Materiality

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

Steel:

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

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

Timber

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

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

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

Masonry

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

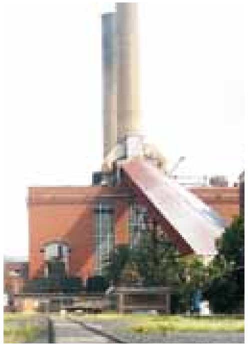
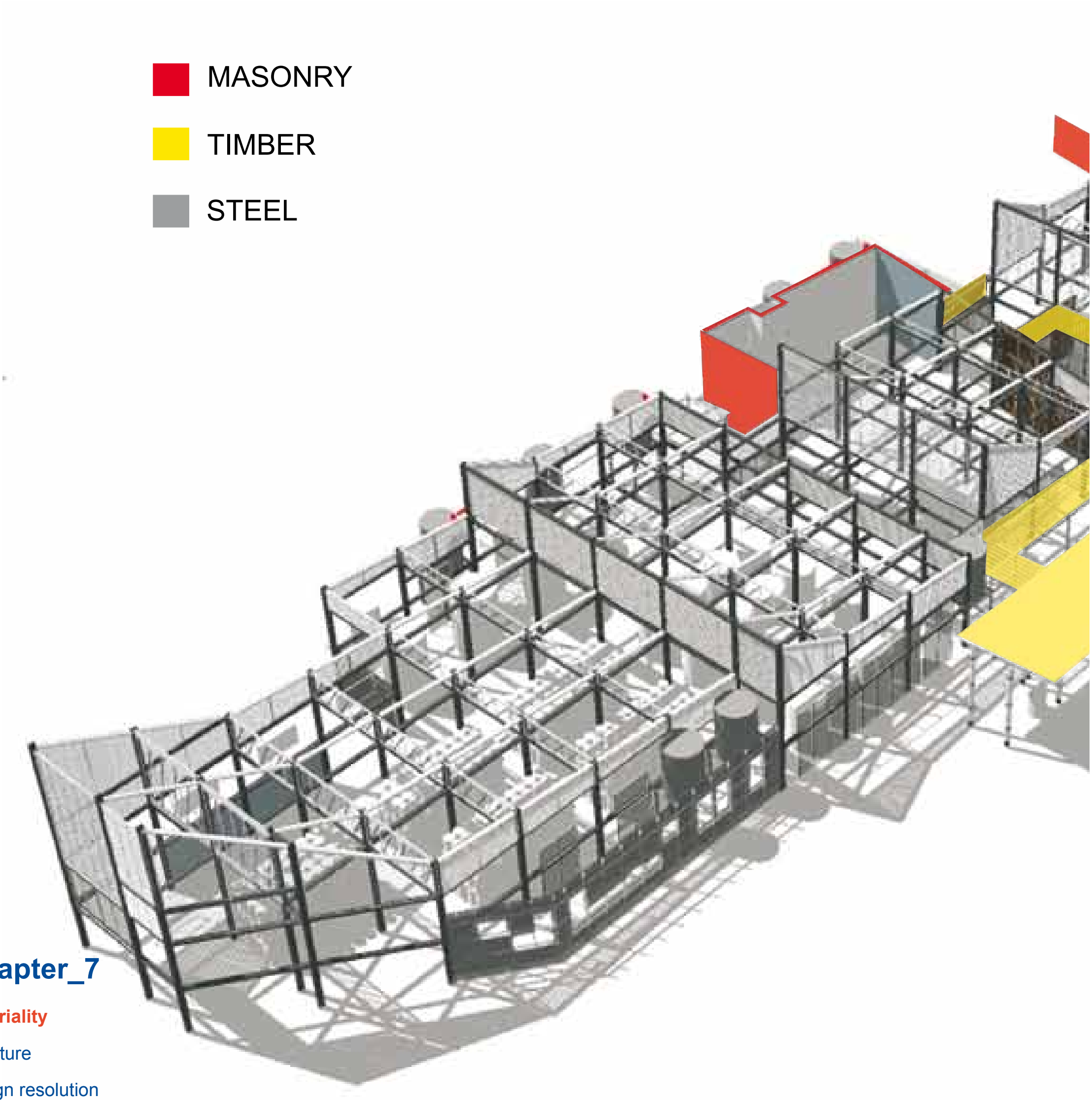
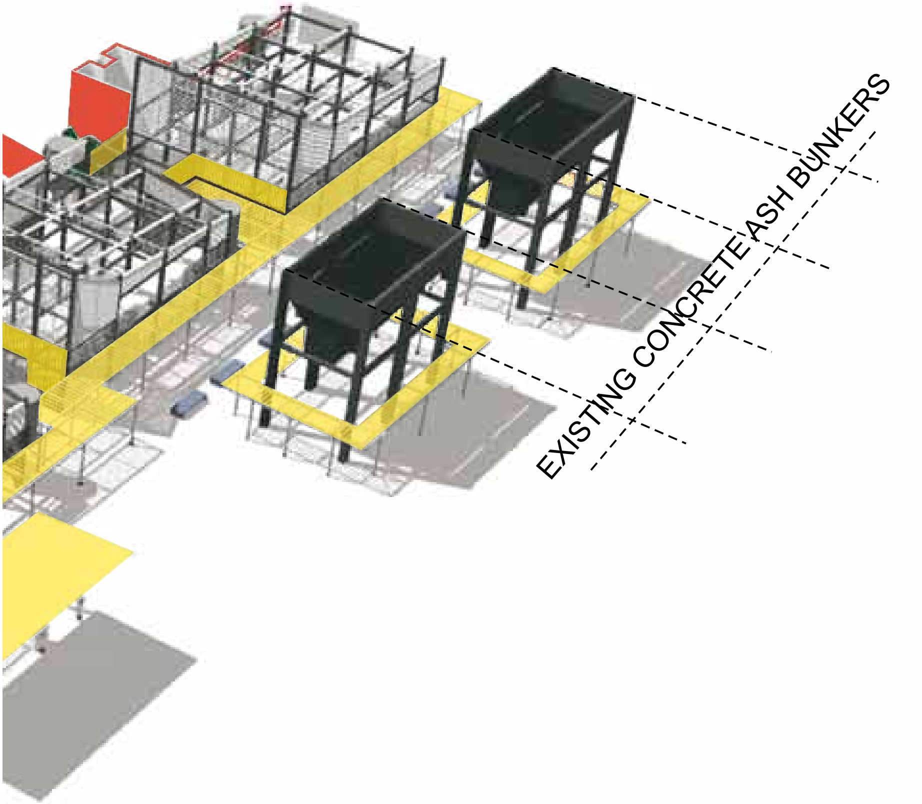


Figure 93. The structure of the two service areas at the back of the bio-diesel plant will consist of masonry and mortar, to relate to adjacent power station building B: Author 2010.

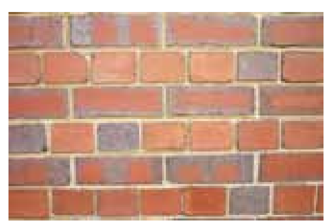


STEEL

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



TIMBER



MASONRY

Structure

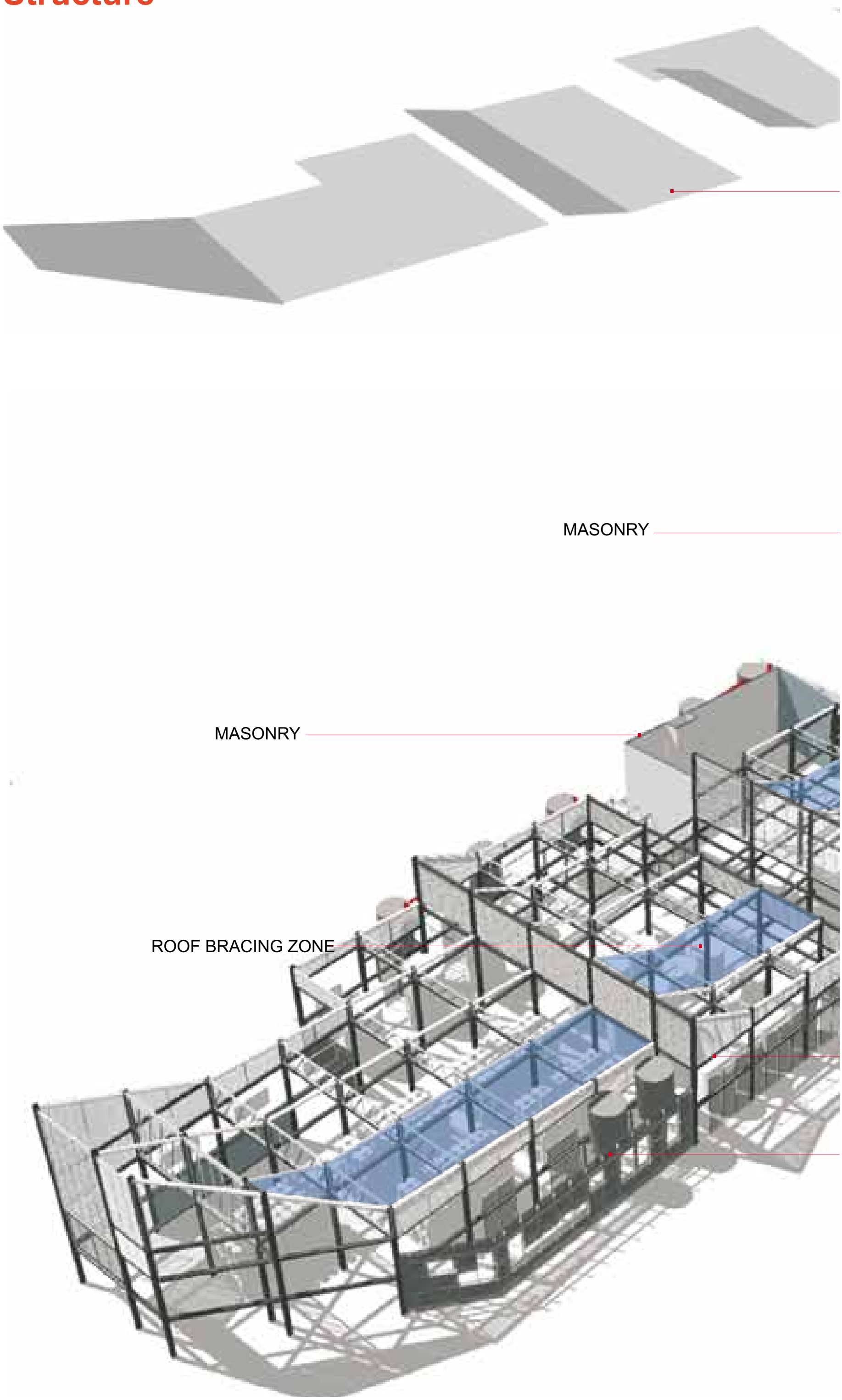
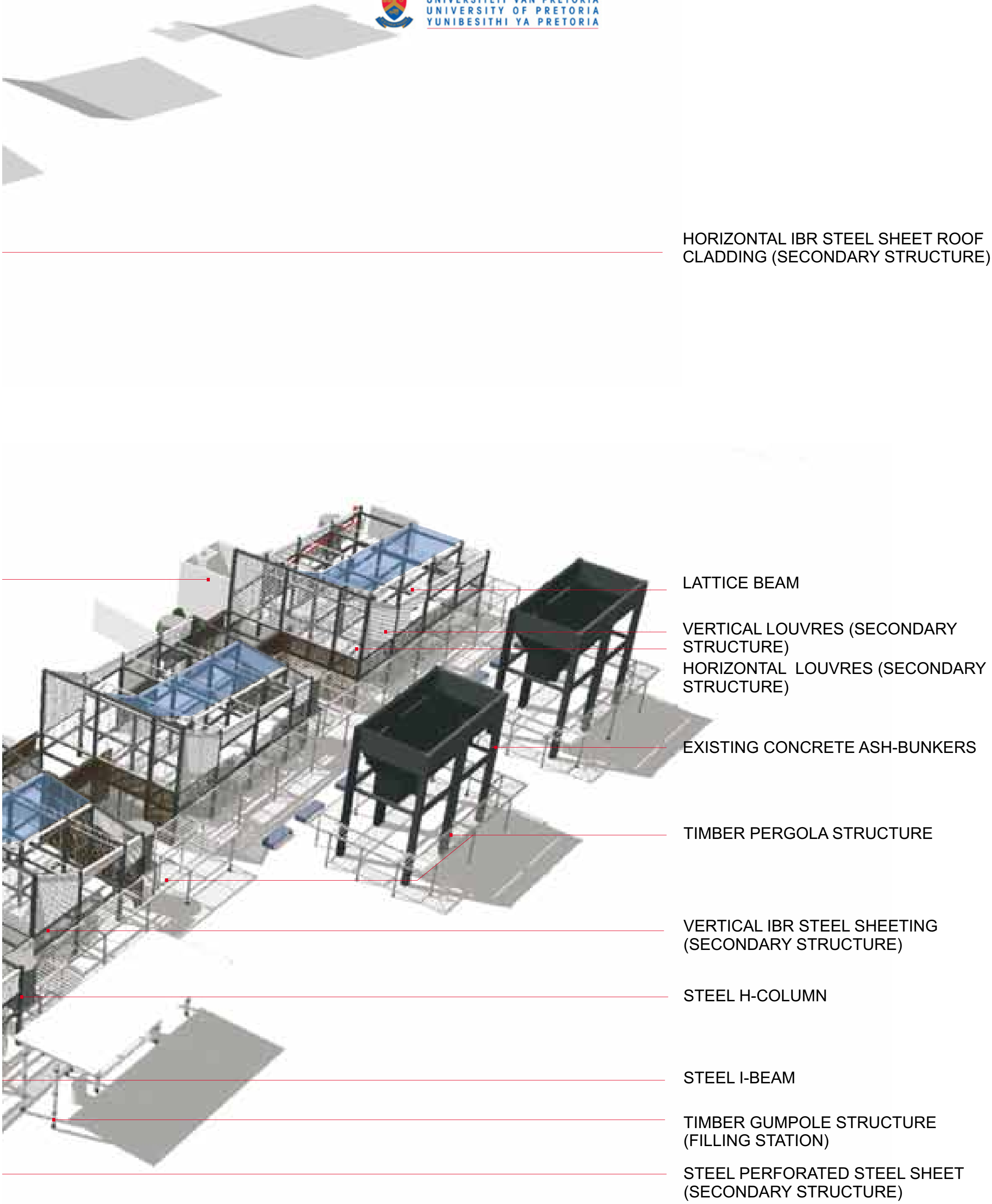


Figure 95. The Pretoria West Bio-diesel Plant: showing the structural components of the building: Author 2010.


HORIZONTAL IBR STEEL SHEET ROOF CLADDING (SECONDARY STRUCTURE)
LATTICE BEAM
VERTICAL LOUVRES (SECONDARY STRUCTURE)
HORIZONTAL LOUVRES (SECONDARY STRUCTURE)
EXISTING CONCRETE ASH-BUNKERS
TIMBER PERGOLA STRUCTURE
VERTICAL IBR STEEL SHEETING (SECONDARY STRUCTURE)
STEEL H-COLUMN
STEEL I-BEAM
TIMBER GUMPOLE STRUCTURE (FILLING STATION)
STEEL PERFORATED STEEL SHEET (SECONDARY STRUCTURE)

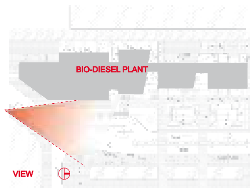
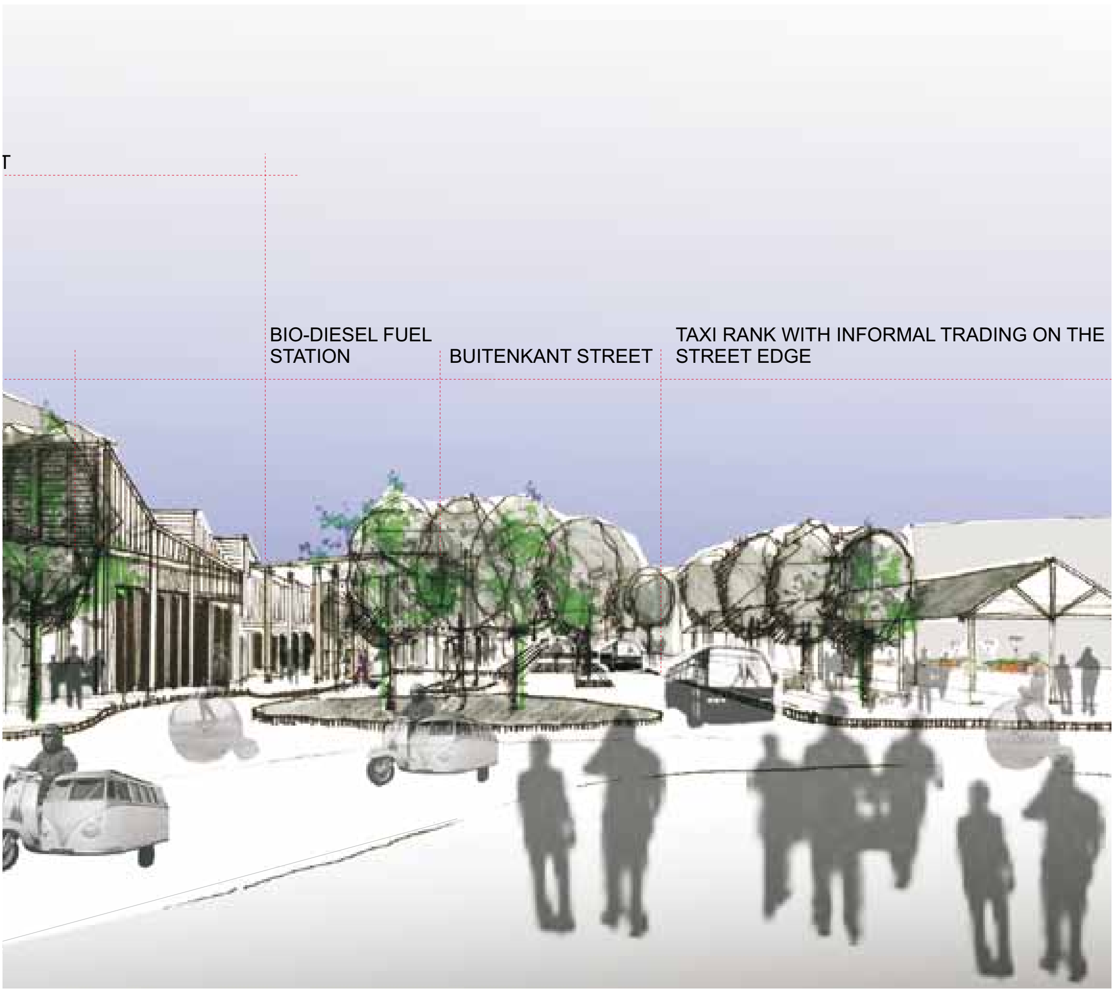
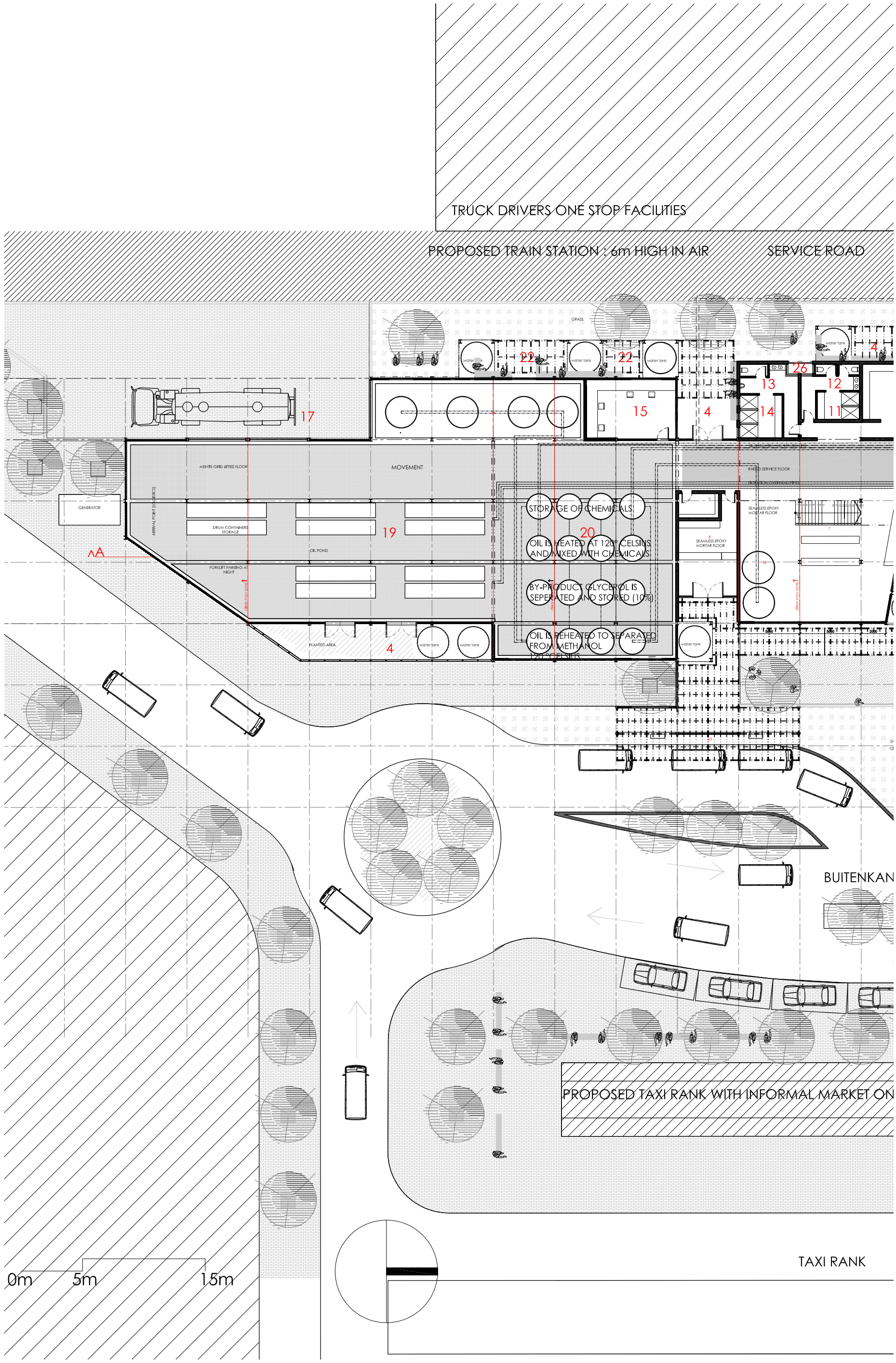


Figure 96. On the left is the threshold between the production process and the street. In the middle back is the bio-diesel fuel station that will establish connectivity through activity. To the right is the informal market that will spill over to the Bio-diesel plant and will be accommodated in the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


T
BIO-DIESEL FUEL STATION
BUITENKANT STREET
TAXI RANK WITH INFORMAL TRADING ON THE STREET EDGE



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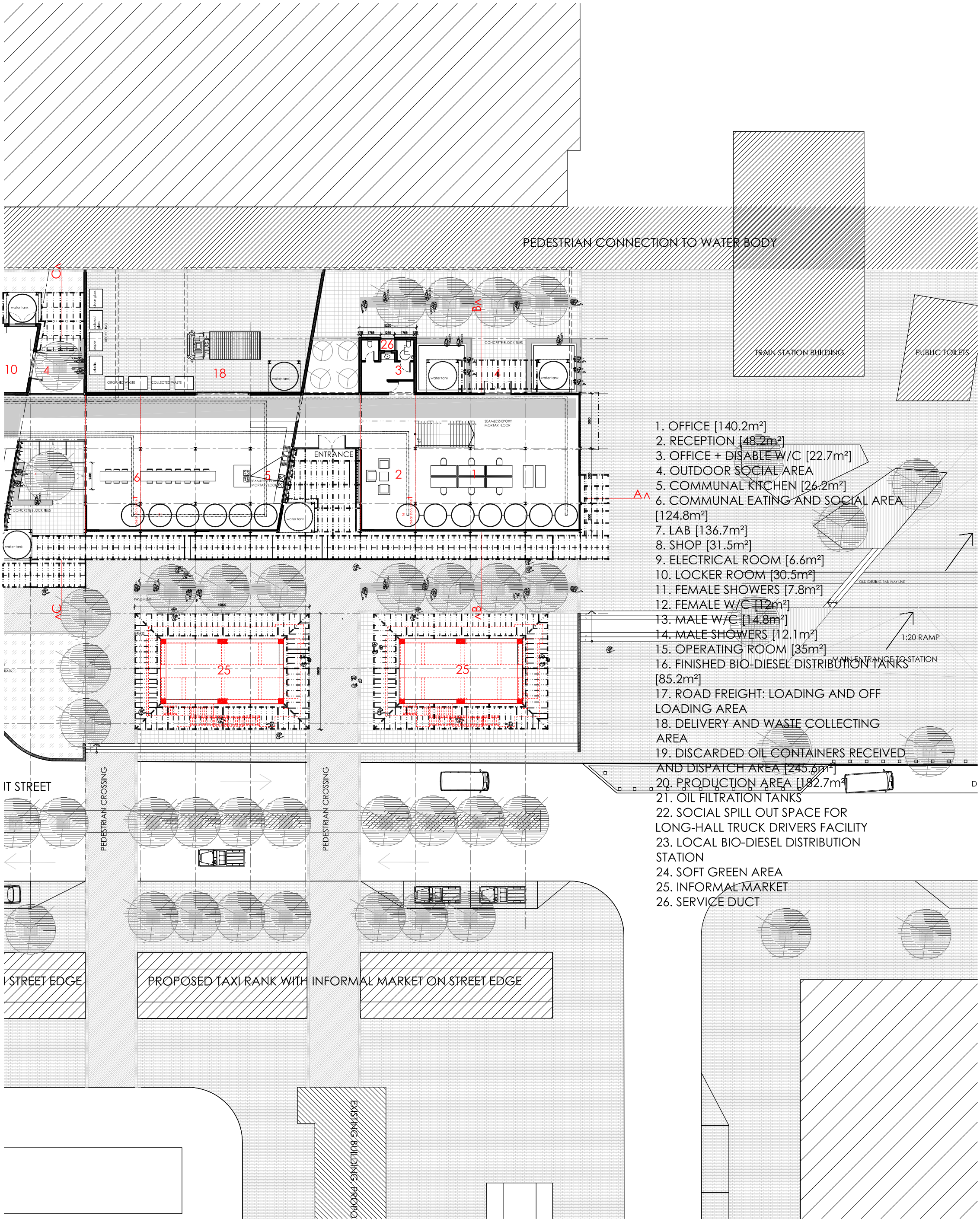
GROUND FLOOR PLAN: PRETORIA WEST BIO-DIESEL PLANT


PEDESTRIAN CONNECTION TO WATER BODY
TRAIN STATION BUILDING
PUBLIC TOILETS
ENTRANCE
1. OFFICE [140.2m²]
2. RECEPTION [48.2m²]
3. OFFICE + DISABLE W/C [22.7m²]
4. OUTDOOR SOCIAL AREA
5. COMMUNAL KITCHEN [26.2m²]
6. COMMUNAL EATING AND SOCIAL AREA [124.8m²]
7. LAB [136.7m²]
8. SHOP [31.5m²]
9. ELECTRICAL ROOM [6.6m²]
10. LOCKER ROOM [30.5m²]
11. FEMALE SHOWERS [7.8m²]
12. FEMALE W/C [12m²]
13. MALE W/C [14.8m²]
14. MALE SHOWERS [12.1m²]
15. OPERATING ROOM [35m²]
16. FINISHED BIO-DIESEL DISTRIBUTION TANKS [85.2m²]
17. ROAD FREIGHT: LOADING AND OFF LOADING AREA
18. DELIVERY AND WASTE COLLECTING AREA
19. DISCARDED OIL CONTAINERS RECEIVED AND DISPATCH AREA [245.6m²]
20. PRODUCTION AREA [182.7m²]
21. OIL FILTRATION TANKS
22. SOCIAL SPILL OUT SPACE FOR LONG-HALL TRUCK DRIVERS FACILITY
23. LOCAL BIO-DIESEL DISTRIBUTION STATION
24. SOFT GREEN AREA
25. INFORMAL MARKET
26. SERVICE DUCT
1:20 RAMP
MAIN ENTRANCE TO STATION
IT STREET
PEDESTRIAN CROSSING
PEDESTRIAN CROSSING
STREET EDGE
PROPOSED TAXI RANK WITH INFORMAL MARKET ON STREET EDGE
EXISTING BUILDING- PROPO

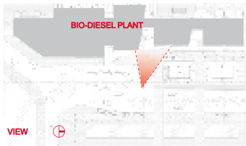
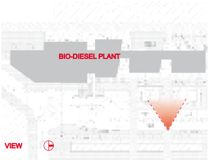


Figure 97. On the left is the production annexe that forms a non-linear facade and accommodates the social spill out space. The facade is opened up to have a visual connection with the production activities. On the right is the existing ash bunkers that will accommodate the informal market, this leads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


SOCIAL SPACE ALONG THE FACADE
ASH BUNKERS WITH INFORMAL MARKET

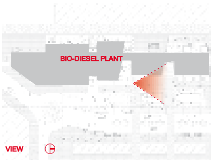


INFORMAL MARKET IN EXISTING ASH BUNKERS

ENTRANCE OF BIO-DIESEL PLANT FRAMED

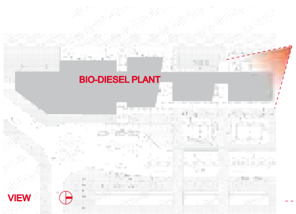
INFORMAL MARKET IN EXISTING ASH BUNKERS

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



PRETORIA WEST BIO-DIESEL PLANT | THRESHOLD | INFORMAL MARKET IN EXISTING ASH BUNKERS

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



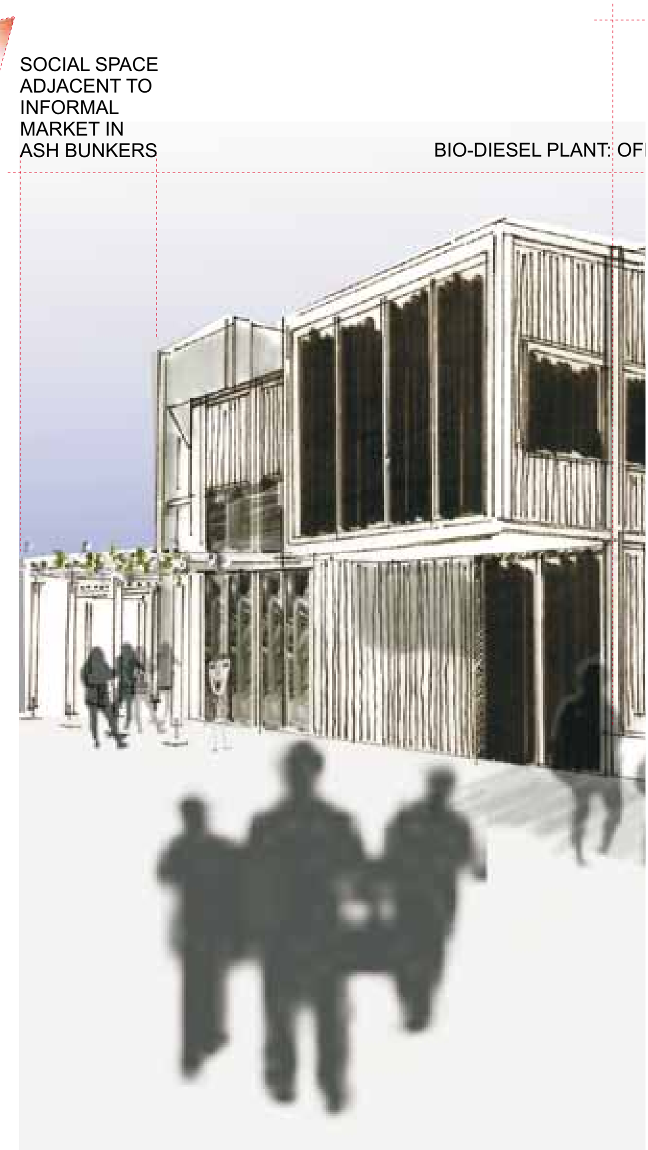


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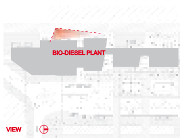
Figure 98. The threshold social space between the Bio-diesel plant (office) and the adjacent main public space, which will contribute to the integration of the industrial building into the urban fabric: Author 2010.

THRESHOLD SPACE BETWEEN BIO-DIESEL
OFFICE AND ADJACENT PUBLIC SPACE



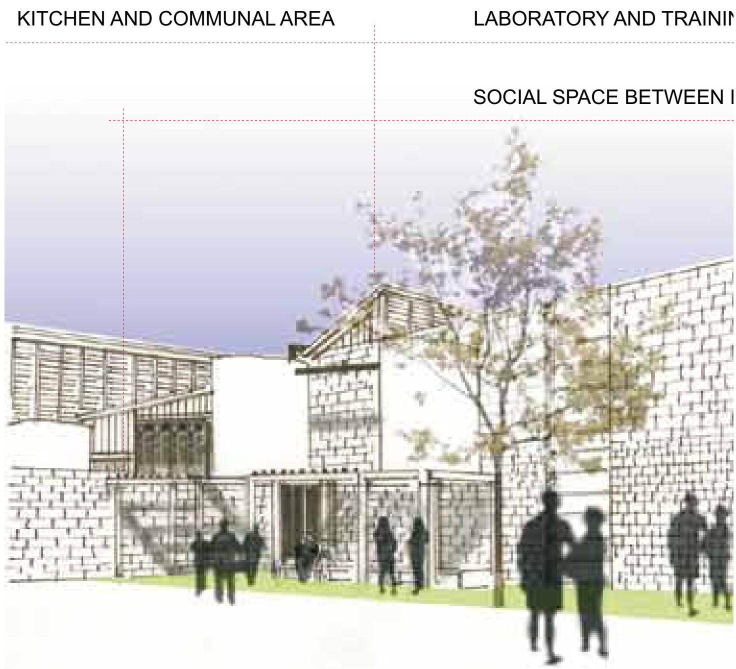


Figure 99. The social space at the back between the train station and the Bio-diesel plant: the workers are the most important source of energy in the production process, and it is therefore vital to have a space where they can interact in conversation, have a quite lunch or just be surrounded by other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

NG AREA

PRODUCTION AREA OF PRETORIA WEST BIO-DIESEL PLANT

BIO-DIESEL PLANT AND RAIL FREIGHT CENTRE

Building systems (energy strategy)

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

Natural light:

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

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

LUX calculations:

Prioduction:

LUX: 500
AREA: 490sqm
LUX = LUMEN/m^2

500 = LUMEN/490m^2
LUMEN = 500 X 490m^2 = 245 000

Production : LUMILUX T8ES - 4800 LUMEN

Total need = 245 000 LUMEN

245 000/4 800 = 51 Luminares are needed , with the day light factor of the bio-diesel plant only 50% will be used, thus:
25 Luminares at 51W will be used - 25 X 51W =1 275

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

Storage: 0,896kW/h

W/C: 1,496kW/h

Retail: 3,344kW/h

Lab and Training area: 2,856kW/h

kitchen and Communal area: 0,23kW/h

Office: 6,12kW/h

Toatal: 25,142 kW/h is needed

Photovoltaic panels:

100 W = 1m^2

10 sqm = 1kW

Pretoria solar factor = 6,2

Bio - Diesel Plant: 493,96m^2

thus 493,96 will yield 49,39 kW

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

49.4 x 3.1 = 153.14 kW

Hot water services:

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

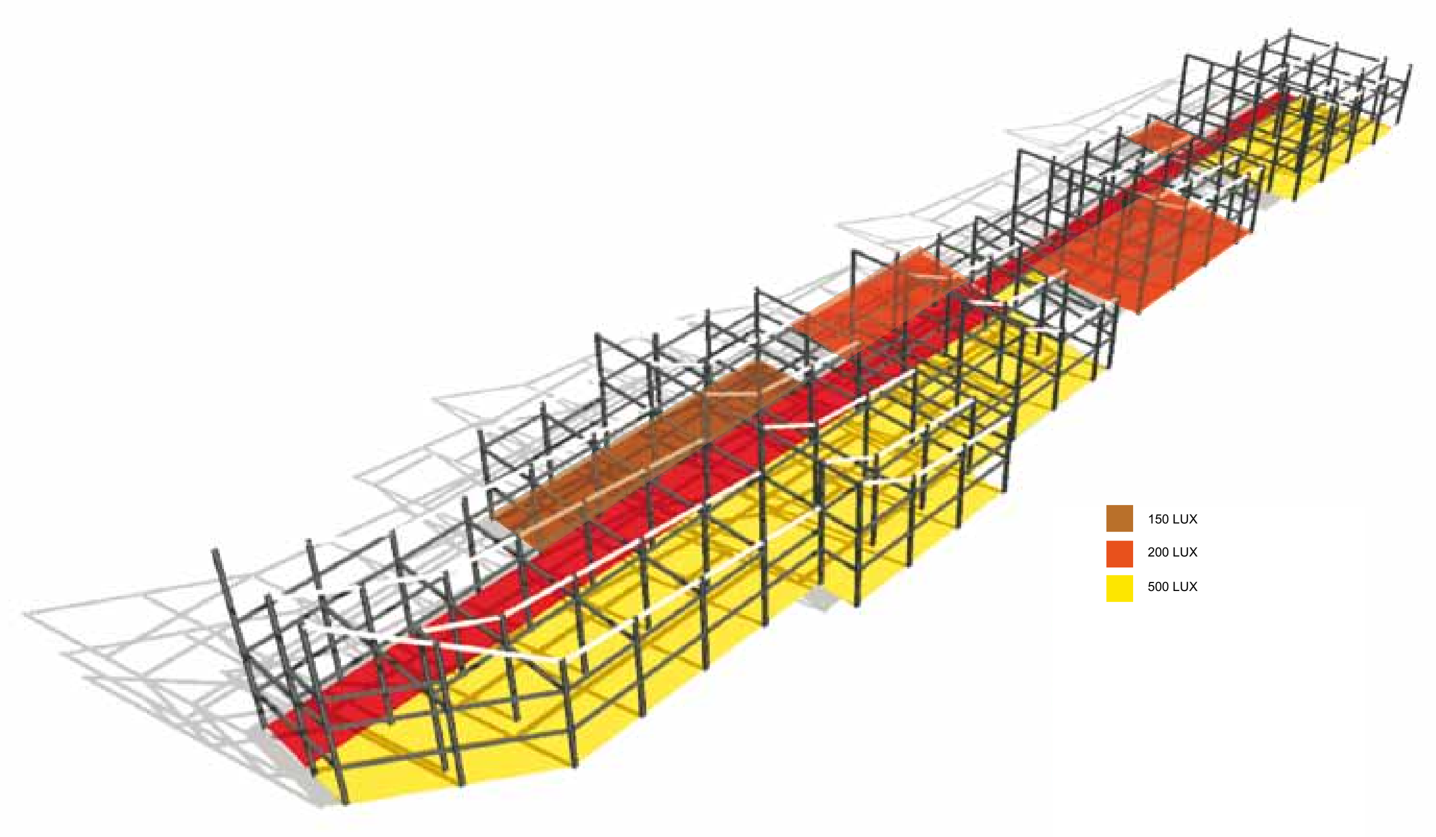


Figure 100. Pretoria West Bio-diesel Plant lighting levels: the lighting level depends on occupancy and activity, and is determined in accordance with the requirements of SANS 10114-1: Author 2010.

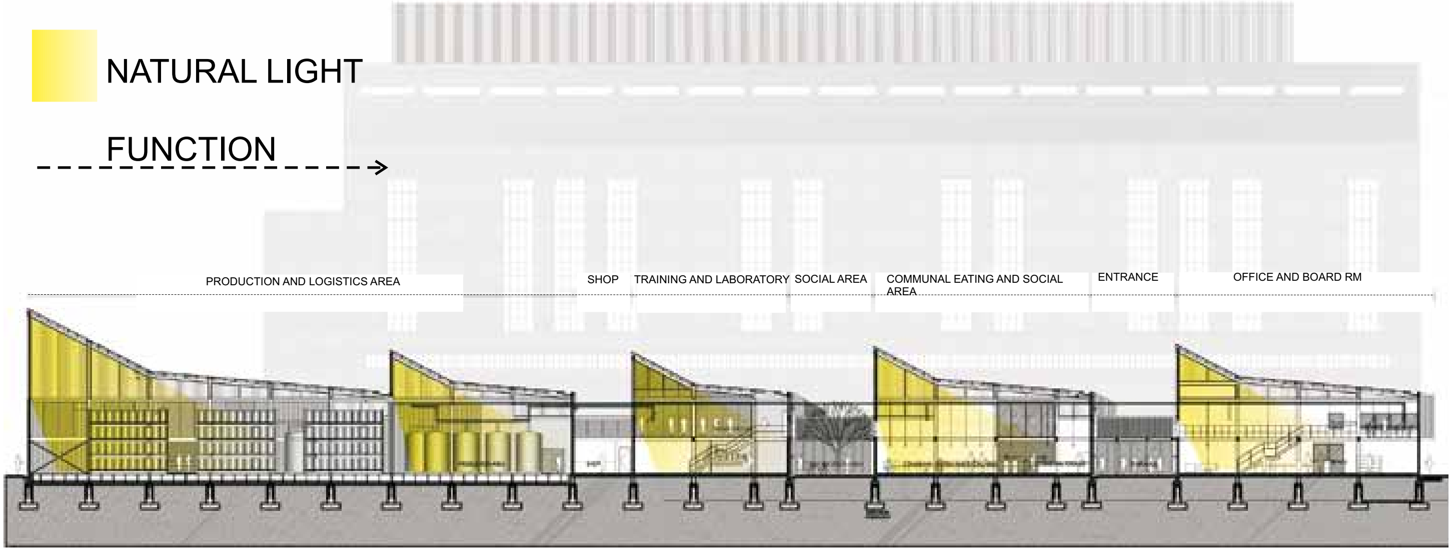


Figure 101. Daylight will enter through louvers which will be manually operated. The functions in the bio-diesel plant are arranged in relation to the natural light that enters the building; human-related activities are placed where the most light enters, and the storage and passive production processes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

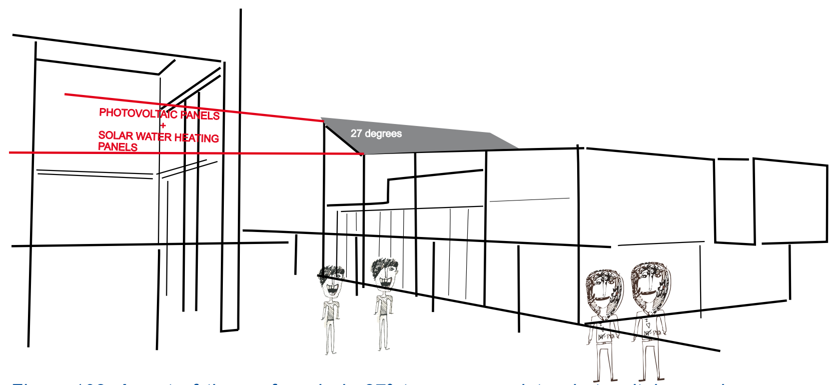


Figure 102. A part of the roof angle is 27° to accommodate photovoltaic panels that will generate electricity for the lighting of the bio-diesel plant and solar water heating panels. From: Author 2010.

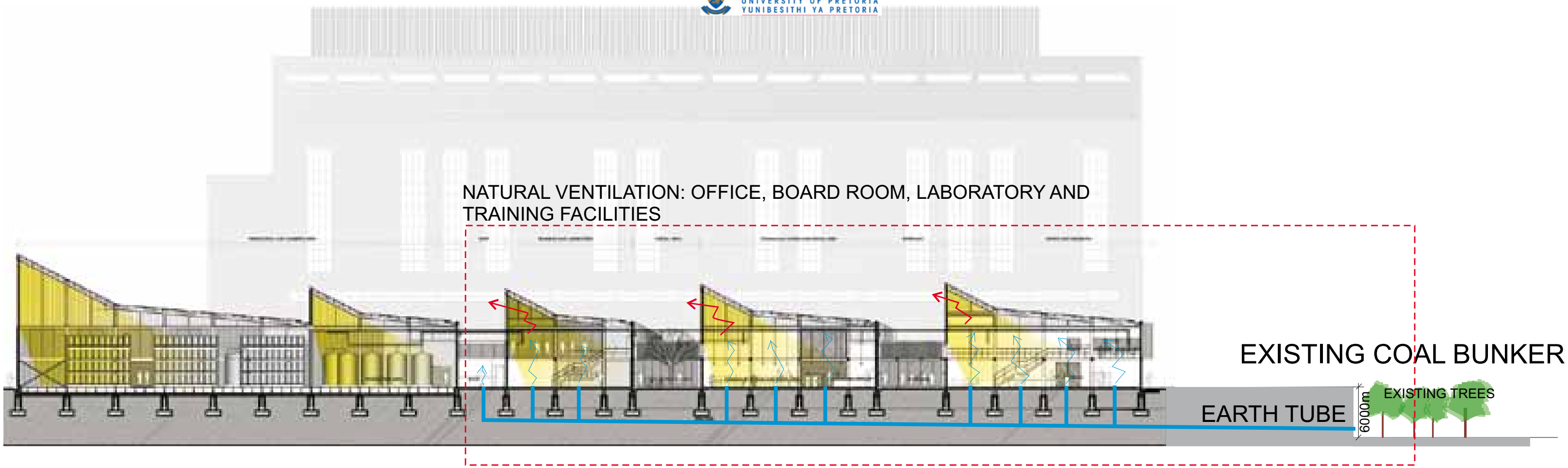


Figure 103. Earth tubes will be connected to the adjacent coal bunker where cool and fresh air will be collected. The earth tube must be sunken into the ground to a distance of at least 2m, and the tube must be installed at a 1:100 slope for condensation to run off and prevent a sick building syndrome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

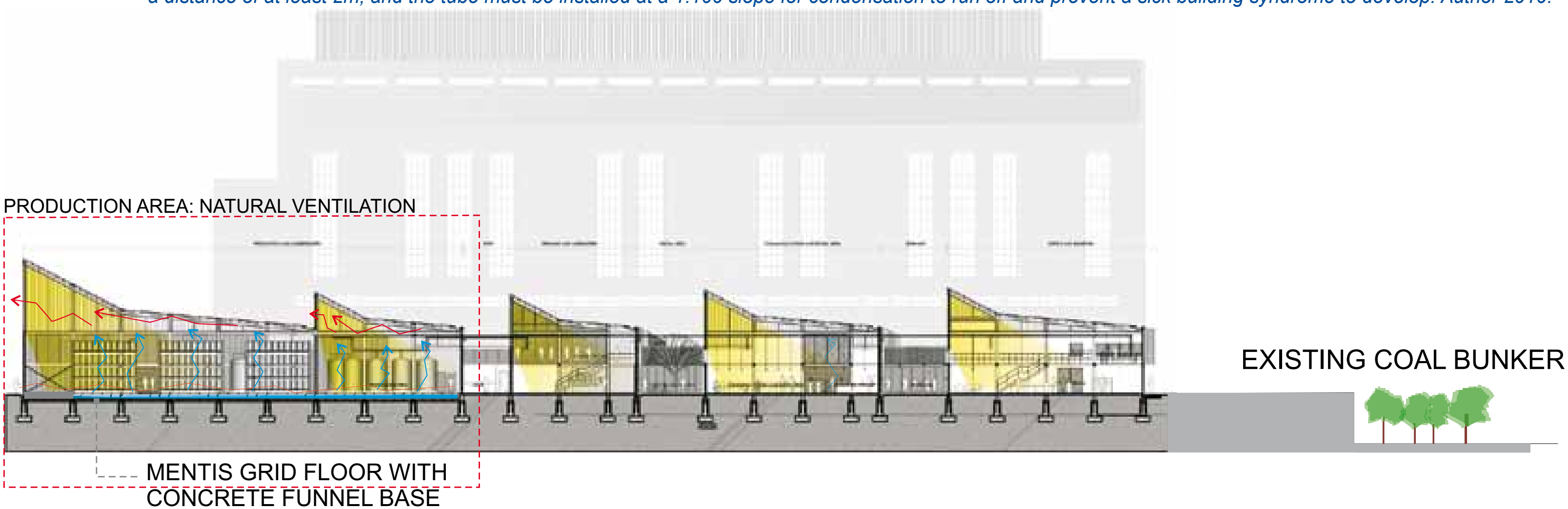


Figure 104. The floor of the production area is a raised steel mentis grid floor with a concrete funnel base which would allow for any spillage to be saved. The strategy is aimed at using use rainwater to run down the funnel base to move and 'wash' the oil (washing the oil is a process where the impurities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

Natural ventilation is achieved by means of the following strategies:

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

Earth tube size: 5l/s per person according to the national building regulation
5l/s x 25 = 125 l/s
0.125$m^{3/s}$
Thus 0.125m^2 area for the tube is needed (conventional ventilation), for displacement ventilation this figure can be doubled = 0.25m^2

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

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

Production area:

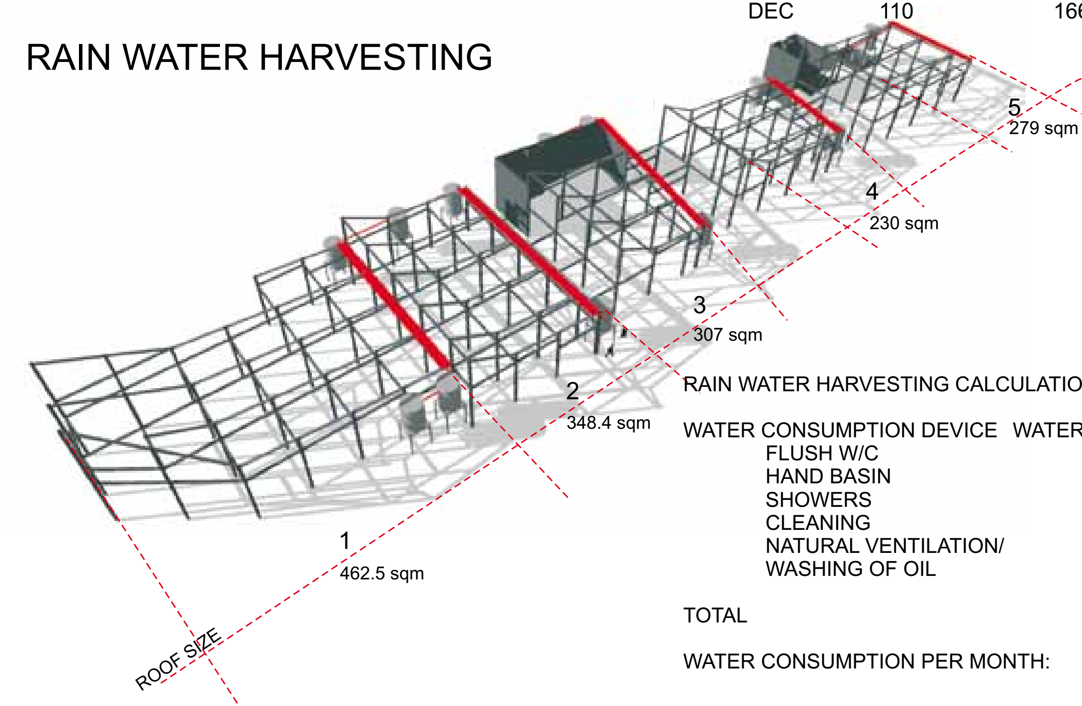
Heat is generated in the production process of bio-diesel. In summer the heat is removed from the building when the hot air rises and escapes through the louvers. In the winter the heat will be redirected and used in other parts of the building; such as the laboratory, training room, office and boardroom.

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

ARVESTING CALCULATIONS

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

RAIN WATER HARVESTING



RAIN WATER HARVESTING CALCULATIONS

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

TOTAL 2628 L/per day

WATER CONSUMPTION PER MONTH: 81468L

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

Rainwater harvesting:

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

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

Rain water harvesting calculations:

Roof 1:

Summer rain fall 140mm/sqm

140 x 462,5 = 64 750 l

140mm/m^2 = sqr root of 64 750
= 254,46 gutter size

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

gutter size: 450mm x 450mm

Down Pipe:
462,5 x 0,5 = 231.25

231,25 x 100mm/m^2 = 23 125

Diameter of gutter = 170mm

Gutter size:

Roof 2: 300mm X 300mm

Roof 3: 300mm X 300mm

Roof 4: 250mm X 250mm

Roof 5: 300mm X 300mm

Rainwater harvesting:

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

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Diameter of gutter = 170mm

Gutter size:

Roof 2: 300mm X 300mm

Roof 3: 300mm X 300mm

Roof 4: 250mm X 250mm

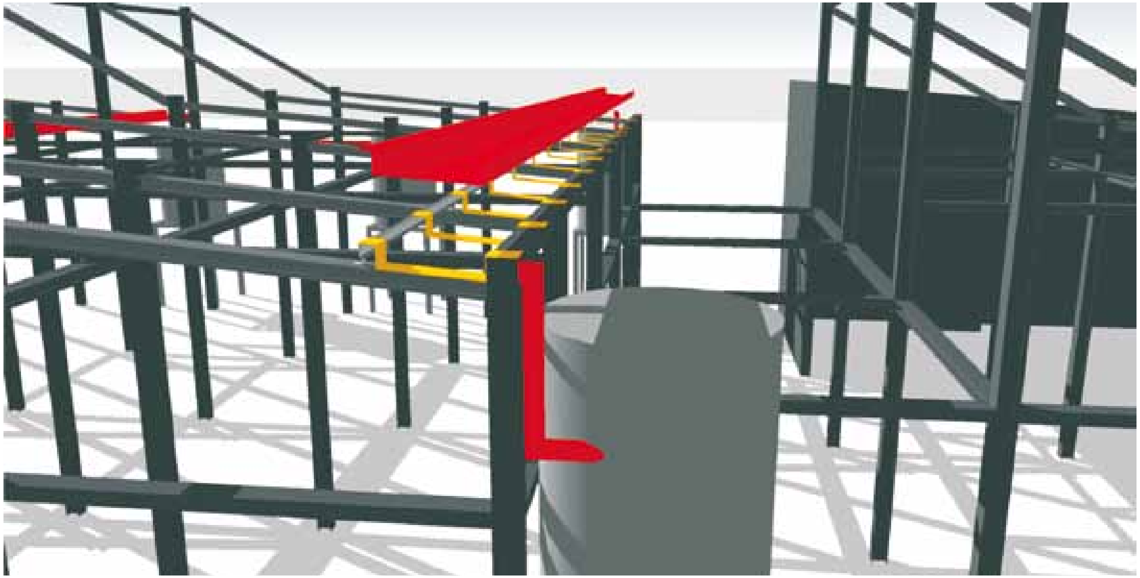
Roof 5: 300mm X 300mm

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

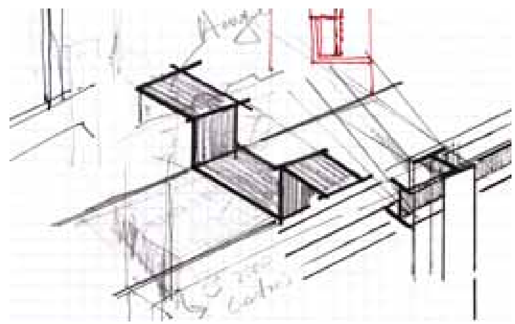
175 DIAMETER DOWNPIPE OF 0.6 CONTINIOUS HOT-DIP ZINC COATED CARBON STEEL SHEET

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

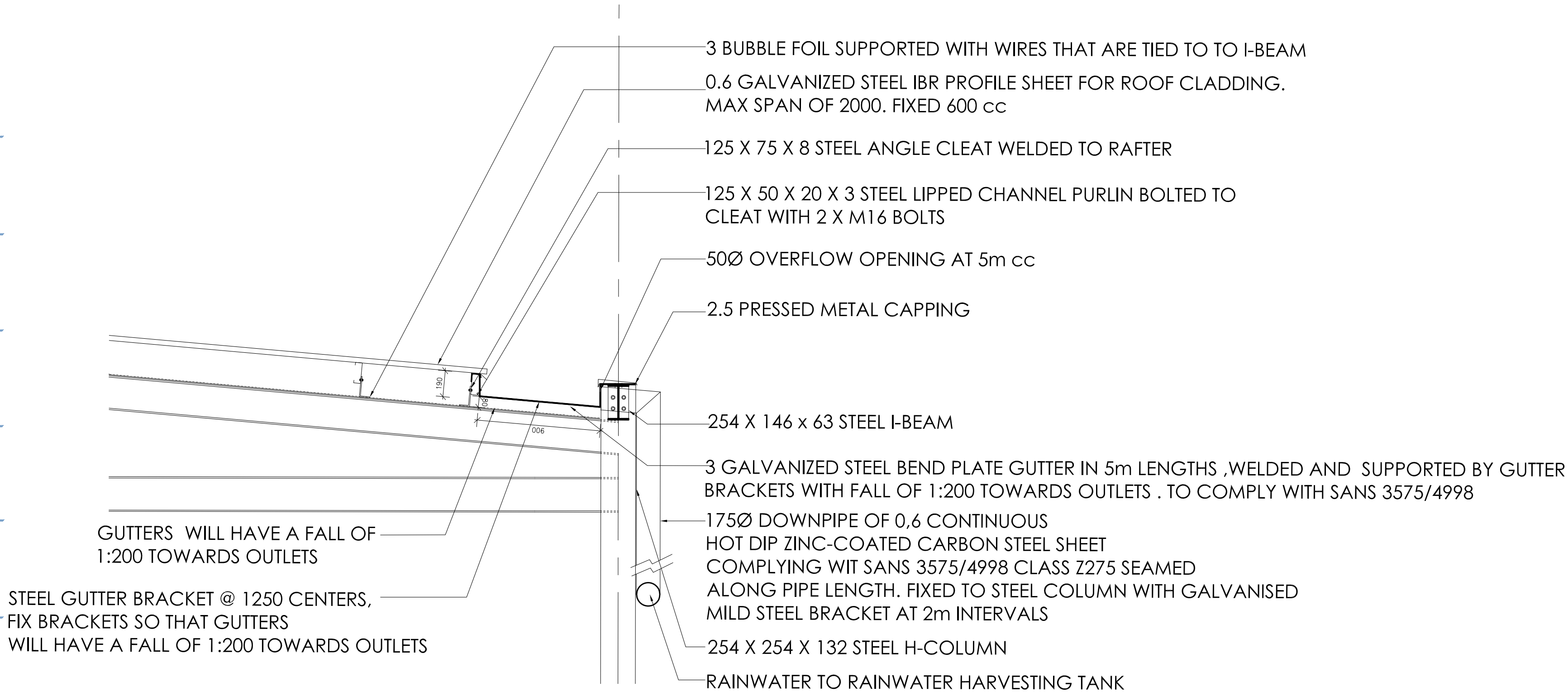
50 DIAMETER OVERFLOW OPENINGS AT 5m cc



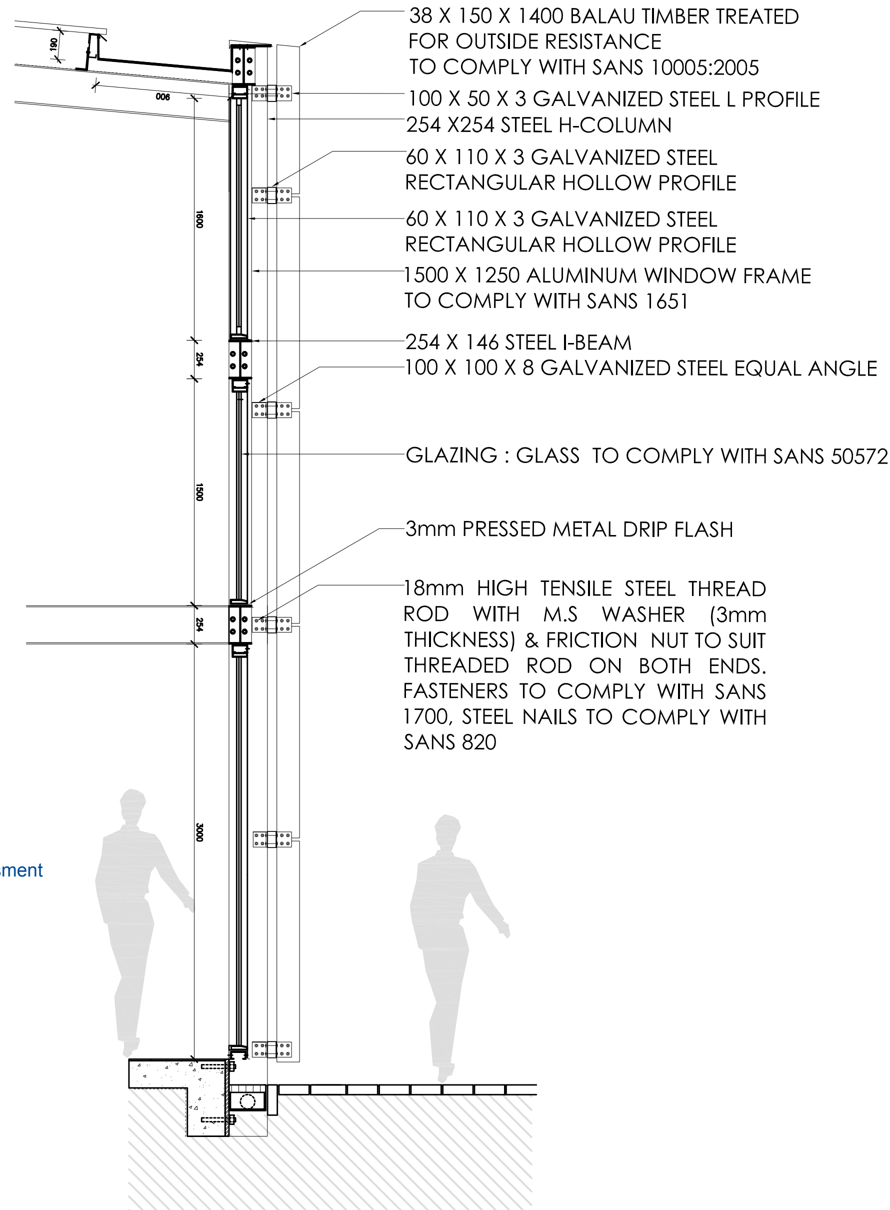
perspective view of gutter



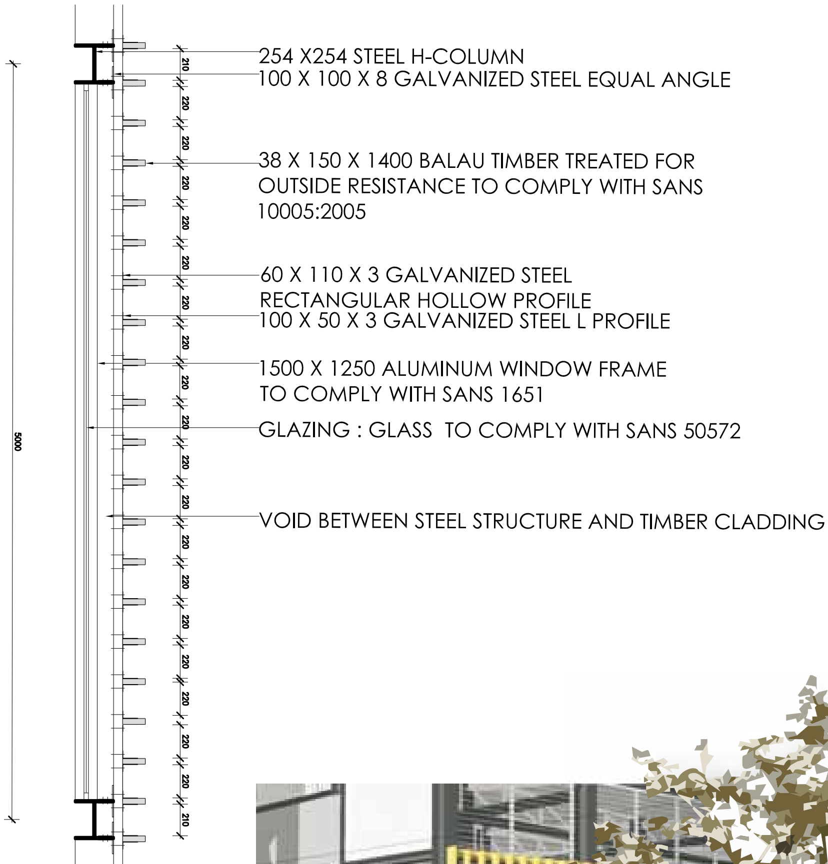
exploration of gutter detail



DETAIL A: gutter detail 1:50



DETAIL E: timber wall cladding section 1:50



DETAIL E: timber wall cladding plan 1:50

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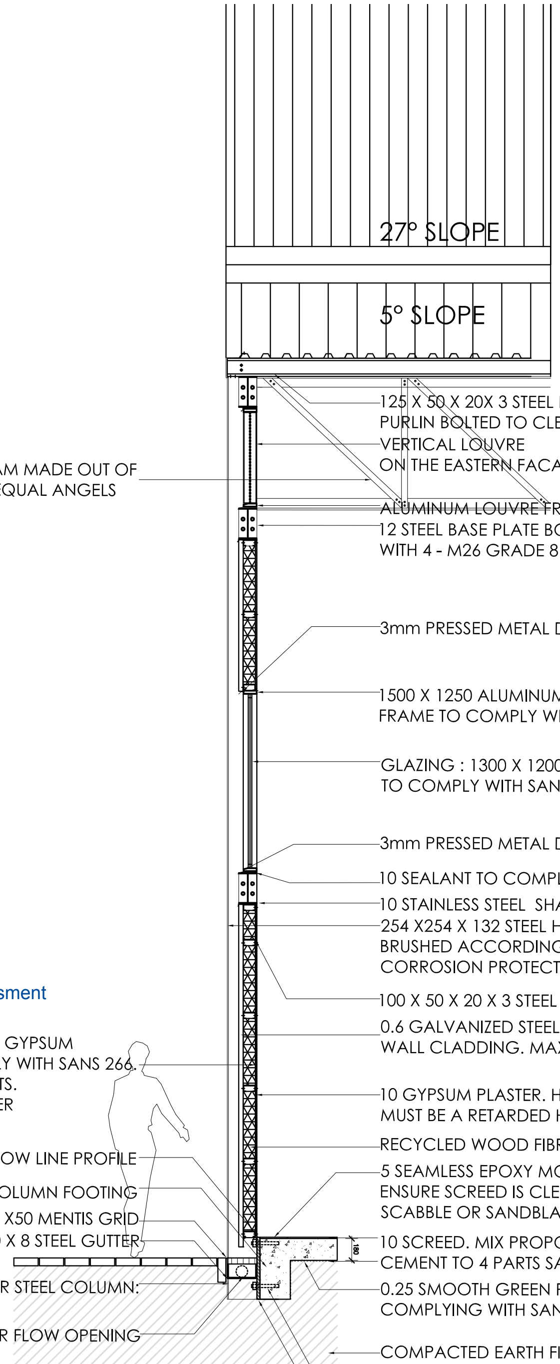
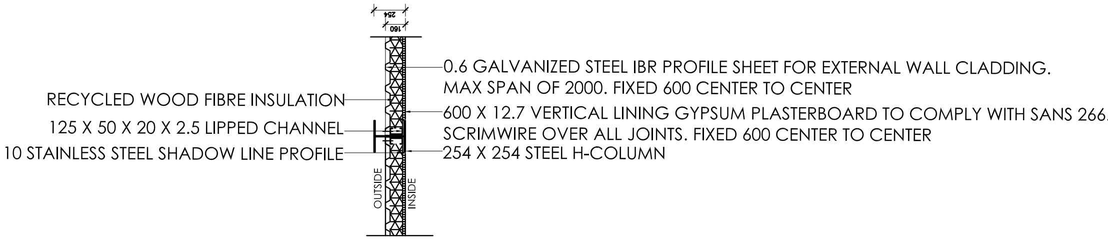
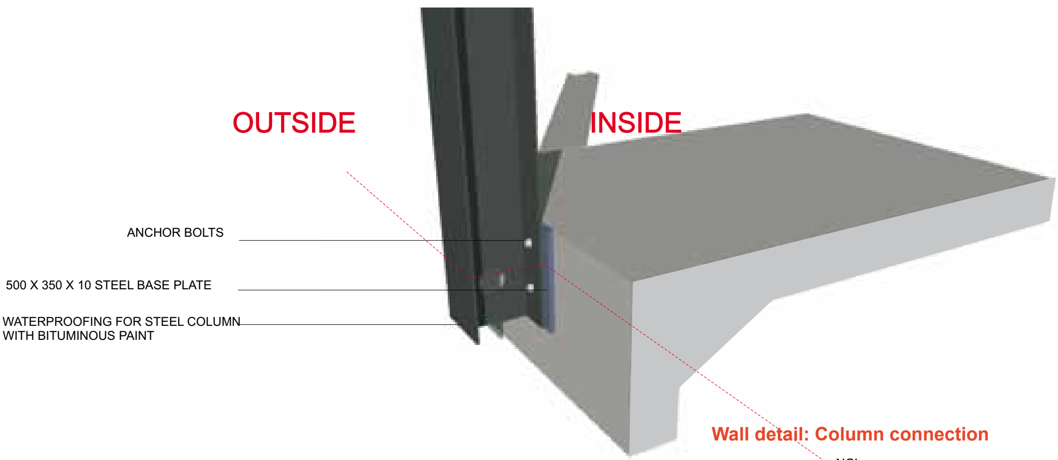


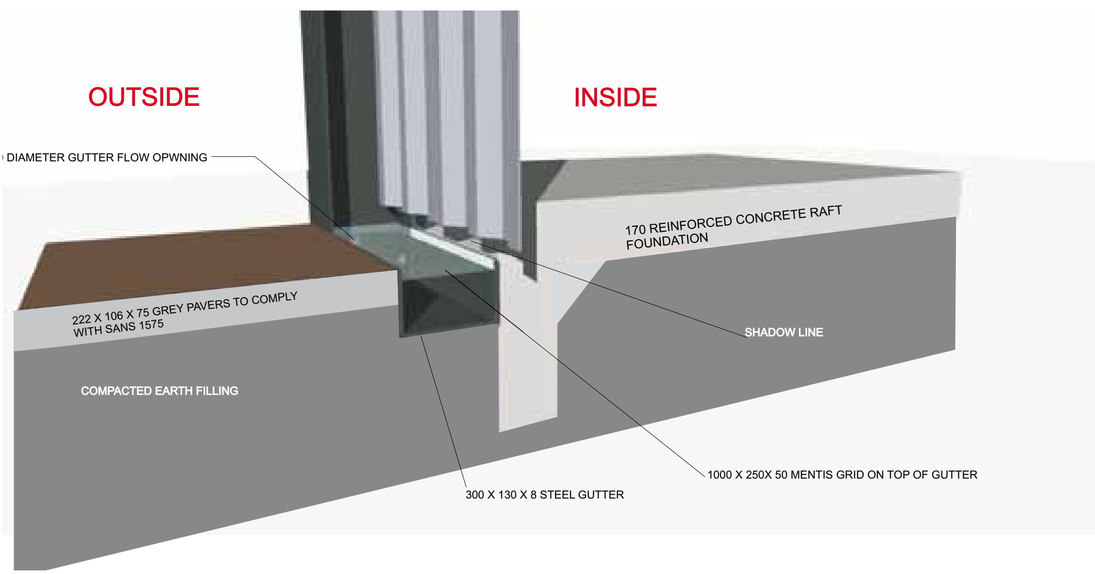
DETAIL C :typical wall section [nts]



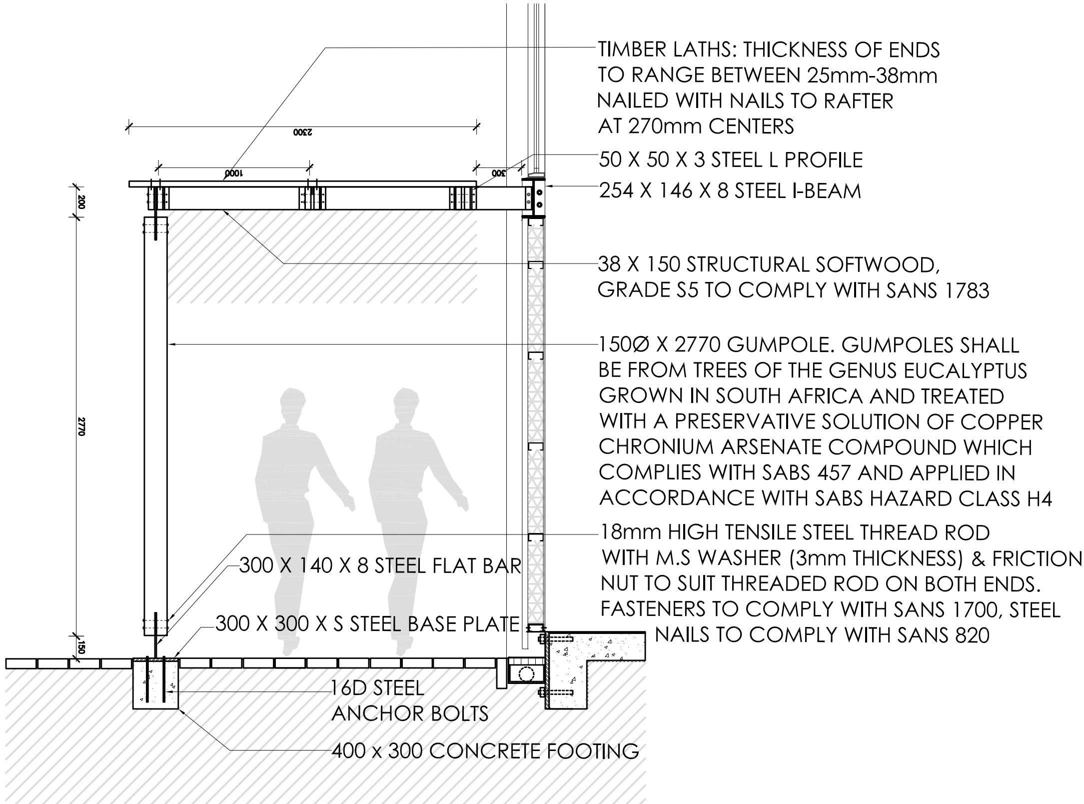
Wall plan [nts]



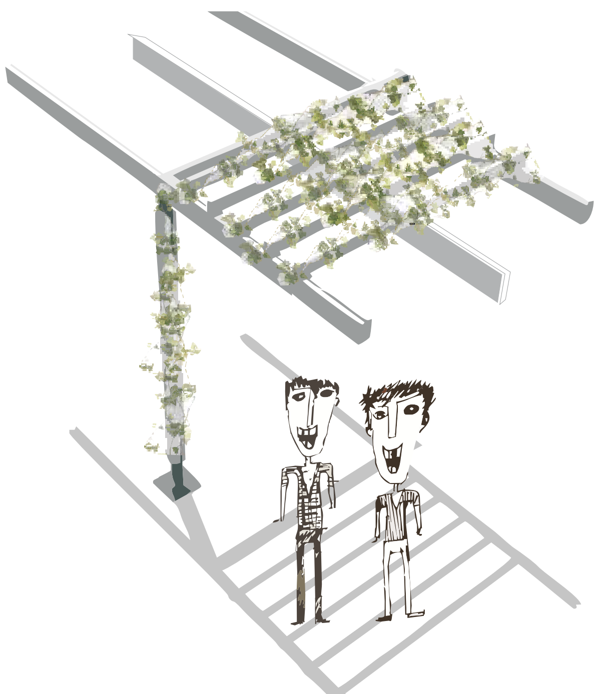
Wall detail: Column connection



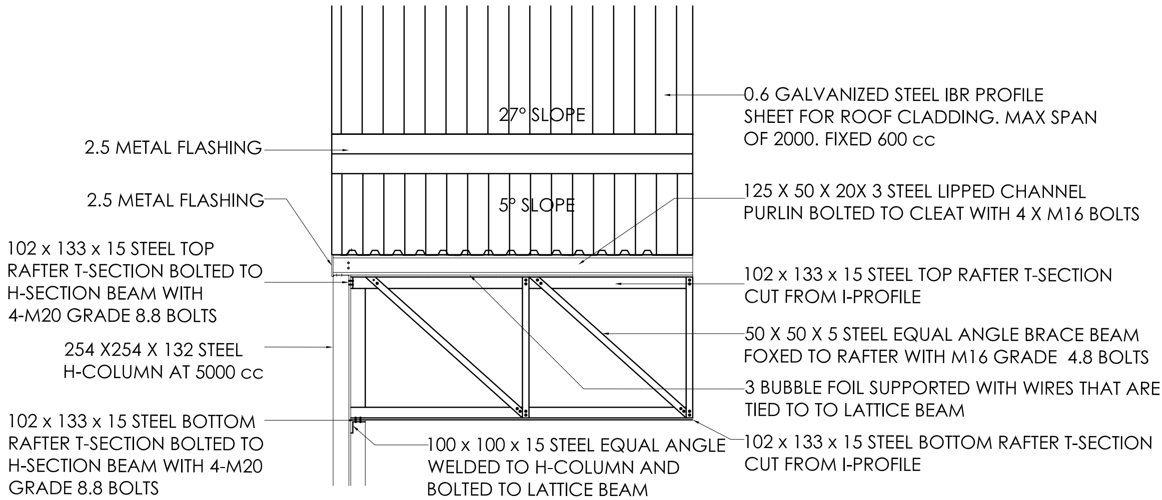
Wall detail: showing ground connection



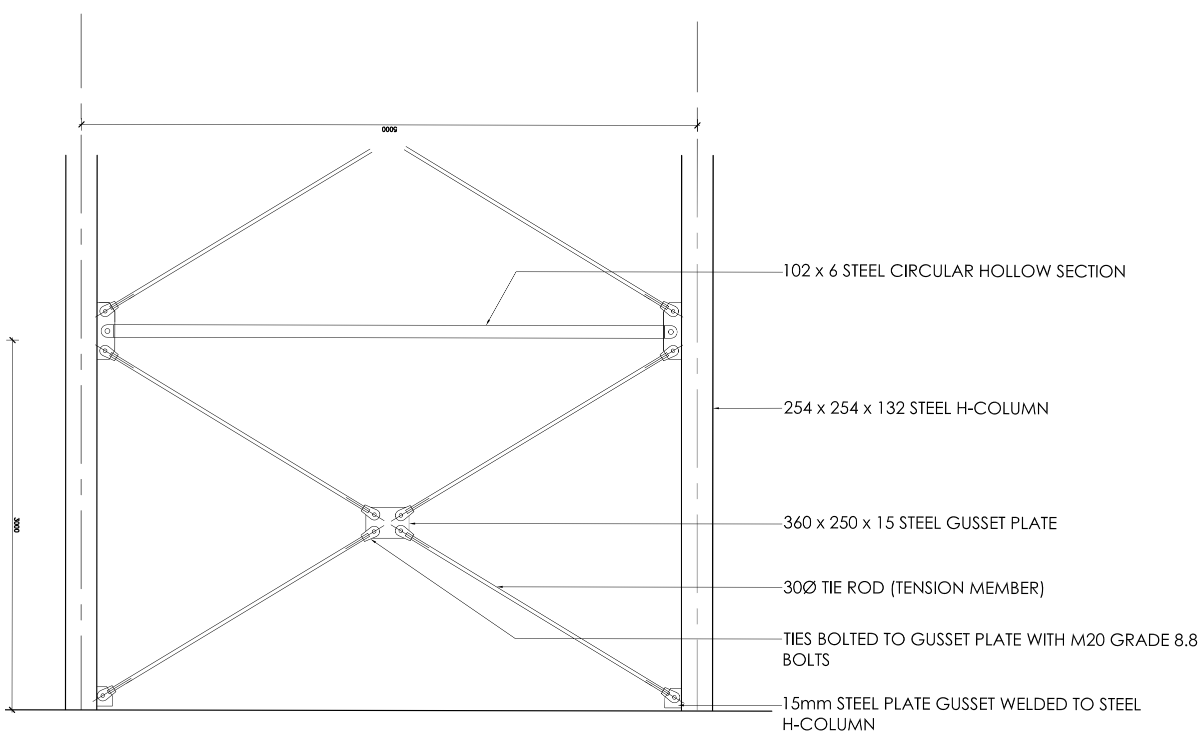
DETAIL D: timber pergola structure 1:50



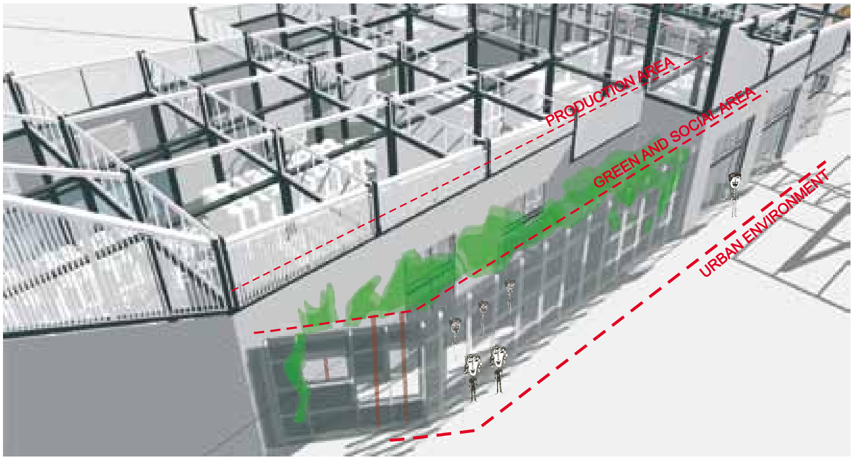
perspective view of timber pergola with vines



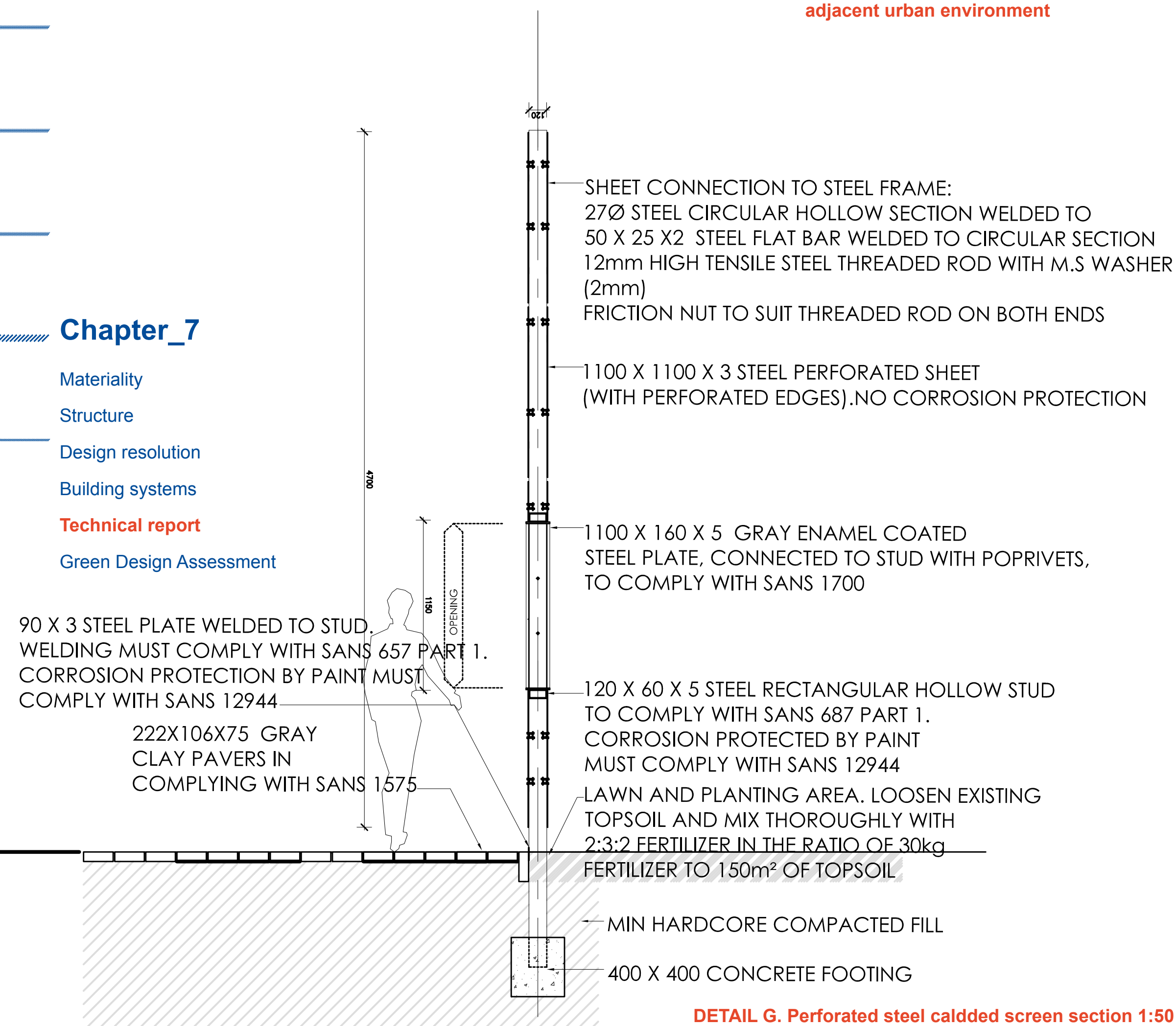
DETAIL E roof lattice beam detail [nts]



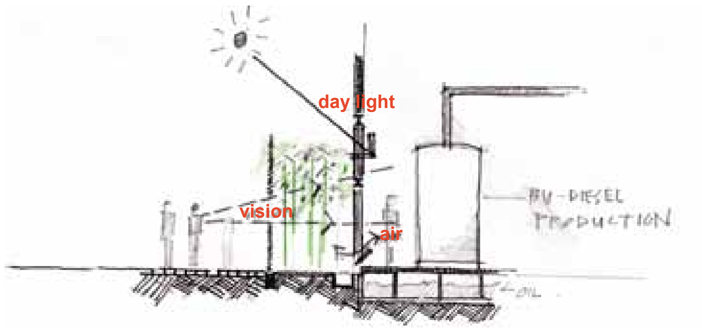
DETAIL F: bracing [nts]



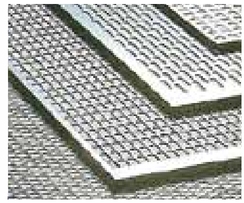
perspective view of green and social space between production space and adjacent urban environment



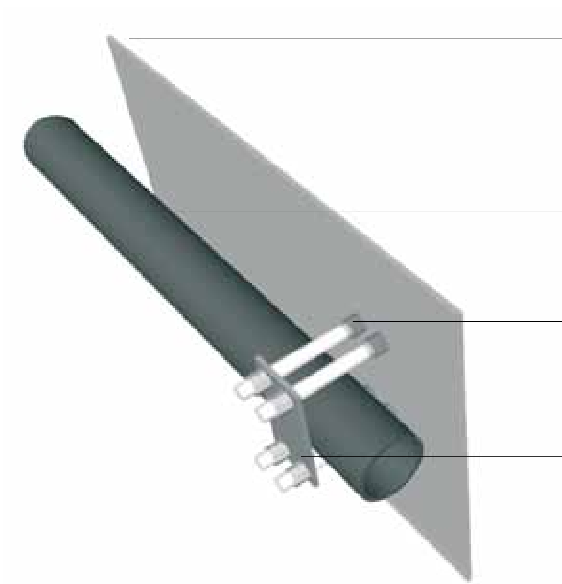
DETAIL G. Perforated steel caldded screen section 1:50



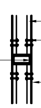
conceptual exploration of perforated steel screen



perforated steel sheets



perspective view of connection detail



DETAIL G. Perforated steel caldded screen plan 1:50

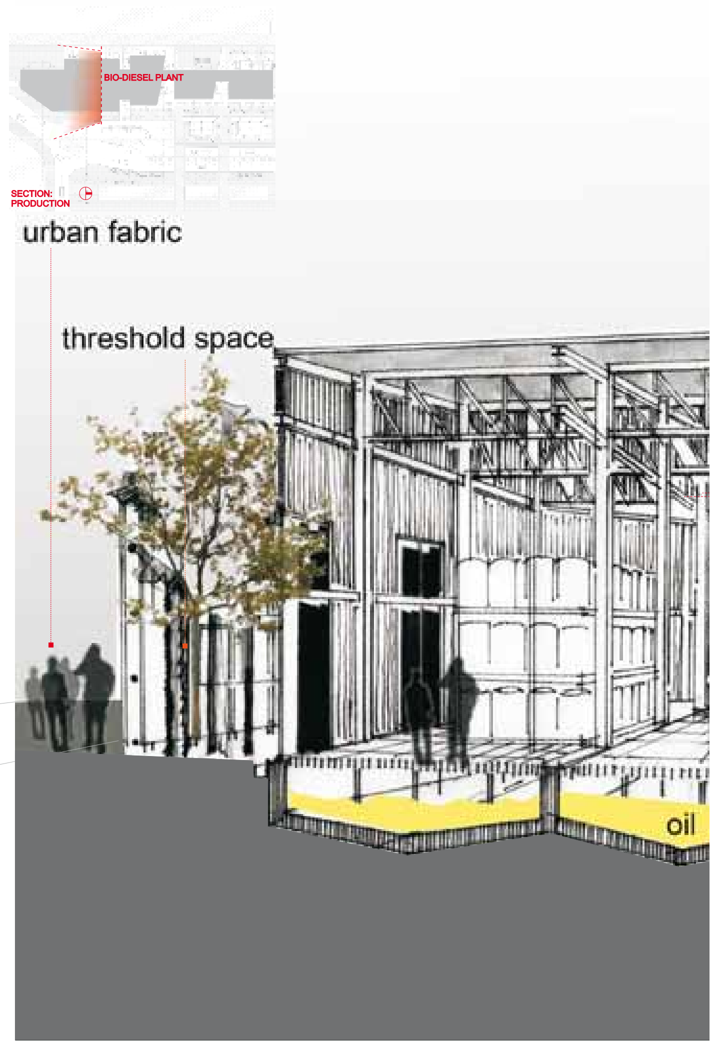
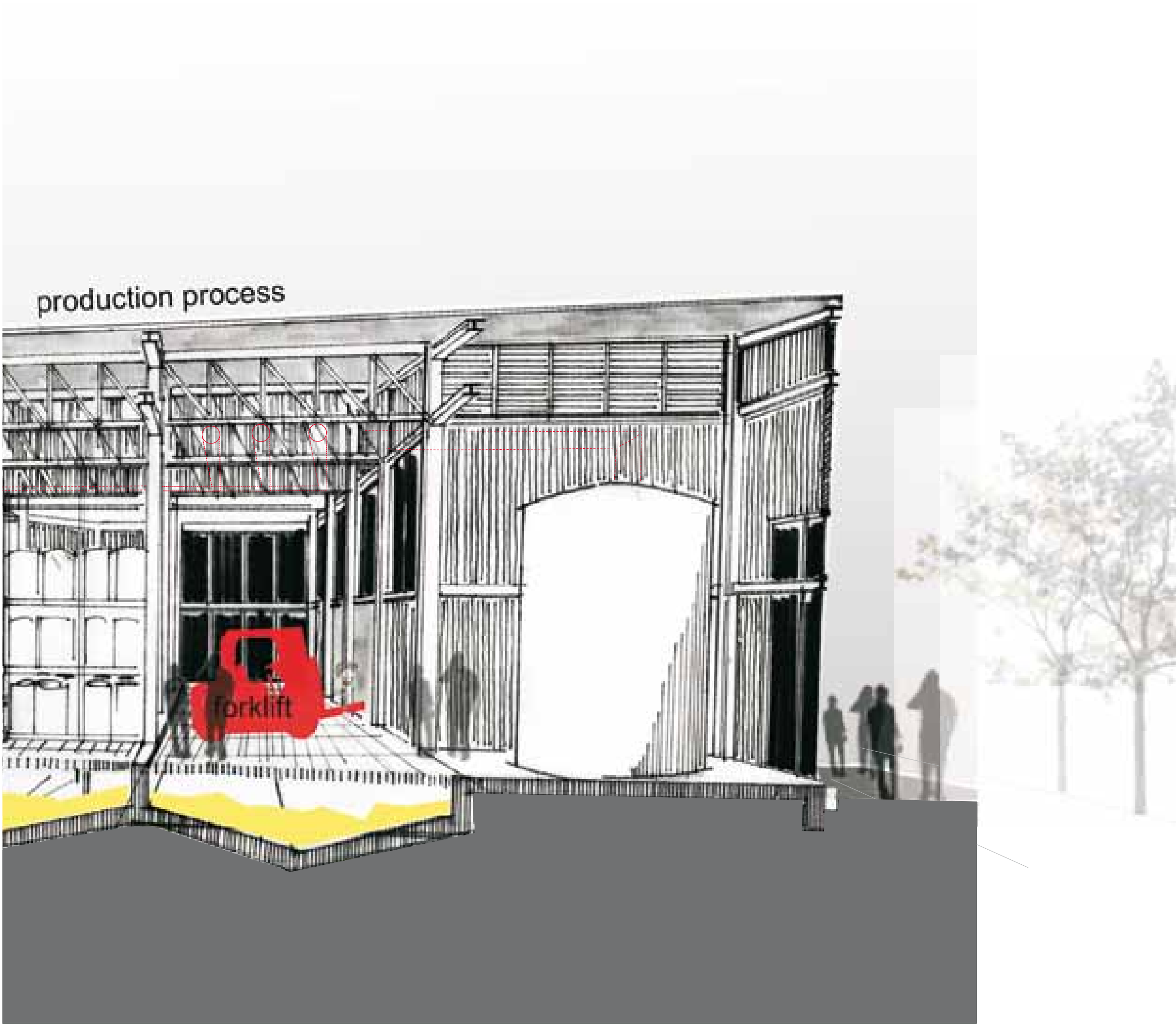


Figure 93. The production area section shows the relationship between the urban fabric, threshold space and Bio-diesel plant. The threshold space will have a visual connection to the street, function as a spill out area for the workers, and the openings will allow ample day light and fresh air into the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


production process
forklift

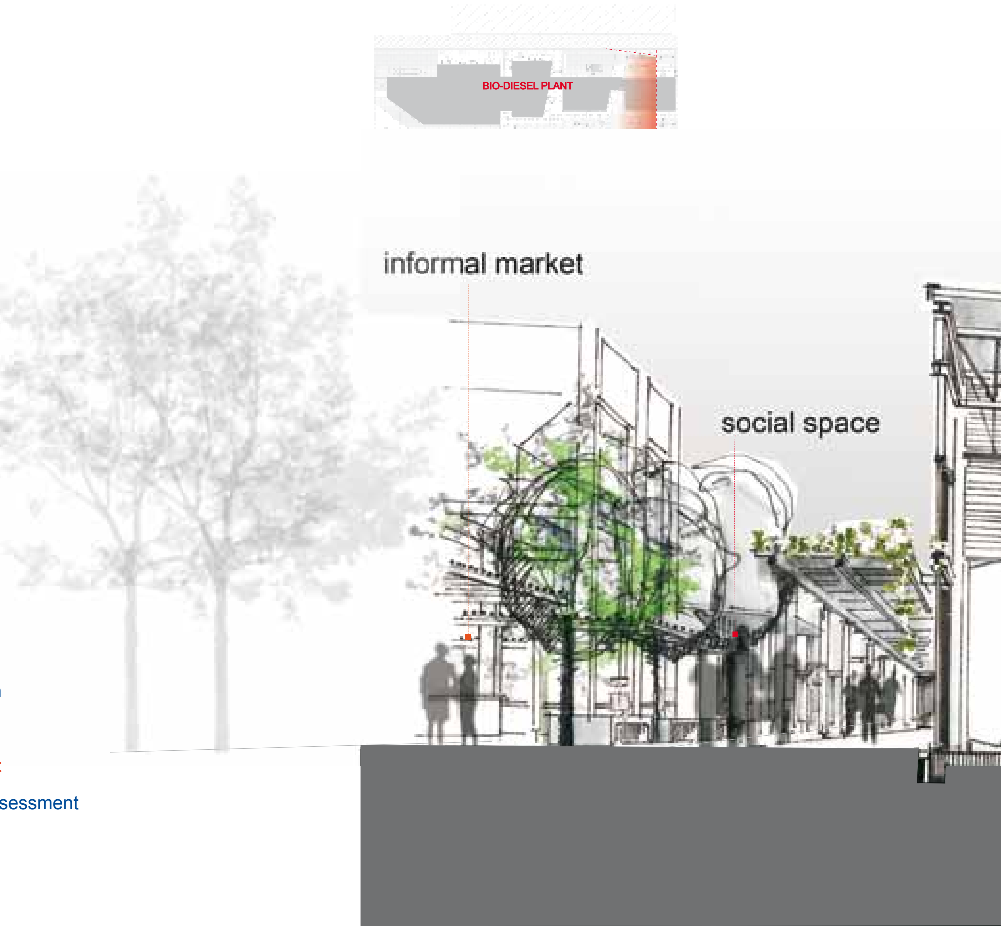


Figure 94. The office area section shows the stitching between the urban activities (informal market at the ash bunkers) and industrial building (Bio-diesel plant); through the integrated social space - the social space is a light structure to strengthen the human scale to that of the industrial scale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


office and boardroom
social space

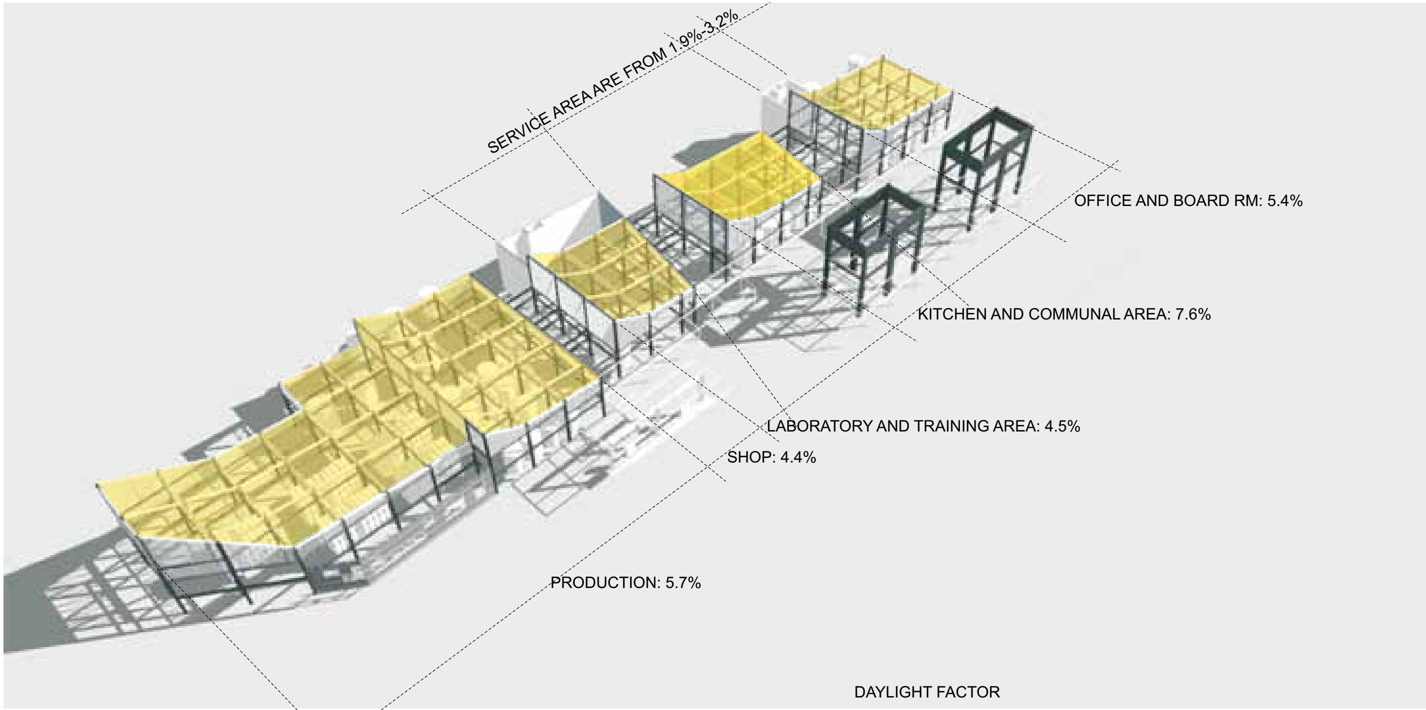


Figure 95. Pretoria West Bio-diesel plant: Daylight factor. From: Author 2010.

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

7.1. Daylight:

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

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

D = 0.1 x P

Where: D = Daylight factor

P = Percentage glazing to floor area

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

D = 0,1 x (20 ÷ 100) x (100 ÷ 1) = 2%

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

Office and Boardroom:

P = 319,6m^2 floor area to 174m^2 of glazing (112m^2) and louvers (62m^2)
D = 0,1 x 0.54 x 100 = 5,4%

Kitchen and Communal space:

P = 248,6m^2 floor area to 189m^2 of glazing (79m^2) and louvers (110m^2)
D = 0,1 x 0,76 x 100 = 7,6%

Laboratory and Training room:

P =323m^2 floor area to 146,9m^2 of glazing (36.9m^2) and louvers (110m^2)
D = 0,1 x 0,45 x 100 = 4.5%

Shop:

P = 50m^2 floor area to 22m^2 of glazing
D = 0,1 x 0,44 x 100 = 4,4%

Production:

P = 711m2 floor area to 408m^2 of glazing (132m^2) and louvers (276m^2)
D = 0,1 x 0,57 x 100 = 5,7%

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

Chapter_7
Materiality
Structure
Design resolution
Building systems
Technical report
Green Design Assessment

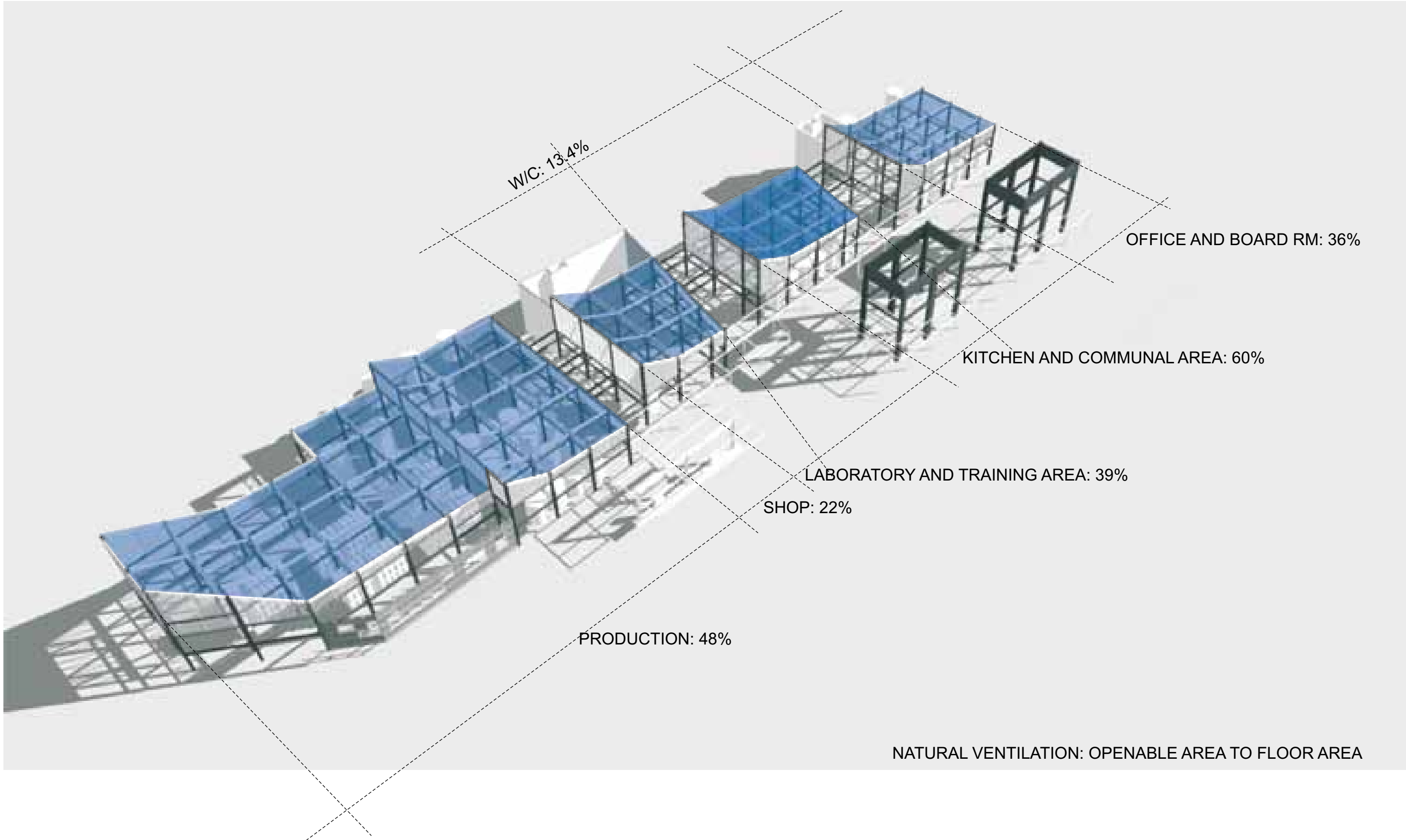


Figure 96. Pretoria West Bio-diesel plant, natural ventilation, indicating the openable area to floor area. From: Author 2010.

7.2. Ventilation

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

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

Office and Boardroom: Openable area: 118m^2/ Floor area: 319,6m^2
Thus 36% openable area in external envelope for natural ventilation

Kitchen and Communal space: Openable area: 149,5m^2 /Floor area: 248,6m^2
Thus 60% openable area in external envelope for natural ventilation

Laboratory and Training room: Openable area: 128,45m^2 /Floor area: 323m^2
Thus 39% openable area in external envelope for natural ventilation

Shop: Openable area: 11m^2 /Floor area: 50m^2
Thus 22% openable area in external envelope for natural ventilation

Production: Openable area: 342m^2 /Floor area: 711m^2
Thus 48% openable area in external envelope for natural ventilation

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

7.3. Sunlight

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

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

7.4. Air tightness:

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

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

7.5. Noise:

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

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

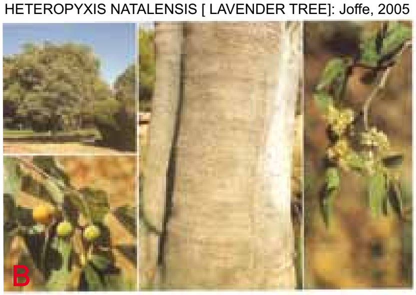
7.6. Habitat and vegetation:

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

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

HETEROPYXIS NATALENSIS [LAVENDER TREE]: Joffe, 2005

CUSSONIA PANICULATA [MOUNTAIN CABBAGE TREE]: Joffe, 2005



CELTIS AFRICANA [WHITE STINKWOOD]: Joffe, 2005

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

7.7. Renewable energy:

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

.

Pretoria West Bio-diesel plant:

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

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

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

7.8. Views:

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

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

7.8. East and West elevations:

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

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

7.9. Openable windows:

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

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

7.10. Rainwater harvesting:

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

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

7.11. Cool roofs:

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

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

7.12. Passive environmental control:

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

Pretoria West Bio-diesel plant:

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