Chapter 8 : Technical Report

Illus: 175 **Vicky's BnB in Kayalitsha, Cape Town - the tectonic and structural inspiration** (Author, 2011)

8.0.1 TECHNICAL RESOLUTION

The ethos of the dissertation's lies in allowing the users of the building to create their own spatial and tectonic appropriate solution to their needs, economic limits and technological capability.

The challenge lies in how much control the designer holds and allows for within the architectural systems applied. This dissertation seeks to achieve that balance through an in-depth process of engagement with the physical and social context.

Chapter 8 explores technical aspects of the proposal at the level from which an architect could enter into the dialogue with the self-build. The tectonics are drawn from the various research exercises and aim to work with the contextual processes.

8.0.2 THE UNIT OF GROWTH

The unit of growth *(see Illus: 120 , on page 90)* is designed to be a flexible and adaptable piece of urban Infra-Tecture. The manufacturing and construction details are explained in further detail.

8.0.3 THE UNIT MANIFESTED IN CONTEXT

A building system is detailed, chosen for its contextual appropriate tectonic while demonstrating a possible alternative system.*(see Illus: 125 , on page 94)*

8.0.4 THE ELEMENT OF UNIFICATION - THE ROOF

The roof becomes the strongest architectural symbol and is designed to be built within the ethos of the self-build processes. *(see Illus: 158 , on page 122)*

Illus: 176 **Unit of Growth technical resolution - Site Plan** (Author, 2011)

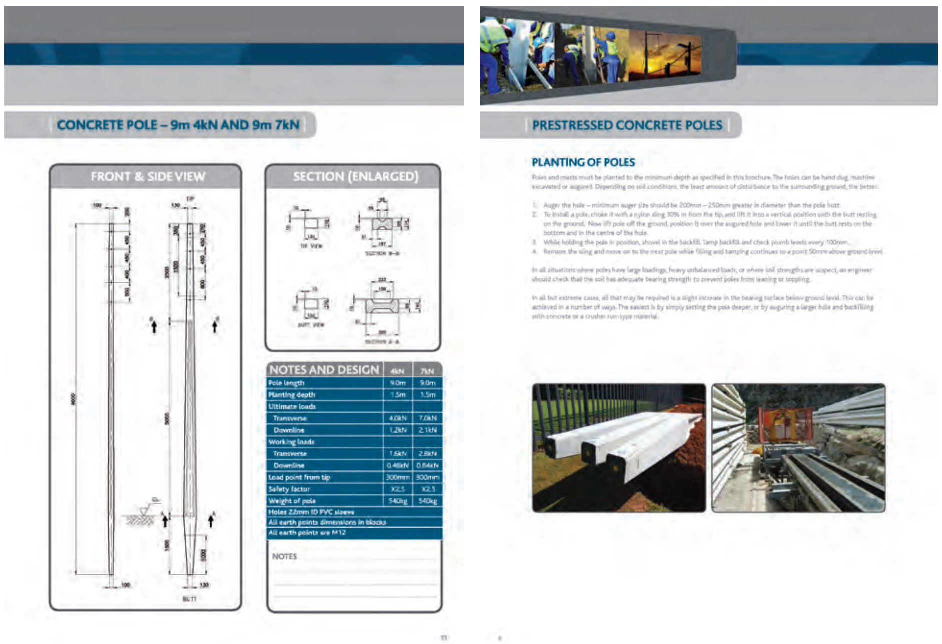
8.1 THE UNIT OF GROWTH

The unit is a intended to provide structural and service support for the retailer network of street vendors while using the infrastructural energy and materials of the typical lamppost. *(see Illus: 123 , on page 92)*

Infraset is one of the largest pre-cast concrete manufactures in the South Africa **(Infraset,2011: 45)** and have several products in their various production facilities that were used in the design. Most importantly the pre-cast concrete lamp post provided the basis from which to design the unit of growth based on the durability in application, transport and maintenance.

In order to allow the unit to perform its additional social role, *(see Illus: 127 , on page 96)* in addition to lighting, the design was modified with the input of Infraset's production engineer and constrained by manufacturing and transport factors.

The unit is designed to use current structural and service technologies while allowing for the incorporation of possible future technologies.



Illus: 177 **Infraset product brochure - pre-cast concrete lamp post (I(Infraset, 2011)**

THE ECOBEAM

EcoBeam, a composite open web joist made from timber chord and mild steel webbing are one of the most efficient span to weight ratio structural member available today. *(see Illus: 185)-D)* Used contemporarily in Mopethi Morajala's 10 x 10 housing in the Western Cape, the Ecobeam has a contextual background in developing areas.

The major benefits of Ecobeams:

- Can be manufactured at any location with minimum facilities.
- Adjustments to Ecobeam lengths are easily made.
- Ecobeams are easy to handle and economical to transport.
- All Ecobeams are straight and uniform in size, despite variations in timber size, because they are manufactured on a straight edge jig.
- Easy joining makes it possible to produce any length.
- The use of Ecobeams typically saves two thirds of the timber used in a classic timber frame construction.
- **(www.eco-technologies.co.za, 2011)**

The size of the Ecobeams was determined by the weight that the unit and a single retailer can lift

POLAR VOLTAIC

The Solar Light Energy Fund has provided solar powered lamp posts to developing communities all over the world, and have a large success factor in South Africa.

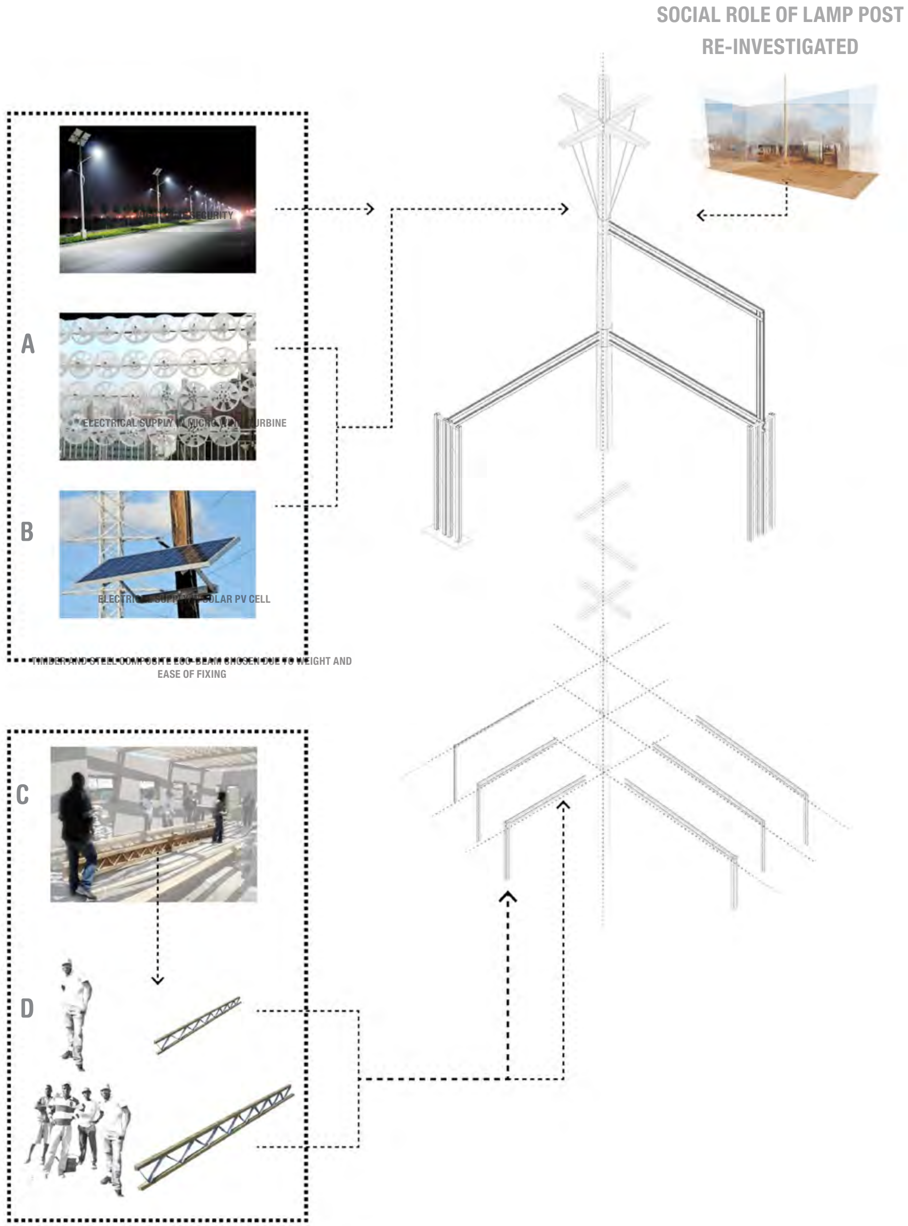
These same thin film silicon cells provide the most cost effective polar voltaic cells, and have been employed in the units. *(see Illus: 185)-B)*

MICROTURBINE

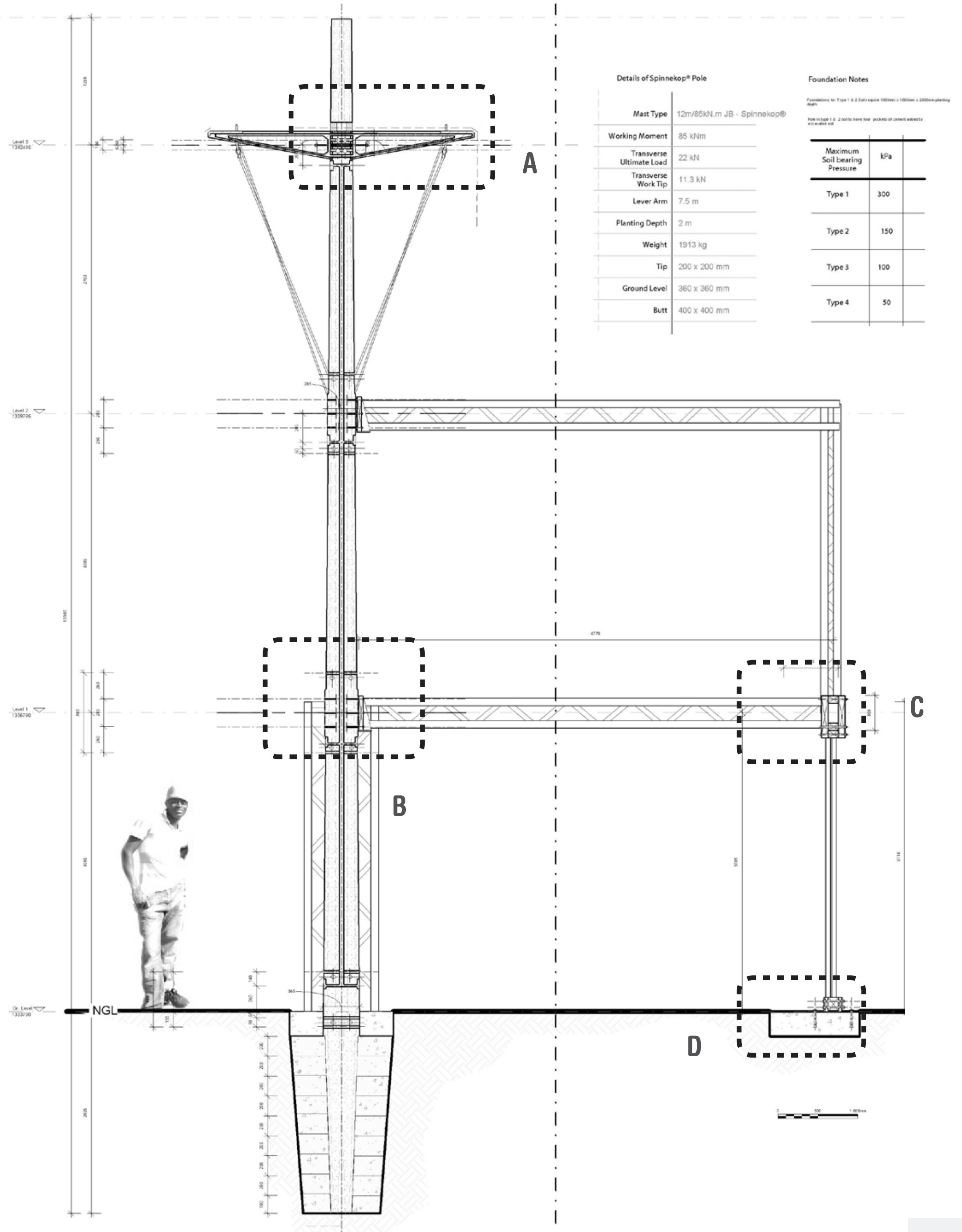
Motorwind is a Port Elizabeth company, which has been pioneering micro-wind turbine technology in South Africa. *(see Illus: 185)-A)*

The microturbines are made from re-cycled plastic and work in parallel series panel that, by being connected in series, work at highly efficient rate in even low wind speed conditions.

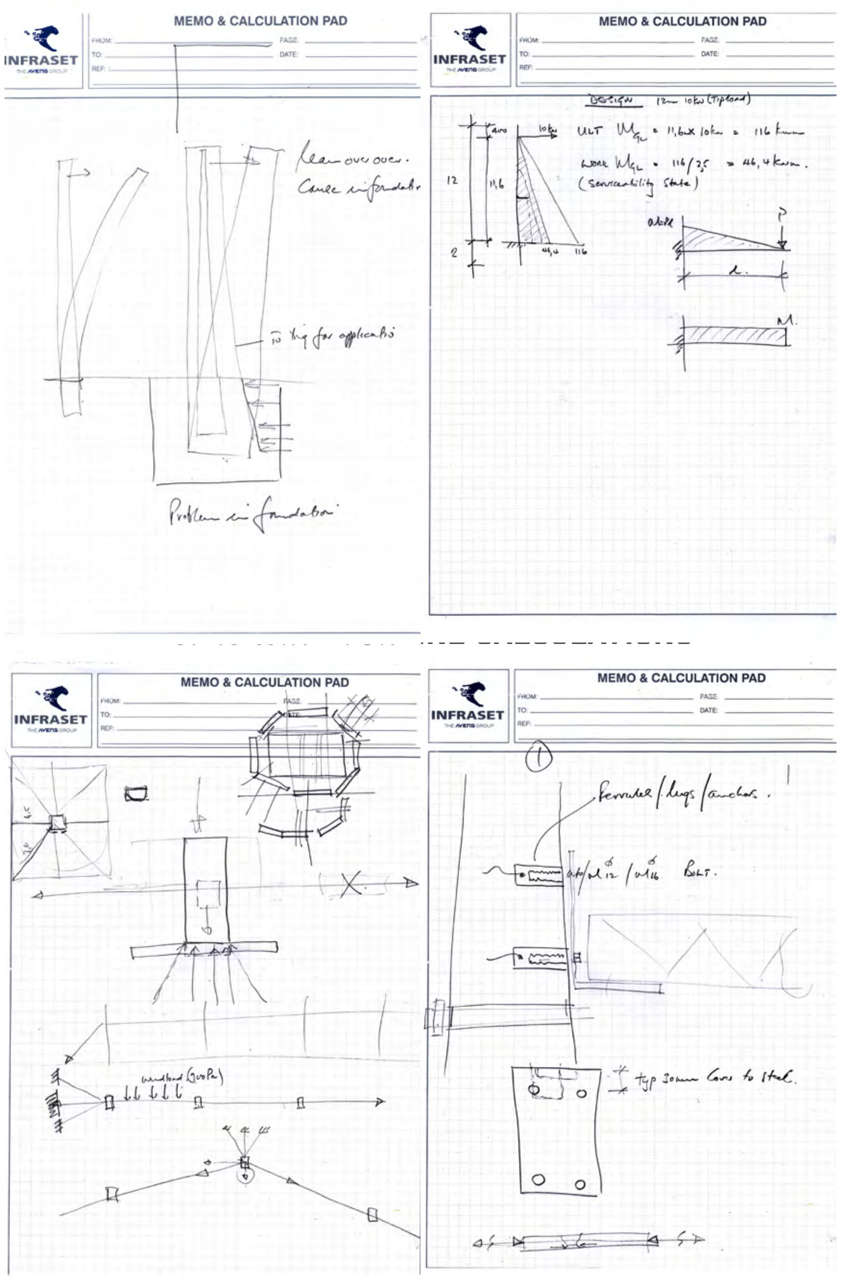
The micro turbine work in extremely low wind speed areas, above 2m/s, where conventional wind turbine's work at wind speeds between 10m/s and 25m/s.



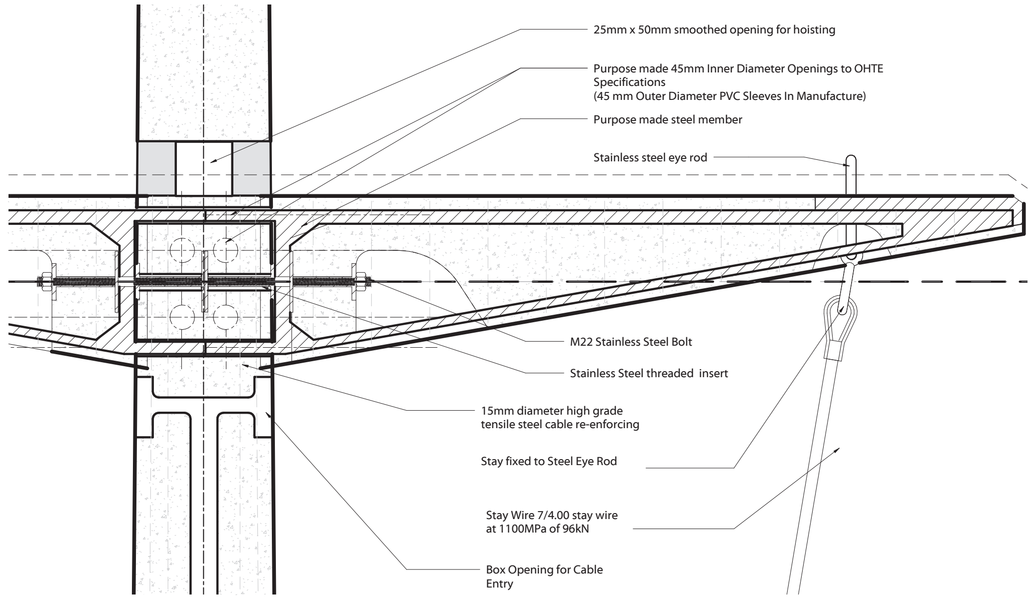
Illus: 178 **Unit Axonometric** (Author, 2011)



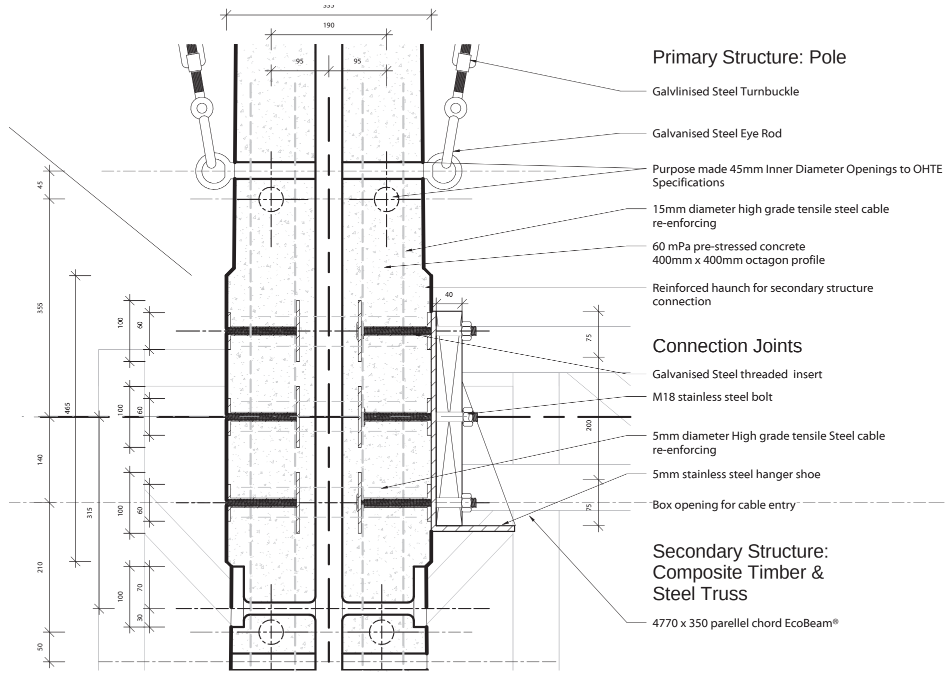
Illus: 179 **Technical Detailing of the Unit of Growth- Not to scale** (Author, 2011)



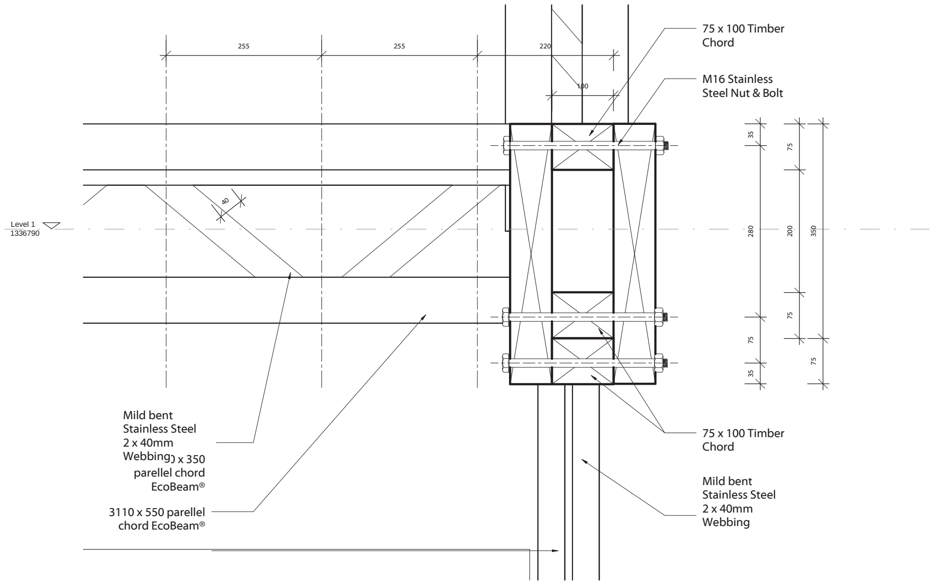
Illus: 180 **Engineer's Notes** (Author, 2011)



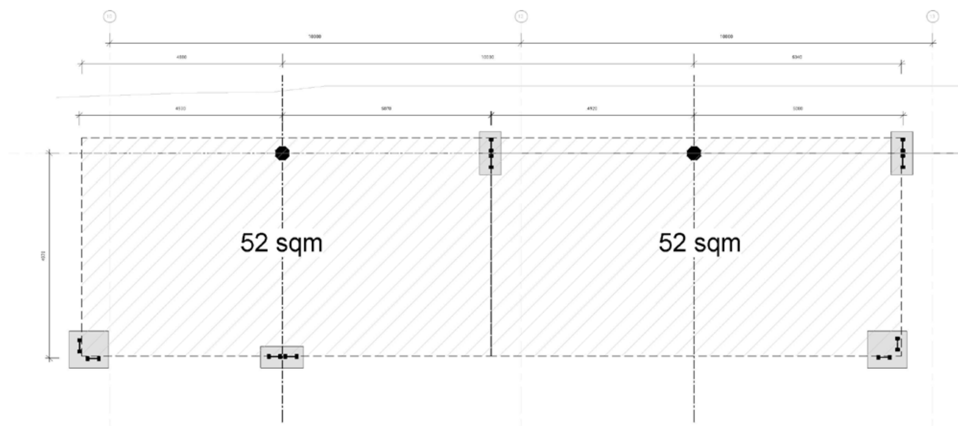
Illus: 181 **Unit of Growth technical resolution - Detail A- Not to scale** (Author, 2011)



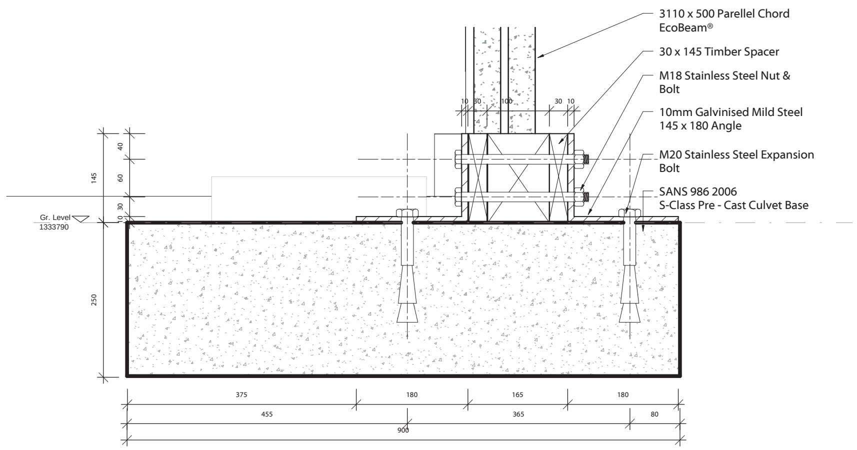
Illus: 182 **Unit of Growth technical resolution - Detail C - Not to scale** (Author, 2011)



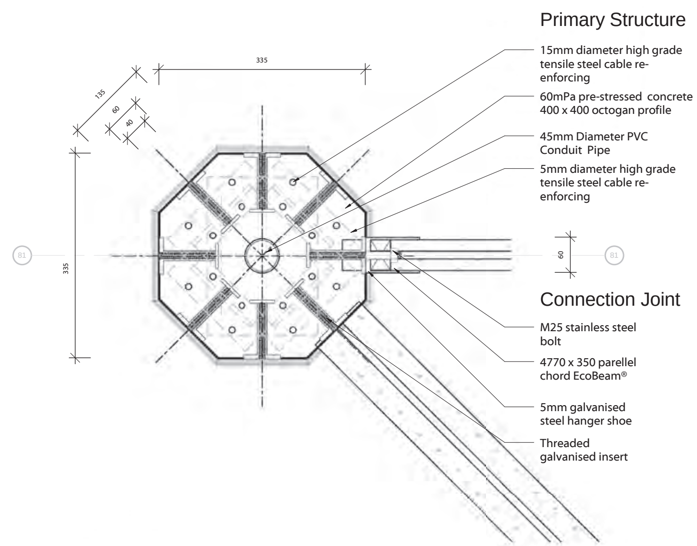
Illus: 183 **Unit of Growth technical resolution - Detail B- Not to scale** **(Author, 2011)**



Illus: 185 **Unit of Growth technical resolution - Spatial allocation** **(Author, 2011)**



Illus: 184 **Unit of Growth technical resolution - Detail D - Not to scale** **(Author, 2011)**



Illus: 186 **Unit of Growth technical resolution - Detail E** **(Author, 2011)**

8.2 THE UNIT IN CONTEXT

To explore the manifestation of the unit in context, a hypothetical process of development was illustrated in Chapter Six. The focus of that hypothetical growth was the cement depot of the cement retailer network.

The focus of the dissertation is not in the design of a structure for the retailers, but in the architectural possibilities of the unit. The ArcelorMittal building system was chosen as a contextually appropriate building system as it is similar to contextual metal frame and cladding systems, but provide insulation and fire protection in addition.

Used in the Meetse-A-Bophela primary school in the adjacent neighborhood of Ext 14, the system is made of insulated pre-manufactured walling and roofing components. Joined by off the shelf flashing and connection units the system allows for quick and easy assembly and possible disassembly.

Flooring is dealt with by the use of Eva-Last recycled lumber decking was used for the flooring, as it too had the insulatory as well as recycled properties needed for the flexible building system.

Illus: 187 **Walling system of Meetse-A-Bophela Primary school in Mamelodi** (Architecture SA, 2011)

Illus: 188 **Sandwich Board - A1 Non-Flammable** (ArcelorMittal, 2011)

Illus: 189 **ArcelorMittal- Arval Alliance Sandwich Walling system** (ArcelorMittal, 2011)

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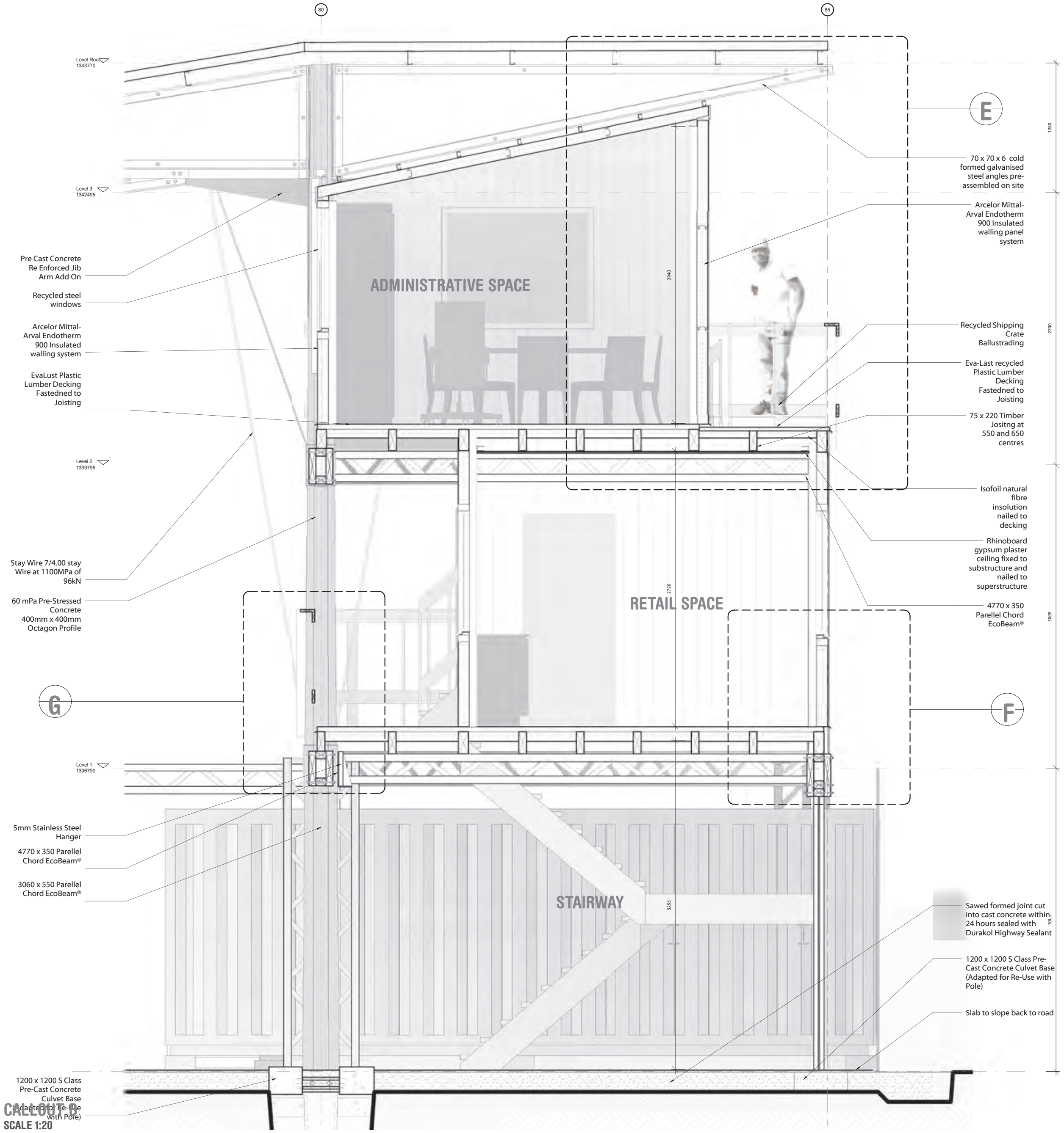
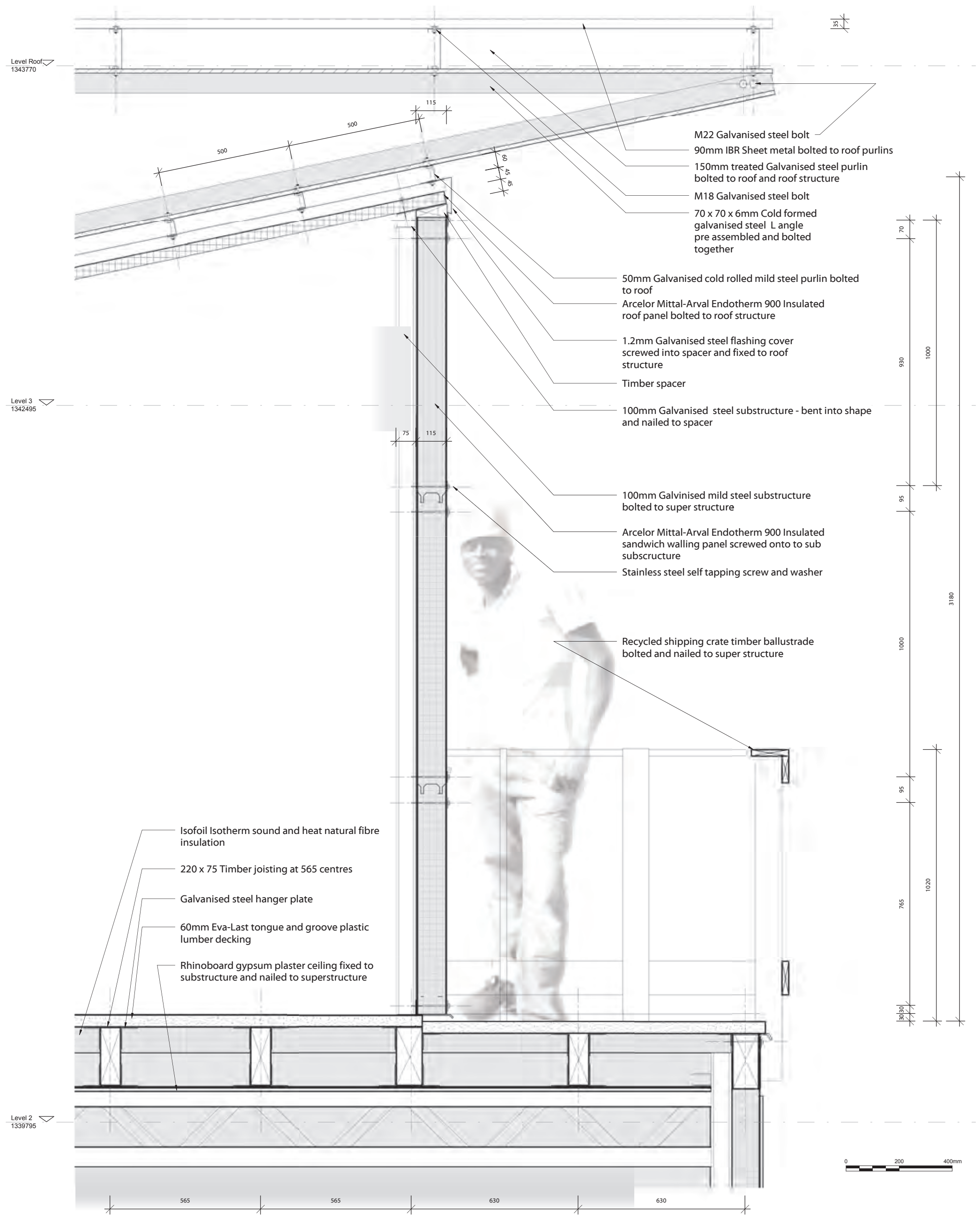


Illus: 190 **Unit of Growth technical resolution -Callout A- Not to scale** (Author, 2011)

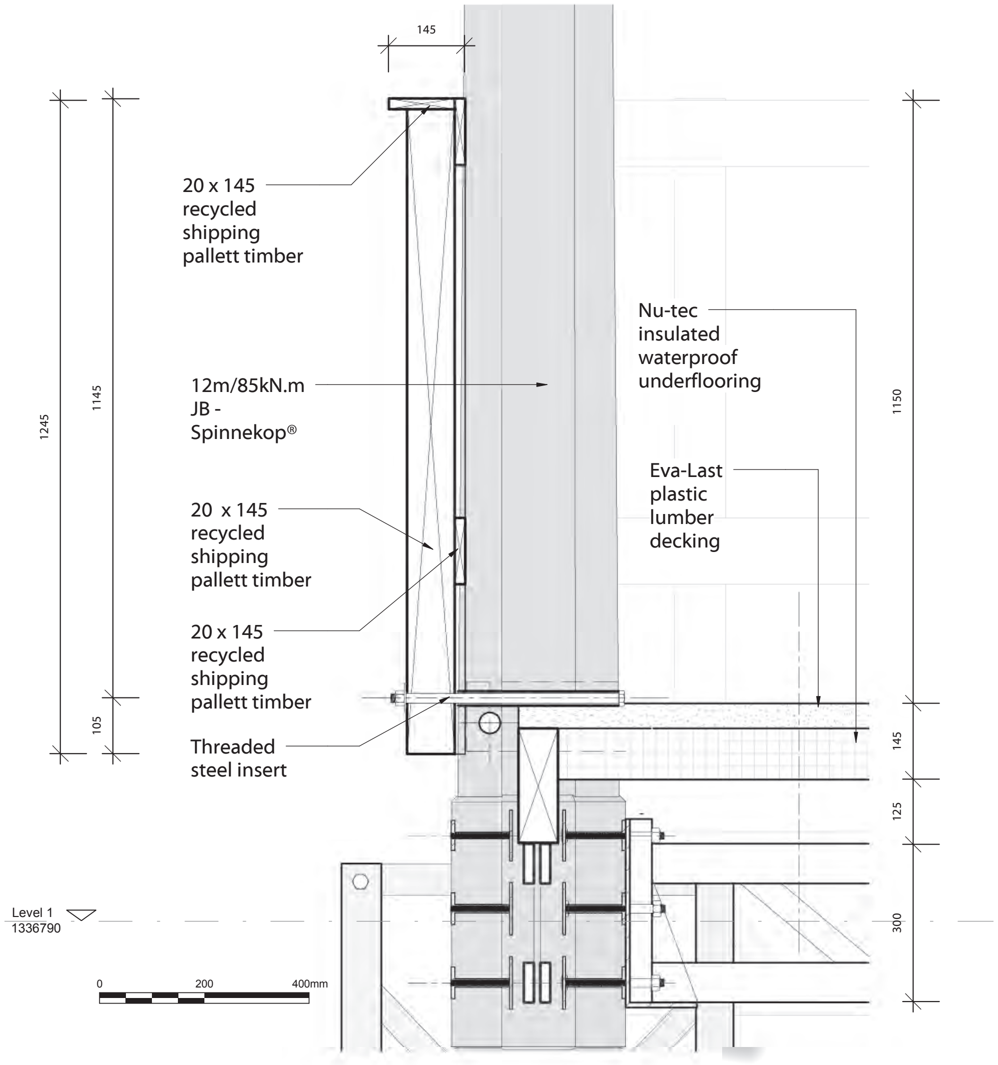
Illus: 192 **Eva-Last recycled plastic lumber**
(Eva-Last, 2011)

Illus: 193 **Eva-Last plastic fastenings**
(Eva-Last, 2011)

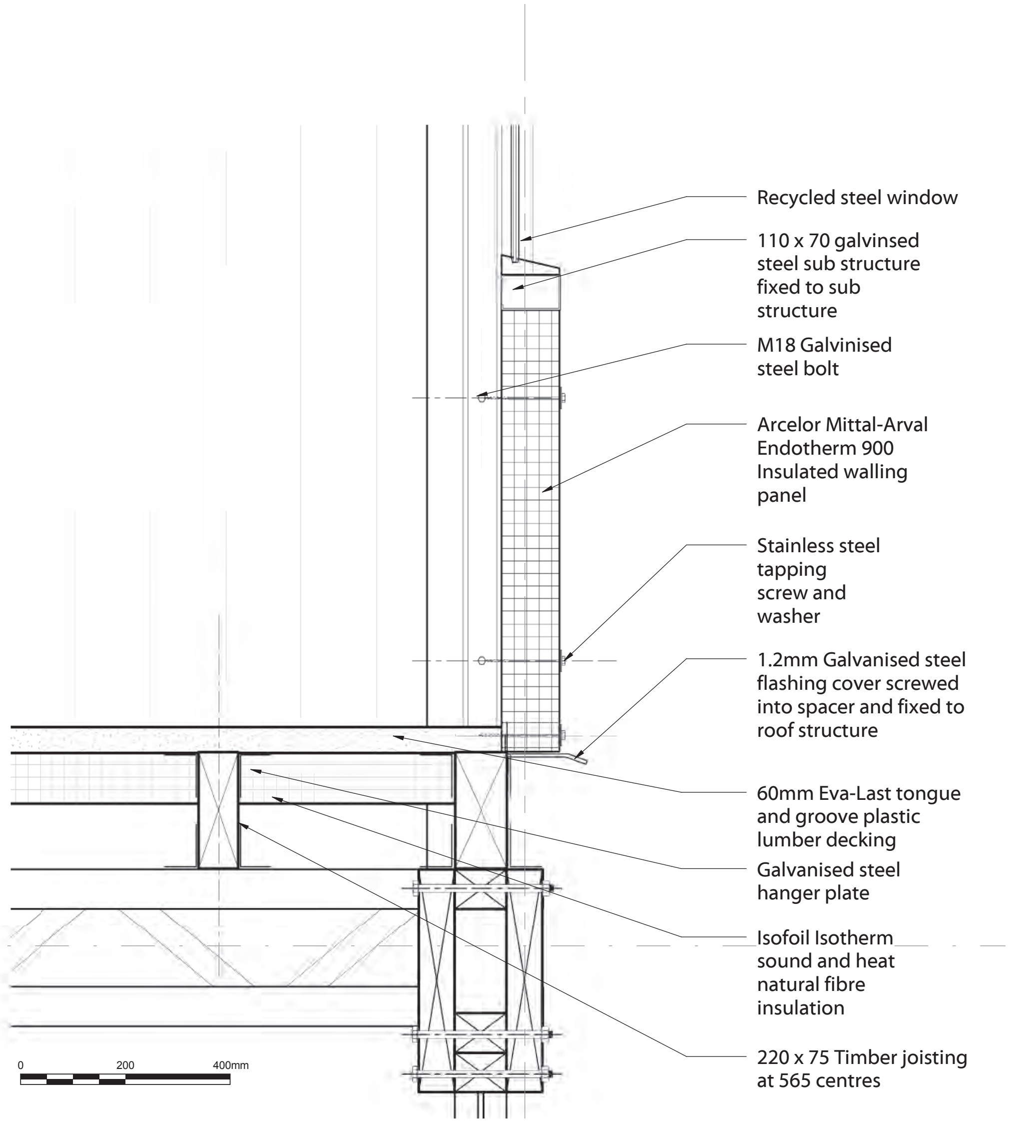
Illus: 194 **Eva-Last recycled plastic lumber joist**
(Eva-Last, 2011)



Illus: 195 **Detail E - Not to scale** (Author, 2011)



Illus: 196 **Detail F - Not to scale** (Author, 2011)



Illus: 197 **Detail G - Not to scale** (Author, 2011)

8.3 THE ARCHITECTURAL MANIFESTATION - THE ROOF

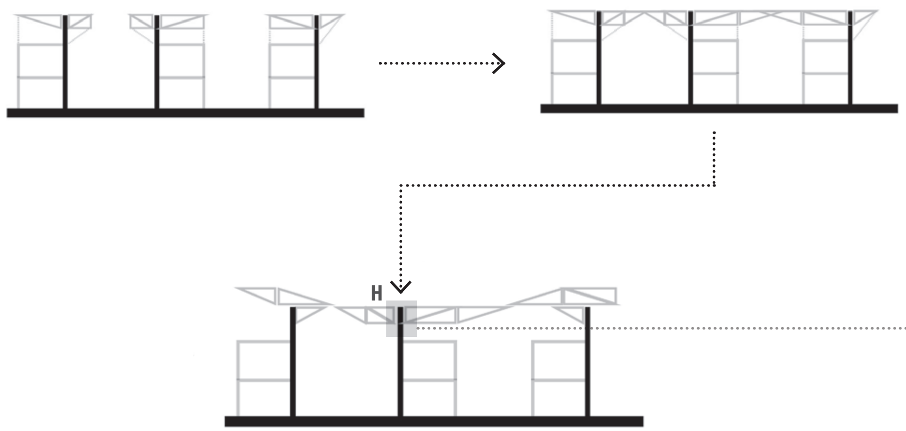
The roof is designed to be assembled from standard parts in order to be built affordably and with minimal extraneous structural supports.

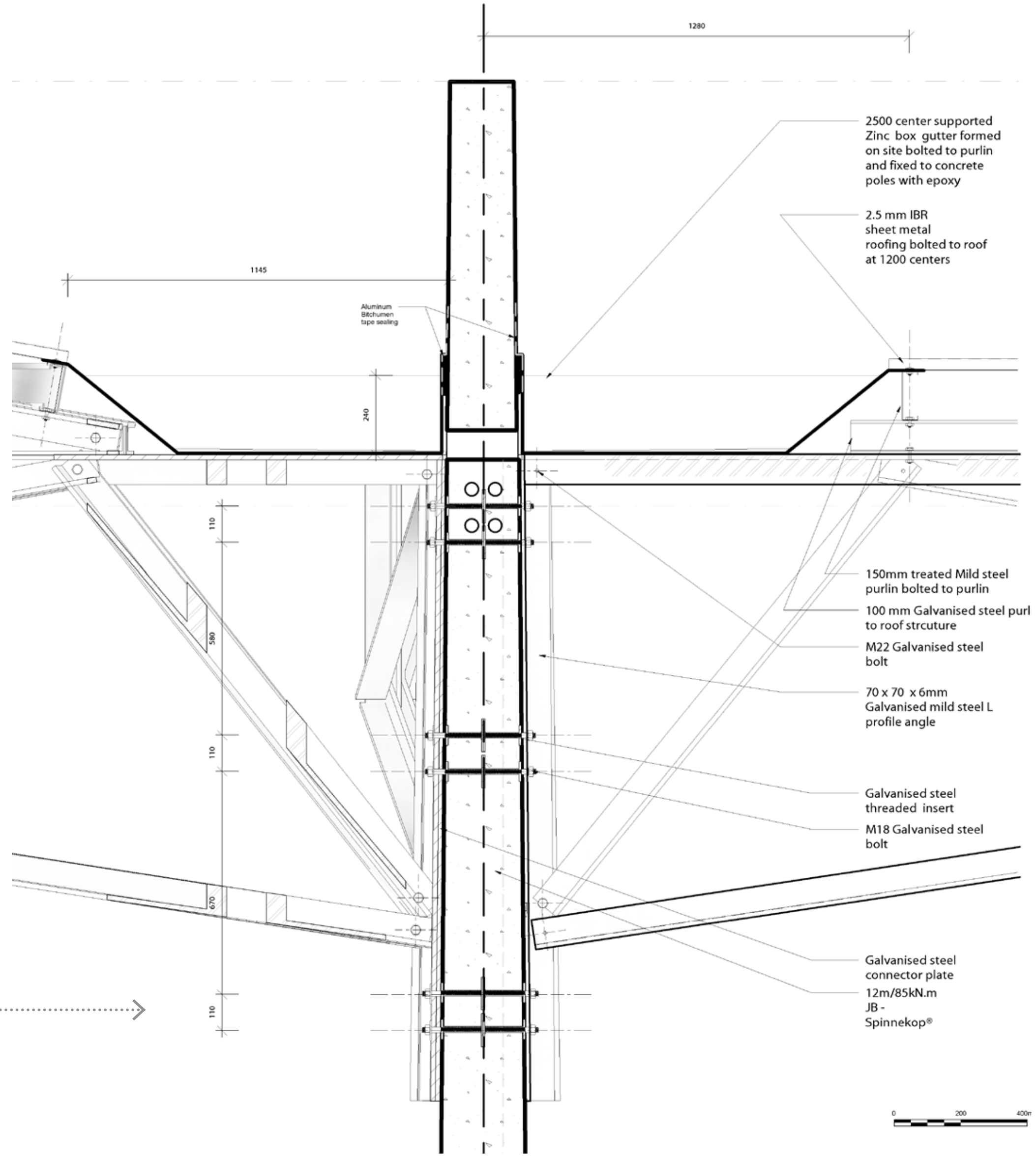
The frame members are mild steel, treated L-profiles bolted together for easy assembly and dis-assembly. These members are then assembled to make an optimized truss system that rest on the main structural members of the concrete poles.

The size and weight of these members are designed to allow a single person to move individual pieces and a group to construct and move the assembled truss units.

The construction of the roof is intended to make use the units as temporary support struts during the process of assemblage. These temporary supports will be removed once the roof structure sits in balance. *(see Illus: 197)*

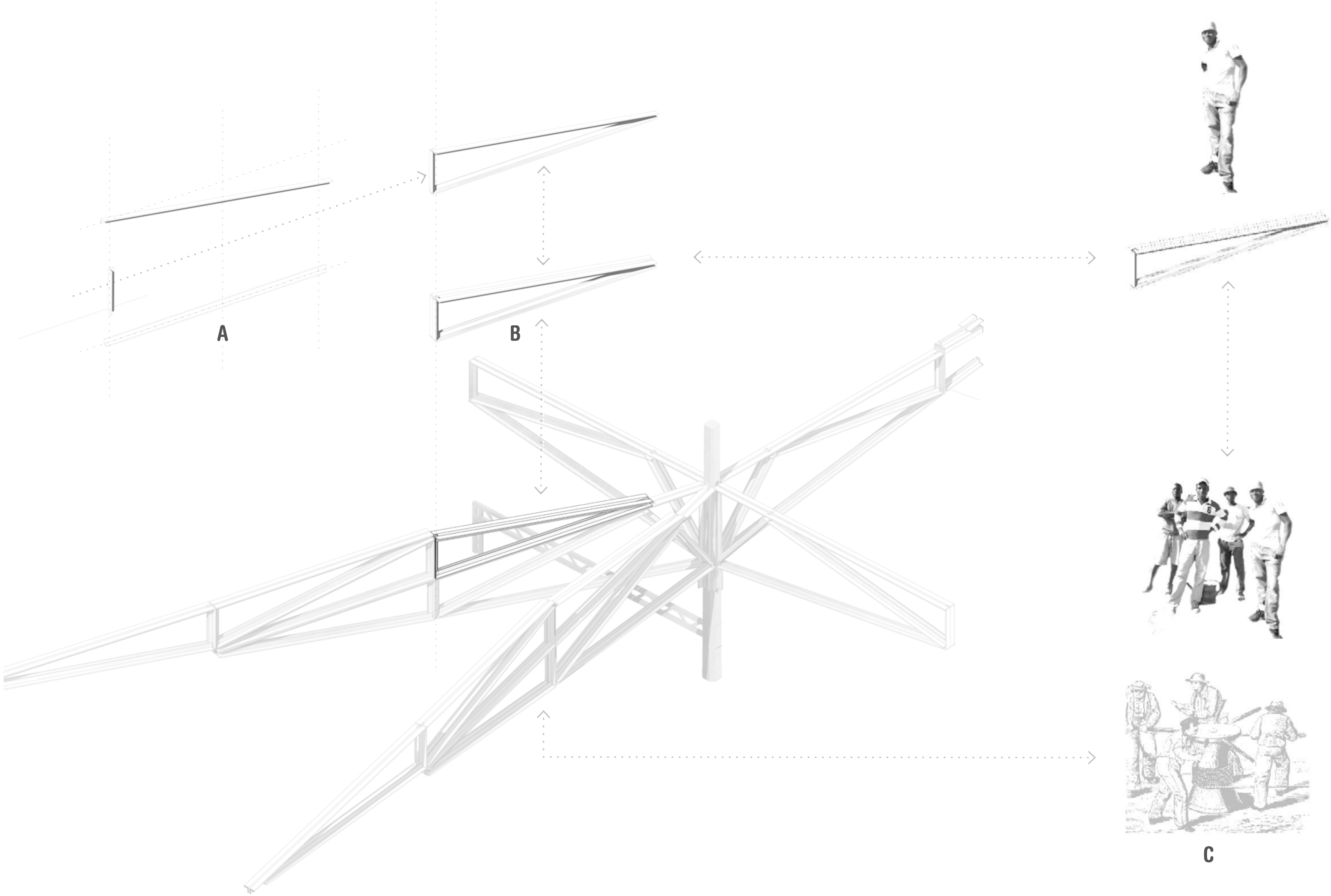
The roof itself is made from treated prefabricated IBR sheet metal, with translucent profiled polycarbonate sheeting in the deepest part of the section to allow for light.





Illus: 198 **Diagrammatic depiction of process of construction** (Author, 2011)

Illus: 199 **Unit of Growth technical resolution - Detail H - Scale:1:20** (Author, 2011)



Illus: 200 **The roof structure unit in its assembled form** (Author, 2011)

8.4 ROOF SYSTEMS

The roof itself forms the spatial and systemic entity that unifies the cement retailer network under a single structural facility. Through water and energy collection the roof not only provides shelter, but access to services that will enable the cement retailers to enhance not only their business, but engage with the other retail networks in the context of Mamelodi.

WATER HARVESTING

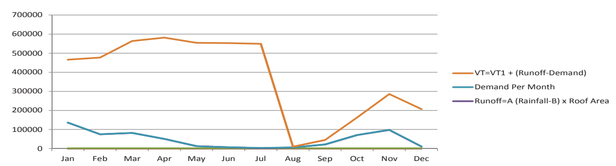
The cement retail depot itself does not require a high yield of water use, but provide access to service to its sub agents of control and its own ablution facility. The combined water use in services with the total water storage amount of 3.8 million liters a year requires that 6 x 5000 liter tanks are required. *(see Illus: 201)*

SOLAR ENERGY COLLECTION

The roof in addition to water collection collects solar energy to supplement the energy consumption of the building. These Polar Voltaic Cells, are required to be at an inclination of 10 degrees plus the degree of latitude, placing them at the required 35 degrees of the horizontal.

Rain Water Calculations

	Average Monthly Precipitation (mm) (V)	Run off Coefficient for sheet roof	Roof Area (sqm)	Runoff=A (Rainfall-B) x Roof Area	Demand Per Month	VT=VT1 + (Runoff-Demand)
Jan	136	0.9	1557.4	134000	400	329600
Feb	75	0.9	1557.4	73000	400	402200
Mar	82	0.9	1557.4	80000	400	481800
Apr	51	0.9	1557.4	49000	400	530400
May	13	0.9	1557.4	11000	400	541000
Jun	7	0.9	1557.4	5000	400	545600
Jul	3	0.9	1557.4	1000	400	546200
Aug	6	0.9	1557.4	4000	400	3600
Sep	22	0.9	1557.4	20000	400	23200
Oct	71	0.9	1557.4	69000	400	91800
Nov	98	0.9	1557.4	96000	400	187400
Dec	11	0.9	1557.4	9000	400	196000

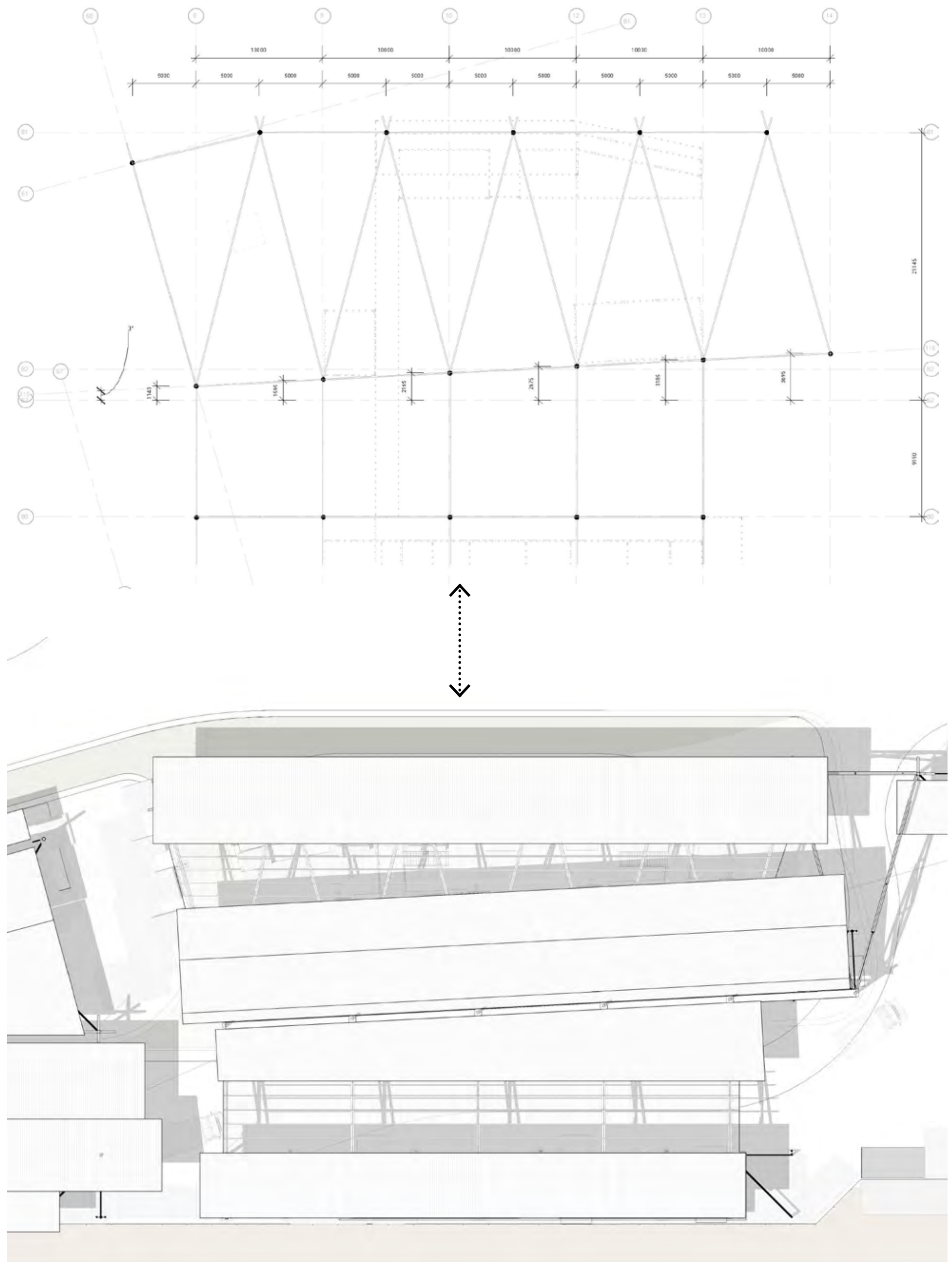


Required Storage Tank Capacity	
323233.3333	Litres a year
32000	Litres a month
6	Tanks @ 5000 Litres a tank

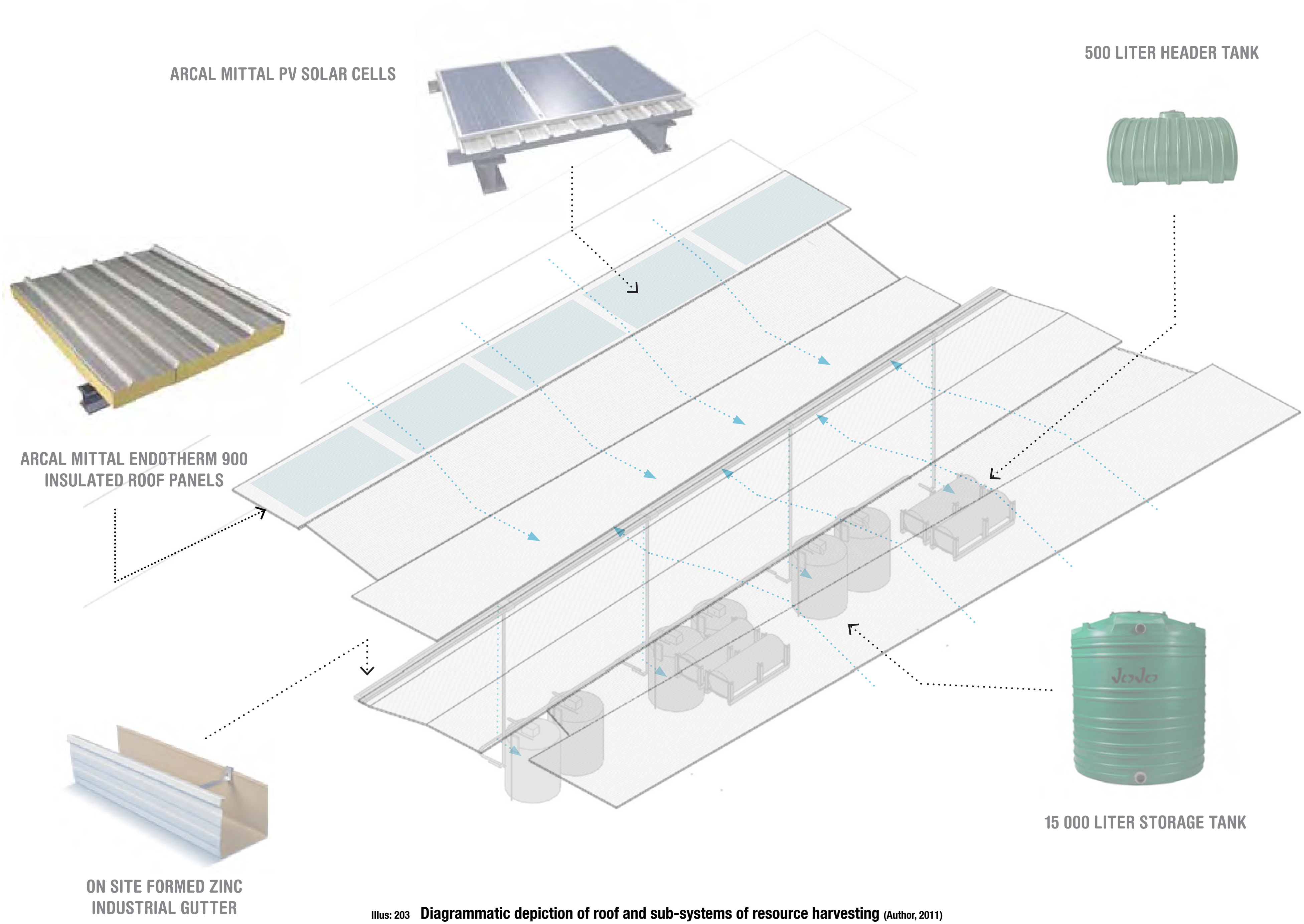
Gutter Size Calculation

Summer Rainfall Area (sqmm)	Roof Area (sqmm)	Rerquried Roof Volume (sqmm)	Gutter Length (mm)	Gutter Width (mm)	Gutter Depth (mm)	Gutter Volume (sqmm)
140 sqmm	1,757,400,000	10,892,000,000	50,000	1,145	250	11,100,000,000 x 2

Illus: 201 **Water Calculation table** (Author, 2011)



Illus: 202 **The roof structure and the sheeting layout** (Author, 2011)



Illus: 203 **Diagrammatic depiction of roof and sub-systems of resource harvesting** (Author, 2011)