
*Fig 5.1: Photo Collage of the Pompidou Centre, Paris, France (Pirate Shrooms 2011)*

# 05 precedent studies

*Fig 5.2: (Opposite) View of Harmania Office Green Wall (Triptyque 2008)*

# Introduction

A precedent should be studied to stimulate the designer, whilst informing the design process through specific qualities and aspects.

This chapter evaluates existing projects that are similar to this thesis proposal. The projects were selected for their functional, typological, theoretical or thematic similarities.

The precedent studies focused on the following premises:

- Wannenburg Scrapyard: an example of a local business to aid in the understanding of the day-to-day requirements of the project

- BMW Central Building: the relationship between production processes and the user of the building

- Masons Bend Community Centre: adaptive re-use of alternative and cheap material resources

- Harmania // 57 Office Building: a building as a passive ecosystem

- Centre for Global Ecology: understanding the application of a cooling tower as a primary cooling system

## 5.1 Project: Wannenburg Scrapyard, 2000-Present
## Location: Pretoria, South Africa

Aim of Precedent: Serves as an example of a local scrapyard to aid in the understanding of the day-to-day requirements of the project.

### *5.1.1 Purpose:*

In essence, the Wannenburg Scrapyard is an example of what the proposed disassembly plant aims to achieve - the re-use of old car parts and materials.

Even though the proposed project intends to work with a larger number of cars at a faster rate, this precedent is of high value. Aesthetically, the precedent does not contribute to the proposed design, but the process will have an influence on how the proposed Disassembly Plant will function.

The business procedure and site operation will be critically analysed in order to inform the design of the project.
The precedent also aims to convey the fact that there is a demand for facilities specialising in disassembly of end-of-life automobiles.

*Fig 5.3: Panoramic view of the storage area located at the back of the premises, Photo by Author 2011*



### *5.1.2 Business Procedure:*

The scrap yard operates fundamentally the same as any other 'cash-for-scrap' business, where old and broken goods are bought, sorted, repaired and redistributed to the public or other recycling facilities to generate an income.

The automobiles, normally fresh from an accident or break down, are bought at auctions for discount prices. Flatbed trucks transport the automobiles to the site where they are stored in the back yard for disassembly.

When arriving on site, the automobile is logged and given a log number. When the time comes for the automobile's disassembly, all the disassembled parts which can be re-used are listed on the database under the automobile's log number. The parts and components are then logged and stored in the yard area.

This process, when applied thoroughly, works well. Once a customer requests a specific part, the system can be checked for stock or a disassembly schedule can be created to determine a time/date upon which a part will become available for purchase.

This business procedure will be applied to the site circulation and plan layout of the proposed disassembly plant.


*From top, left to right:*
*a. Automobiles transported to site on flatbed trucks*
*b. Forklift for moving automobiles in back yard*
*c. Storage of disassembled vehicles before compression*
*d/e. Disassembly of a vehicle*
*f. Storage ruck with different nuts and bolts*

*Fig 5.4: Photo collage of automobiles arriving on site and disassembly, Photos by Author 2011*


Fig 5.5: Photo Collage of storage arrangements for different components, Photos by Author 2011

### *5.1.3 Unofficial/Informal 'Market':*

The site consists of two main aspects: the payment/reception counter on street level and the yard situated at the back of the site.

The reception counter acts as a threshold space between the street and the yard and is the first space the user is exposed to. From here one moves through to the back yard, which operates as an informal market area where the different components and parts are displayed.

Of the five visited scrap yards, Wannenburg was the most welcoming, allowing me to browse around and take photos on my own. However, the other scrap yards gave the impression that customers are not welcome in the back yard, making it feel more like a private storage space than a market area supplying used car parts. These spaces also made me feel unsafe whilst moving through them alone.

The proposed project aims to re-address the manner in which the back yard space of a typical scrapyard operates. A market area forms part of the disassembly plant's programme, intended to make the user feel save and wanted in the space whilst browsing, creating a space with social interaction.

*From top, left to right:*
*a. Storage rack for boots*
*b, Tyres and petrol pumps*
*c. Interior door panels*
*d. Exterior door panels*

*Fig 5.6: (Opposite) Automobile bodies are sent away to be compressed and recycled, Photo by Author 2011*

## *5.1.4 Storage:*

Storage and display racks play an important role in the efficiency of the business. Firstly, space is limited, requiring storage to be economical, and secondly, the wide spectrum of parts requires custom made storage racks to achieve maximum storage capacity.

A thoroughly designed storage system ensures a well organised stock of components, which is often one of the main problems facing scrap yards, resulting in theft and other security problems.

In the Wannenburg Scrapyard, innovative use of available and inexpensive steel members (pipes, rods, sections and sheeting) for storage and display racks contributes to the character of the site. Maximum storage is achieved with minimum use of materials.

The proposed design aims to incorporate the following aspects regarding storage:

- Maximum storage capacity in relation to floor area
- Ease of movement and storage of parts
- Clear display of available stock in market area
- Placement of storage to allow for passive security
- Innovative design of different storage racks

*From top, left to right:*
*a. Storage rack for glass panels*
*b, Covered storage for suspension modules*
*c. Seat belt fasteners*
*d. Brake callipers*

*Fig 5.7: Photo Collage of storage arrangements for different components, Photos by Author 2011*

*From left to right:*
*a. Storage for smaller components*
*b. Bonnet/boot storage racks*
*c. Interior components and upholstery*
*d. Petrol tanks*

*Fig 5.8: Photo Collage of storage arrangements for different components, Photos by Author 2011*

## *5.1.5 Influences:*

- Innovative use of materials
- Hierarchy of spaces: the different thresholds
- Back yard as an informal market area
- Adequate storage space

## *5.1.6 Application:*

The precedent aims to inform the day-to-day activities of the proposed disassembly plant. The process of disassembly is not as ordered and technologically advanced as that of an assembly plant, however, existing businesses like the Wannenburg Scrapyard is a good example of how this industry operate in the area of Pretoria West.

# 5.2 Project: BMW Central Building, 2003-2005
# Location: Leipzig, Germany
# Architects: Zaha Hadid Architects

Fig 5.9: Central Building in context (ArcSpace 2006)

Fig 5.10: Relationship between assembly process and office space (ArcSpace 2006)

Aim of Precedent: To investigate the relationship between production processes and the user of the building.

## 5.2.1 Purpose:

The building is the result of an architectural competition held by BMW with the aim to connect the three existing industrial production buildings (auto bodies fabrication, paint shop and assembly hall), all of which play an integral part in the production of BMW's 3 Series.

The Central Building functions as the core, serving as the link between the assembly process steps and the employees. The activities and processes of the whole factory complex gather at the Central Building, where they branch out to different production points again. The building is designed as a series of different overlapping and interconnected spaces and levels, creating a unified whole between the cars, visitors and employees through constant interaction (Zaha Hadid Architects 2005).

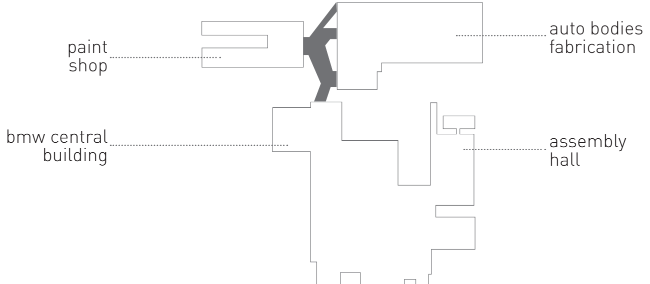


Fig 5.11: Position of the Central Building, Illustrated by Author 2011

## 5.2.3 Materials used:

- Cast in-situ concrete structure
- Structural steel beam and space frame roof
- Corrugated metal sheeting
- Glass curtain walls

## 5.2.4 Application:

The precedent study aims to inform the connection of social and industrial spaces in the proposed project. The relationship, hierarchy and interaction between these spaces will be investigated to ensure program cohesion.

Fig 5.12: Elevated conveyor system (ArcSpace 2006)

## 5.2.2 Influences:

- Elevated conveyor system, transporting partially assembled cars to one of the three existing industrial buildings, blue LED lights illuminate the vehicles as they become more and more complete each time they return to the Central Building.
- Converging flows - All the spaces catering for the employees (offices, meeting rooms, public relations facilities and social spaces) are inhabited by the elevated conveyors, creating an interesting relationship between the industrial and social activities of the building.

## 5.3 Project: Masons Bend Community Centre, 1999-2000
## Location: Masons Bend, Alabama, USA
## Architects: Rural Studio - Auburn University

Aim of Precedent: Adaptive re-use of alternative and cheap material resources; tectonics of the structure.

### *5.3.1 Purpose:*

Located on a site privately owned by three extended families that make up the community, a small group of Rural Studio thesis students designed and built the centre based on the community's needs.

The proposal included a public, multifunctional, open-air space in the form of a transportation stop (used by the local mobile library and health centre) and a small chapel. The chapel is utilized by the local prayer group and also serves free school meals to children in the summer months (Forrest Fulton Architecture 2009).

### *5.3.2 Influences:*

- Achieves impressive effect with a small budget
- Innovative use of alternative and cheap material resources, improvised construction techniques - the structure's most striking feature is the glass and aluminium roof constructed of salvaged car windshields obtained from a local scrap yard.
- The collection of different materials and fixing mechanisms creates a temporary character, a structure than can easily be disassembled and put together on another site – the architecture language adapts to the multifunctional nature of the space.

*Fig 5.13: Masons Bend Community Center, Rural Studio 2000 (Forrest Fulton Architecture 2009)*

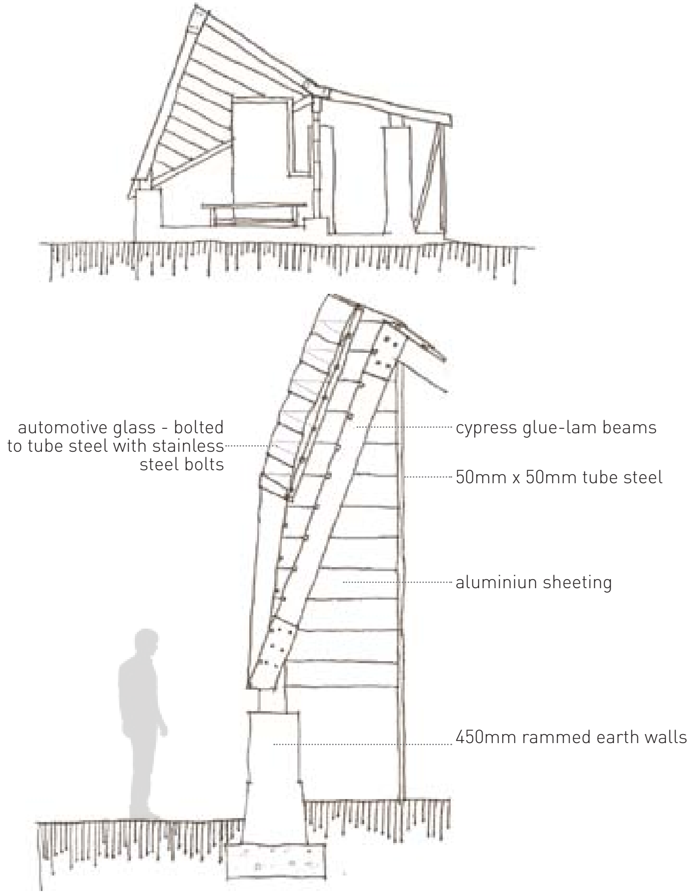


*Fig 5.14 & 5.15: Section indicating structure elements, Rural Studio 2000, Illustrated by Author 2011*

*Fig 5.16: Views of building structure and materiality, Rural Studio 2000 (Forrest Fulton Architecture 2009)*

### *5.3.3 Materials used:*

- Rammed earth walls
- Cypress glue-lam beams
- Steel tube sub-structure
- Aluminium
- Automotive glass
- Stainless steel bolts

### *5.3.4 Application:*

The "lightness" and proportion of the structure as a building skin, as well as the effective use of materials, will be investigated and applied to the car part vendors/market area of the proposed building.

## 5.4 Project: Harmonia // 57 Office Building, 2006-2008
## Location: Sao Paulo, Brazil
## Architects: Triptyque Architects

*Fig 5.17: Views of the organic concrete walls and externally placed systems (Triptyque 2008)*

Aim of Precedent: Investigation of a building as a passive ecosystem

### *5.4.1 Purpose:*

The walls are thick and covered externally by a vegetal layer that works like the skin of the structure. This thick wall is made of an organic concrete that has pores, where several plant species grow, giving the façade a unique look.

In this 'machine', where the rain and soil waters are drained, treated and reused, a complex ecosystem is formed within the local. This ecosystem is a multifunctional universe made of several intercon-nected machines (Triptyque 2008).

### *5.4.2 Influences:*

• Exposed inner workings of the different systems on the building façade (pipelines, pumps and treatment systems are presented as veins and arteries of a living body).
• Cut openings in the concrete mass, framed with a concrete 'lip'.
• Green walls and mist irrigation system
• Adjustable timber shading doors - the building can be closed of to-wards street level

*Fig 5.18: An ecosystem where rain- and soil water are drained, treated and re-used (Triptyque 2008)*

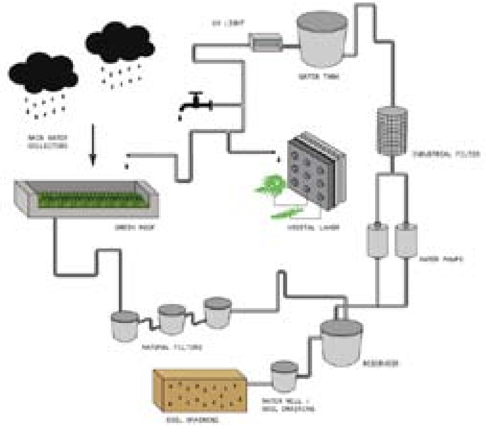

*Fig 5.19: Adjustable timber shading mechanisms (Triptyque 2008)*

*Fig 5.20: Irrigation system on façade (Triptyque 2008)*

### *5.4.3 Materials used:*

• Timber shading elements
• Steel sub-structure
• Organic Concrete with 'pores'
*(Organic concrete has a permeable surface which allows plants to grow out of it. (Inhabitat 2005).)*

### *5.4.4 Application:*

Implementation of passive systems and the inter-relation-ship between these systems: Rain water harvesting (green roof), filtering system, irrigation of green walls and the mist system, regulates interior temperatures.

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## 5.5 Project: Centre for Global Ecology, 2003-2004
## Location: Stanford, California, USA
## Architects: EHDD Architecture

Aim of Precedent: Application of a cooling tower as a primary cooling system

### *5.5.1 Building Systems:*

The design of the centre responded to the climatic conditions with a number of passive and active design strategies.

The building consists of a mix of natural ventilation and mechanical ventilation, known as mixed mode ventilation, allowing the building to save energy on mechanical ventilation and cooling only in the spaces that need them at the times where natural ventilation is not sufficient.

As a general rule, offices are naturally ventilated using operable windows and ceiling fans, and cooled using a radiant slab, while lab spaces requires a higher level of ventilation and cooling and thus resorted to mechanical solutions.

The design also includes natural ventilation of the main building lobby using a wind tower, common in traditional islamic architecture (Carboun 2010).

*Fig 5.21: Views of the building's cooling tower and foyer entrance (Carboun 2010)*



*Fig 5.22: Views of roof openings for maximum daylight exposure (Carboun 2010)*

*Fig 5.23: Section describing the 'Night Sky' cooling system (Carboun 2010)*

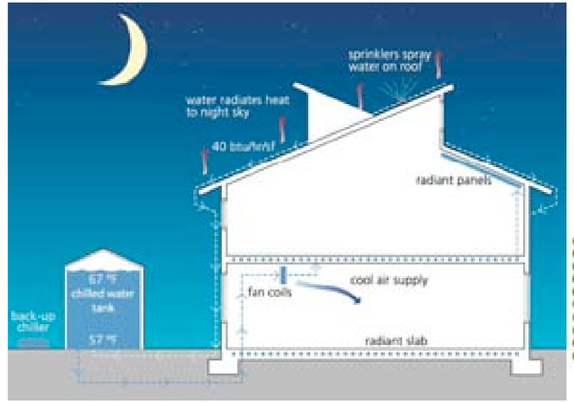
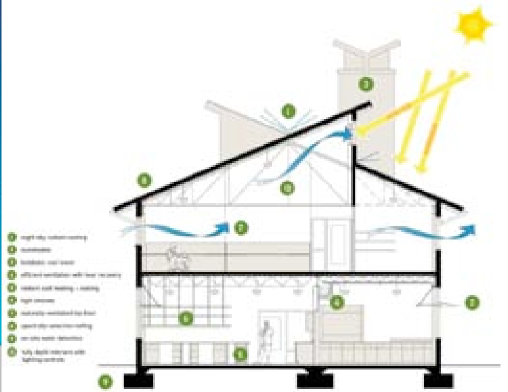



*Fig 5.24: Section indicating sun angles and ventilation patterns (Carboun 2010)*



### *5.5.2 'Night Sky' Cooling System:*

Another application of evaporative cooling is the use of the 'Night Sky' on the building roof at night. This strategy is based on the fact that the building radiates heat to the sky at night and aims to encourage this shedding of heat by spraying water on the roof. This considerably minimizes the need for cooling the next morning, and reduces water since the night sky system uses 50% less water than a standard cooling chiller (Carboun 2010).

### *5.5.3 Traditional 'Wind Catchers':*

Evaporative cooling towers can be seen as the modern enhancement of a traditional 'wind catcher'.

A wind catcher is an architectural device used for many centuries to create natural ventilation in buildings. The function of this tower is to catch cooler breezes that prevail at a higher level above the ground and to direct it into the interior of the buildings (Solaripedia 2010).

*Fig 5.27: (Top) Yazd, a city of wind towers or "badgirs" (wind catchers) lies quietly in the middle of a desert. The wind towers of Yazd are built with thick walls and tall arches (N. Kasraian 2010)*

*Fig 5.28: (Bottom) A portion of the old quarter of Dubai, Near Creek (Rmnathan 2010)*

*Fig 5.25: (Bottom Left) The burj al hawwa, the need to draw air down into the compact, courtyard houses resulted in the construction of these towers: Rafeek Manchayil 2010*

*Fig 5.26: (Bottom) Traditional mono-directional wind tower in Cairo (left) and multi-directional wind tower in Bahrain (right) (Rafeek Manchayil 2010)*

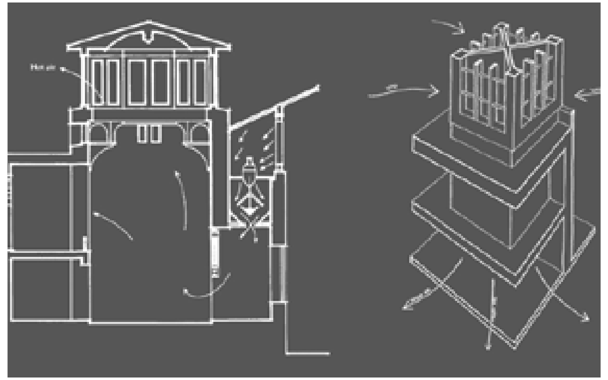




*Fig 5.29: Views of the building's cooling tower (Carboun 2010)*

### *5.5.4 Evaporative Cooling Towers:*

Evaporative cooling towers use the principles of direct evaporative cooling and downdraft to passively cool hot dry outdoor air and circulate it through a building. The resulting cooler and more humid air can be circulated through a building using the inertia inherent in the falling cool air. Cooling towers are sometimes referred to as reverse chimneys (Kwok and Grondzik, 2007: 151).

Hot dry air is exposed to water at the top of the tower. As water evaporates into the air inside the tower, the air temperature drops and the moisture content of the air increases; the resulting denser air drops down the tower and out of an opening at the base. The air movement down the tower creates a negative (suction) pressure at the top of the tower and a positive pressure at the base. Air exiting the base of the tower enters the space or spaces requiring cooling. (Kwok and Grondzik, 2007: 151).

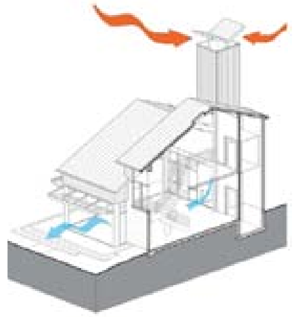


*Fig 5.30: Cooling tower's ventilation diagram (Carboun 2010)*

### *5.5.5 Implementation Considerations:*

Evaporative cool towers work best under dry, hot conditions. Under these conditions (in an arid climate) the wet bulb depression is high so the cooling effect is maximized. Also, the increase in relative humidity of the exiting air is not a problem (and is likely a benefit) (Kwok and Grondzik, 2007: 151).

According to Baruch Givoni (1994) the effectiveness of a cooling tower does not depend upon wind, so cooling towers can be used in areas with little or no wind resources and on sites with limited or no wind access.

The technical composition of the proposed cooling tower will be discussed in Chapter 7 - Technical Development