opted for.

The stepped building façade and fragmented building structure from Concept Model 2 have been incorporated in this investigation. Exposure of the structural tectonics and display of the disassembly process has also been included in Concept Model 3

The model revisited the core concept of the seven stages of disassembly and the flow/circulation of parts.

These two fundamental concepts were connected back with the idea of stepping the building edge and a fragmented structure.

The structure aimed to articulate every stage of disassembly as a separate workshop, but, at the same time, connecting the structure as one entity.

Offsetting each stage from the process line with the different floor areas (page 114-115) meant that new spaces were starting to be formed along the structure.

* Only six stages form part of the building in this concept, stage 7: *Body Compression* has been incorporated with the industrial loading platform next to the railway line

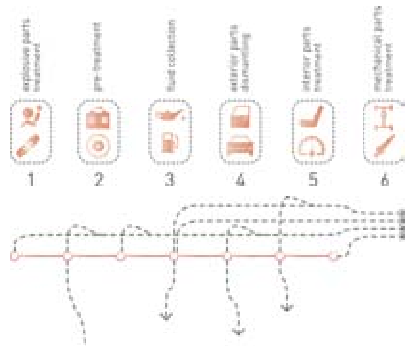


Fig 6.43: (Above) Flow Diagram, Illustrated by Author 2011

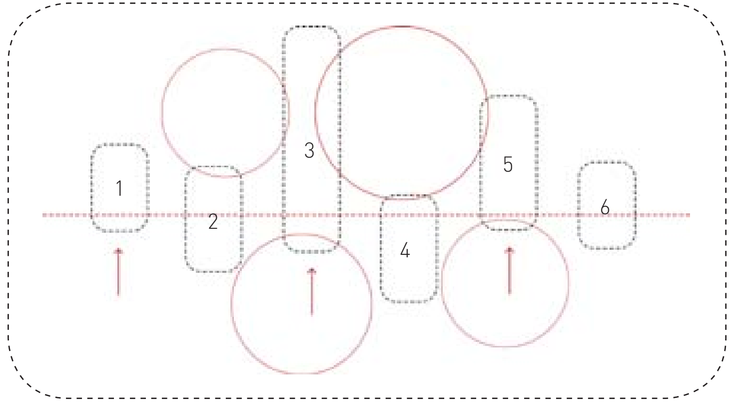


Fig 6.44: Parti Diagram, Illustrated by Author 2011

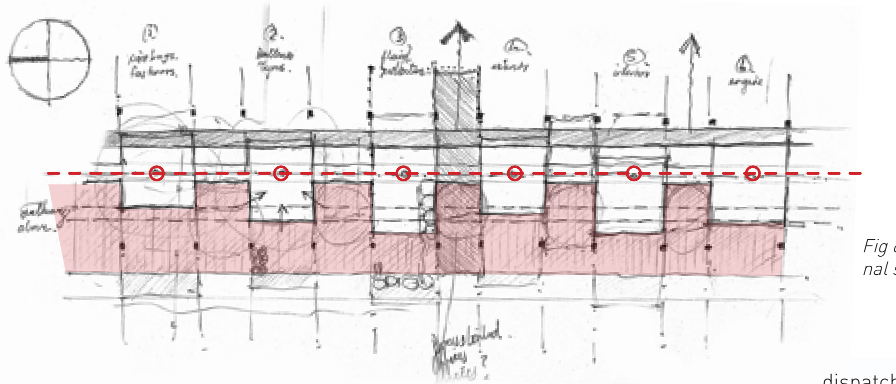


Fig 6.45: Concept drawing of internal and external spaces, Illustrated by Author 2011

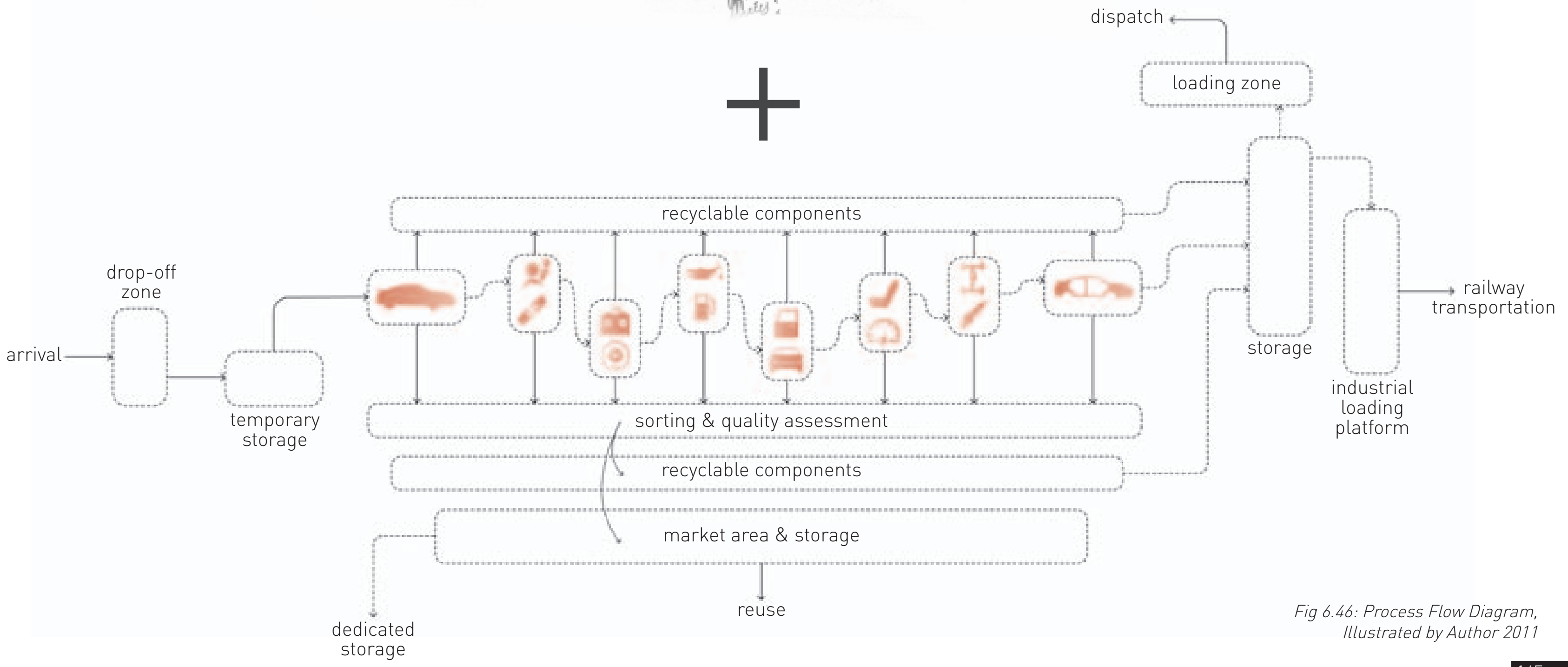


Fig 6.46: Process Flow Diagram, Illustrated by Author 2011

The concept was further developed into a sketch where the layout of the building plan started to display the relationship between Concept Model 3 and the process diagram.

The spatial layout of the yard area started to take form, looking at the circulation (turning circles) of trucks for deliveries and pick-ups.

Facilities for the employees (rest rooms, lockers, bathing facilities, communal eating hall and kitchen) are extended to the east, extruded as a separate volume. Through this, the employees are separated from the industrial process during lunch breaks, also, providing the space with enough exposure to daylight.

The workshop area, where repair work is done, is treated in a similar fashion. The two volumes frame a social green space for the employees and is covered from the yard area with trees and landscaping.

Fig 6.47: Site circulation and plan layout, Illustrated by Author 2011

Composition of Concept:

1_Disassembly line
2_Circulation corridor for recycled materials
3_Multi-functional tower with 'wind catcher'
4_Fitting Centre
5_Start of disassembly line
6_Emplyees' Facilities
7_Workshop/Laboratory
8_Market Shading structure
9_One of seven disassembly workshops
10_Rebecca Station

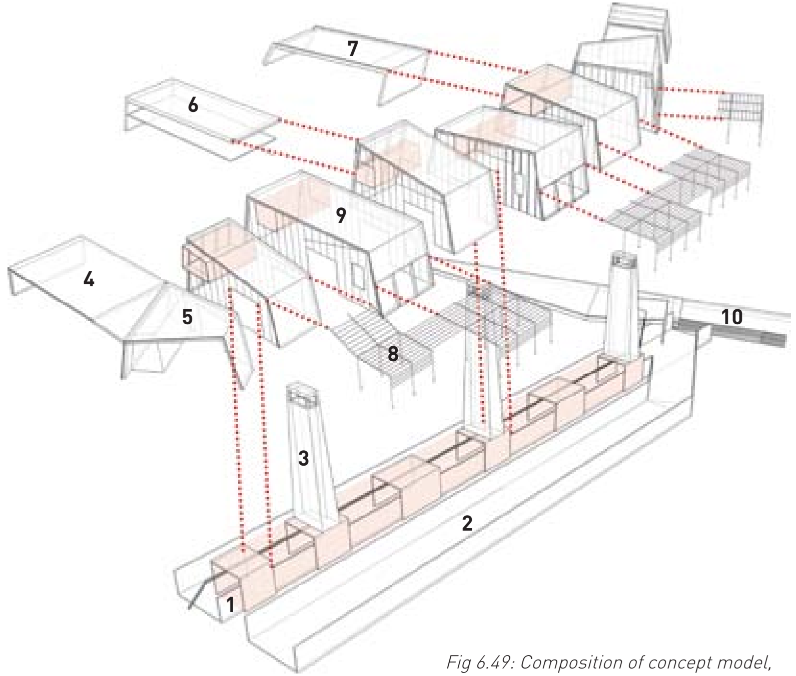


Fig 6.49: Composition of concept model, Model by Author 2011

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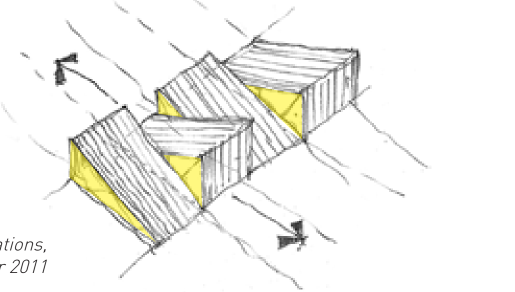

Fig 6.48: Module configurations, Illustrated by Author 2011

Concept Model 3 is constructed with a series of steel structures wrapping around each step of disassembly. By moving the structures away from each other, daylight can filter through into the structure.

The market structure aims to act as a shading device for the building's western façade and forms spaces for the display of parts in the market area.

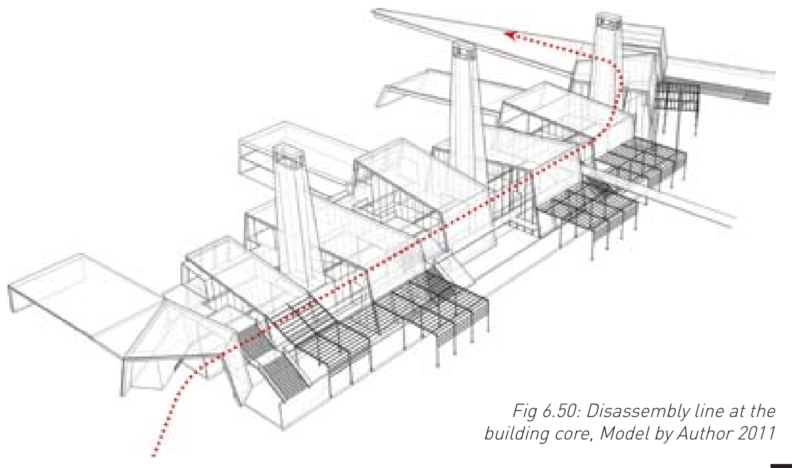

Fig 6.50: Disassembly line at the building core, Model by Author 2011

Tower Structures:

With reference to the *Centre for Global Ecology* precedent study (page 108), three tower structures has been introduced as part of the structure.

The main function of these towers is to extract heat, generated in the workshops. This extraction of heat forms part of a trombé stack, and the system is situated on the plane facing north.

The second function is to cool down the workshops in warm summer months. The system is composed of an evaporative cooling tower, and is situated on the cooler southern face of the main tower structure.

The towers will be designed to enhance the idea of the structure as a landmark in Pretoria West.

*The tower structures will be discussed in detail in Chapter 7 - Technical Development

Fig 6.51 and Fig 6.52: Passive cooling system - Evaporative cooling tower, Model by Author 2011

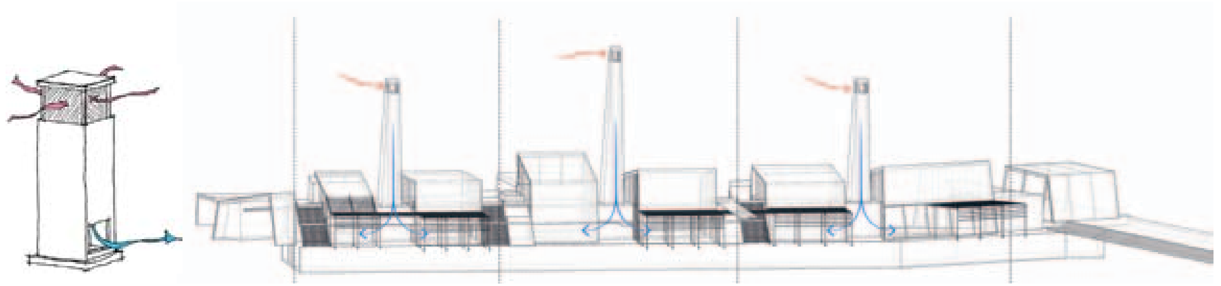

Fig 6.53: Centre for Global Ecology (Carboun 2010)

Fig 6.54: The burj al hawwa (Rafeek Manchayil 2010)

Fig 6.55: A portion of the old quarter of Dubai, Near Creek (Rmnathan 2010)

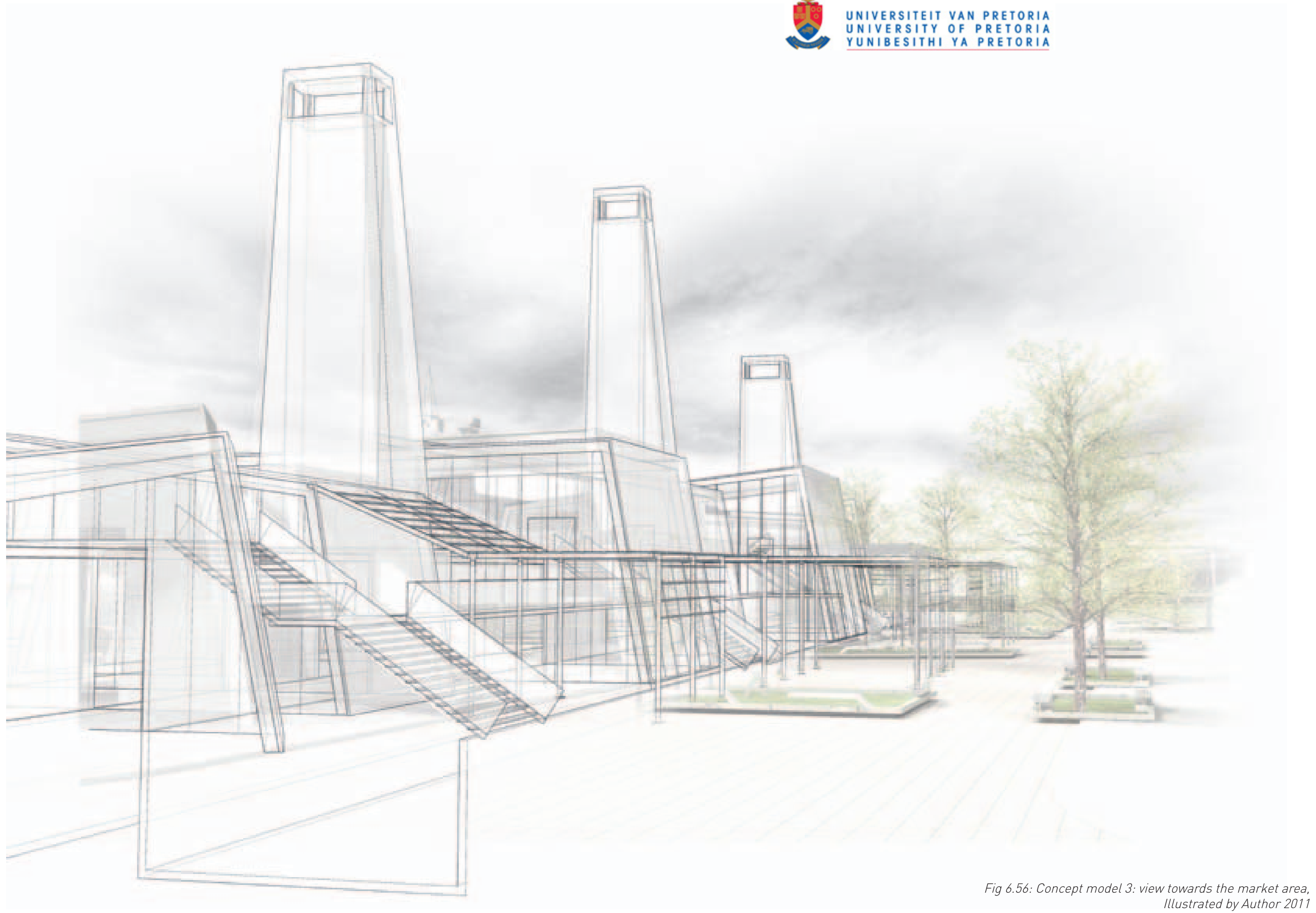

Fig 6.56: Concept model 3: view towards the market area, Illustrated by Author 2011

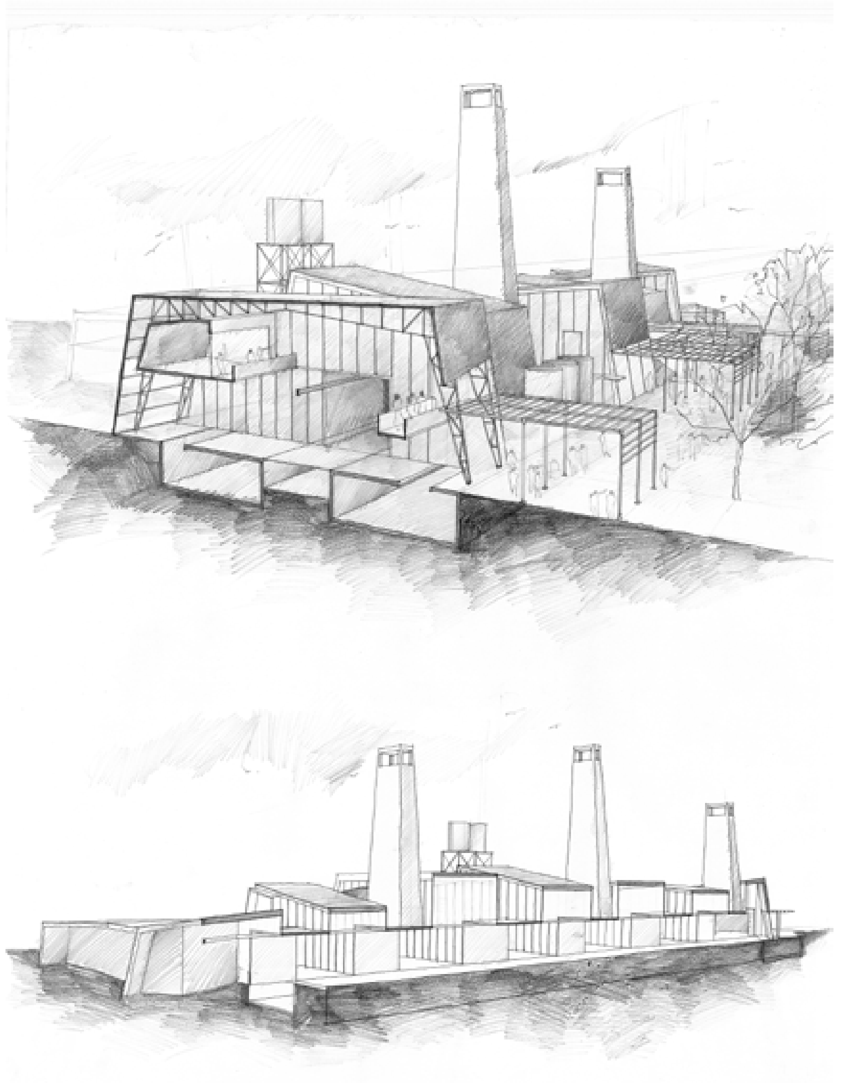

Fig 6.57: Concept model 3: section drawings, Illustrated by Author 2011

Proposed Building Programs

Disassembly process:

1
- Drop-off zones
- Automobile logging office
- Temporary storage
- Disassembly workshops
- Material / Component sorting
- Repair workshop / Quality assessment
- Storage
- Electrical / Machine room
- Deliveries & Dispatch / Waste collection

Yard Area:

2
- Access for heavy automobiles
- Industrial loading platform
- Crane structure
- Temporary storage
- Loading Zone
- Waste Collection

Employee facilities:

3
- Training facilities
- Rest rooms
- Locker rooms / Shower facilities
- Communal kitchen & eating hall
- Outdoor green space & social area

Administration

4
- Admin / Management offices
- Boardroom
- Process offices

Market area:

5
- Car parts shops
- Market storage
- Pay points

Fitting Centre:

6
- Workshops
- Reception & Waiting area
- Rest rooms
- Management Office

Rebecca Station based functions:

7
- Bicycle service
- Connection Park / Green space
- Kiosk

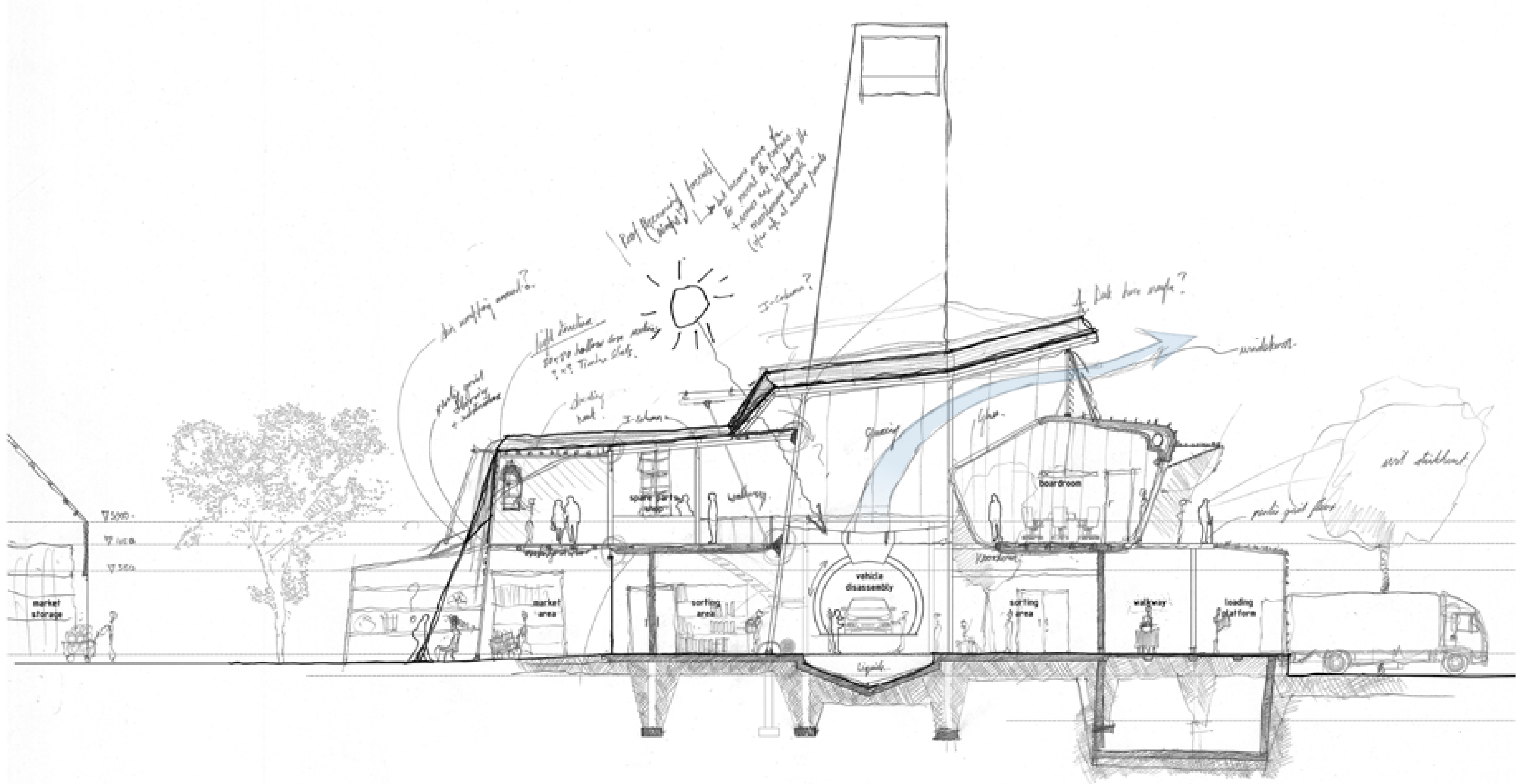

Fig 6.58: Conceptual section investigating the spatial relationships, Illustrated by Author 2011

Fig 6.59: View of Concept model 3 (A) in context with the proposed Production Facility (B), Illustrated by Author 2011

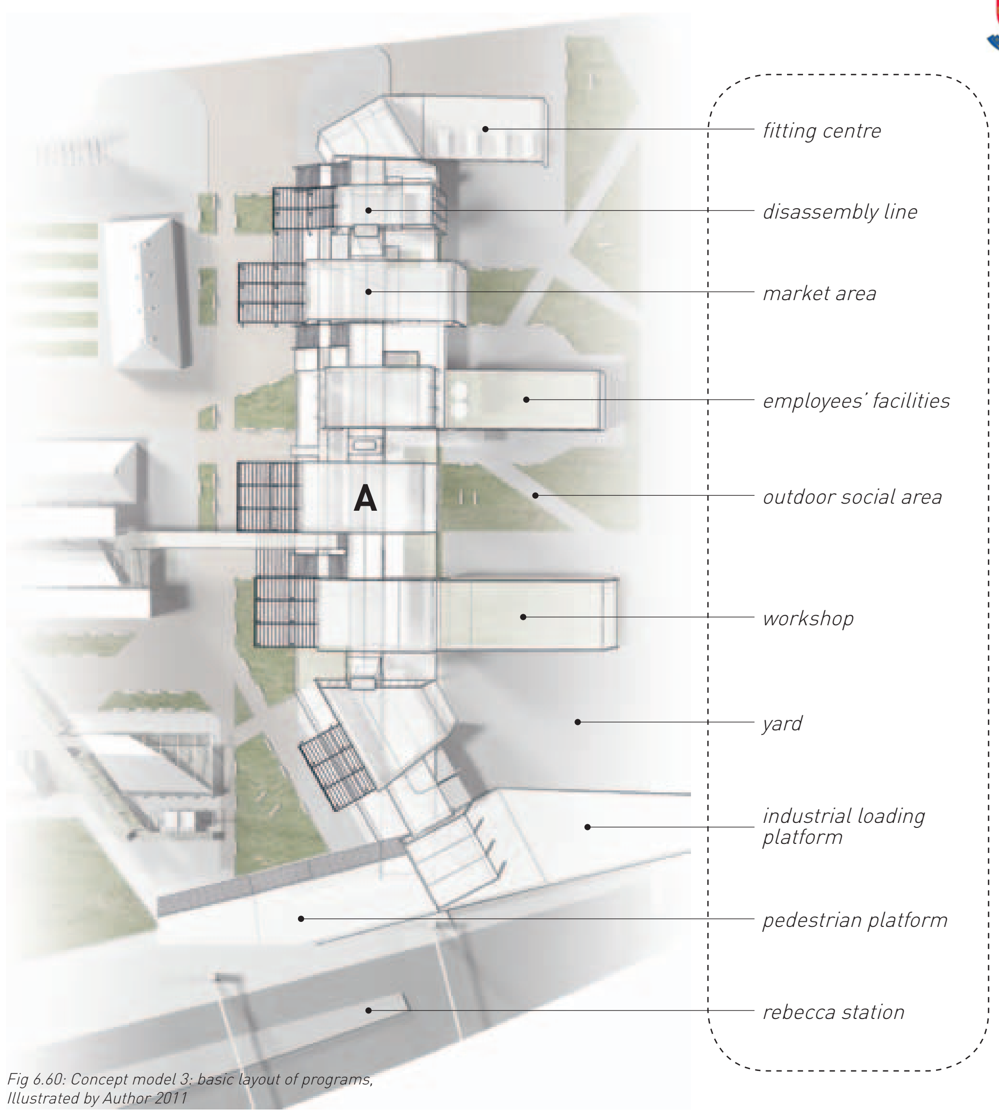

Fig 6.60: Concept model 3: basic layout of programs, Illustrated by Author 2011

Conclusion:

Concept Model 3 will form the basis for the technical development.

The design is not final as illustrated here, as all the investigated elements will be revisited in Chapter 7 to form the final design proposal.

The structure of the proposed industrial building will add much needed character to the basic form decided upon in *Concept Model 3*.

The composition of this structure aims to form a link with the process of disassembly of products. The building itself, should become a product designed for disassembly.