



## CHAPTER 8: TECHNICAL INVESTIGATION

# CHAPTER 8: TECHNICAL INVESTIGATION

## 1. DESIGN RESPONSE TO THE GEOGRAPHY:

### a. TOPOGRAPHY

- roof slope parallel with topography (see Fig. 145)

- building footprints parallel with contours (see Fig. 144)

- half cut and fill terracing, but not on stilts, because of the tallness of buildings and the topography fall at more than 1:8 gradient (see Fig. 145)

FIG. 144: DESIGN RESPONSE TO THE SITE'S TOPOGRAPHY BY PUTTING THE FOOTPRINTS PARRALLEL WITH THE CONTOURS (AUTHOR, 2006).

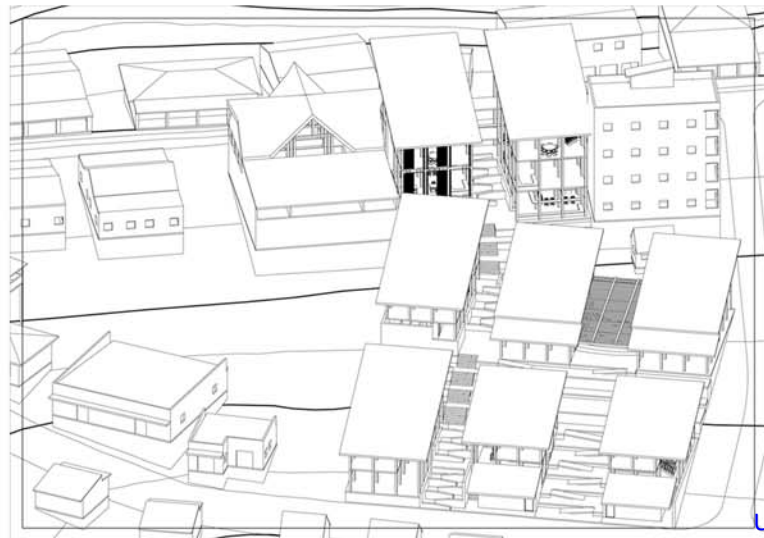


FIG. 145: DESIGN RESPONSE TO THE SITE'S TOPOGRAPHY BY MAKING THE ROOF PARRALLEL WITH THE TOPOGRAPHY AND TERRACING THE TERRAIN USING HALF CUT AND FILL STRATEGY (AUTHOR, 2006).

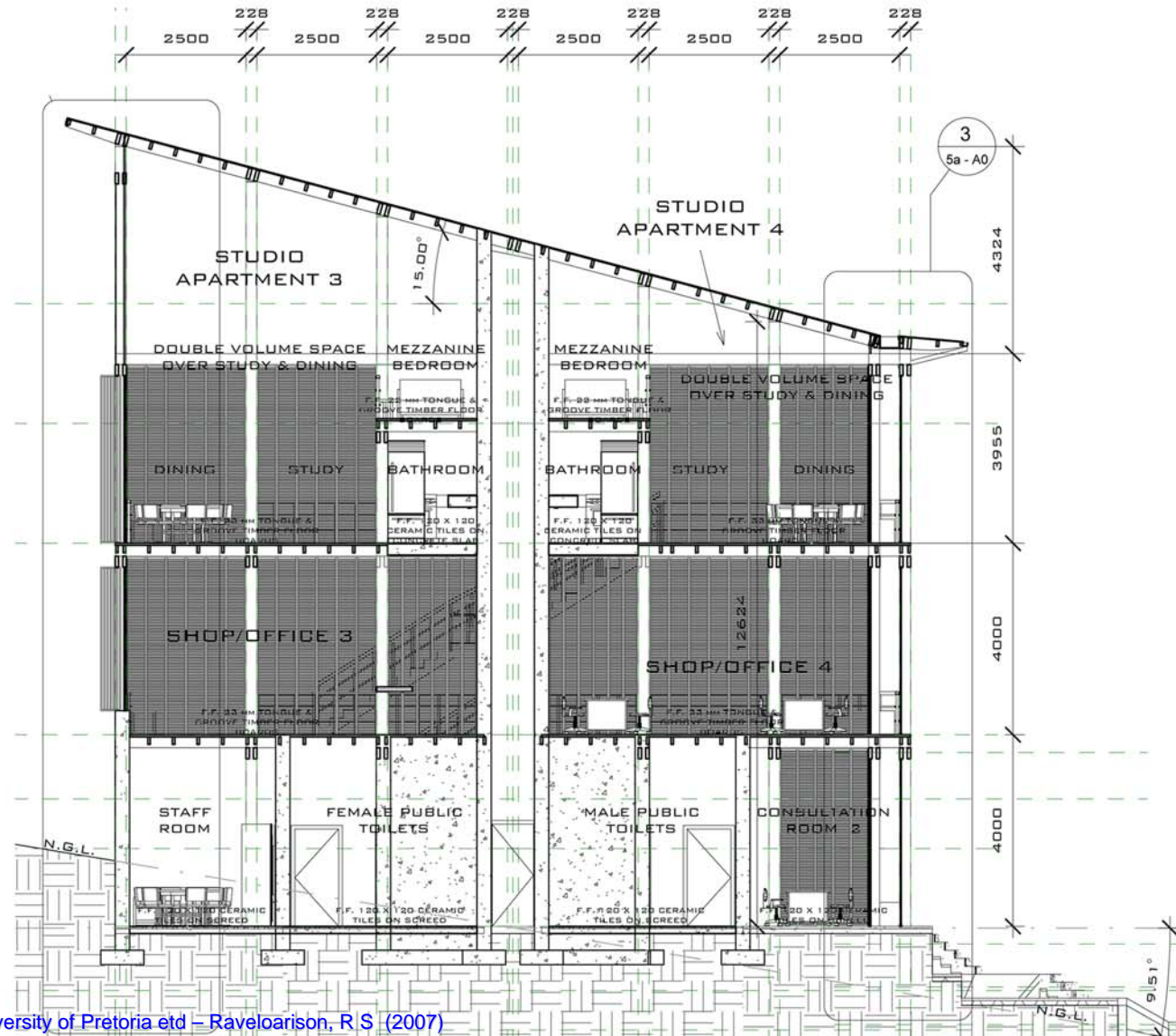




FIG. 146: SITE PLAN WITH WIND DIRECTIONS (ADAPTED BY AUTHOR, 2006).



**b. CLIMATE:**

**i. CROSS VENTILATION:**

- for one room, at least two opposite sides open
- building orientation in relation with breeze directions (North West) - see Fig. 146
- room sizes: 10 x 10 x 4 m.
- sliding folding full height screens on the East and West facades - for spatial flexibility, airiness, and ventilation
- dry wall system with sliding folding openings on the North and South facades, acting as a balustrade for the upper floors as well as ventilation and sun shading devices (see Fig. 147)

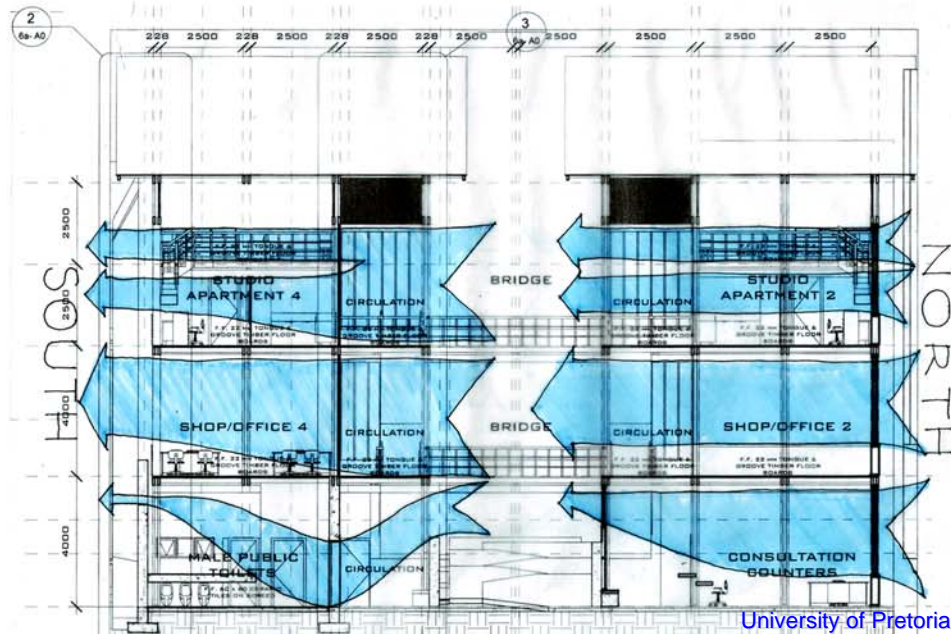


FIG. 147: LONGITUDINAL SECTION WITH CROSS VENTILATION (AUTHOR, 2006).

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## ii. ORIENTATION AND PLANNING :

### 1. SUN ANGLES:

TABLE 4: NOSY BE SUN ANGLES

TIMES	07.00		08.00		10.00		12.00		14.00		16.00		17.00	
	AZ.	ALT.	AZ.	ALT.	AZ.	ALT.	AZ.	ALT.	AZ.	ALT.	AZ.	ALT.	AZ.	ALT.
RAINY SEASON 20/02	105	12	110	26	127.5	51.5	180	66	232.5	321.5 (-51.5)	250	296 (-26)	255	282 (-12)

TIMES	06.00		08.00		10.00		12.00		14.00		16.00		18.00	
	AZ.	ALT.	AZ.	ALT.	AZ.	ALT.	AZ.	ALT.	AZ.	ALT.	AZ.	ALT.	AZ.	ALT.
DRY SEASON 21/08	79	03	86.5	31.5	90	61	180	88	270	331 (-61)	275.5	301.5 (-31.5)	289	273 (-3)

SOURCE: <http://solardat.uregon.edu/download/temp>



## 2. SHADOW STUDY:

These following studies are done during the times when the centre is inhabited, between 07.00 and 18.00, in February - during the rainy season peak when temperatures and humidity are at their highest, and in August, during the dry season when there is only about height hundred millimetres rain.

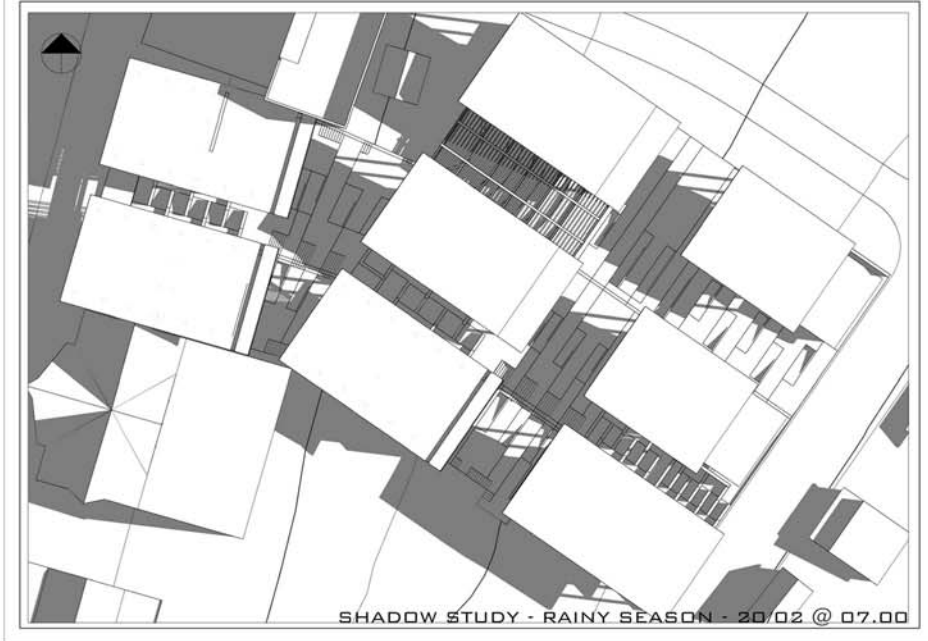


FIG. 148: SHADOW STUDY ON 20 FEBRUARY AT 07.00 - SITE PLAN (AUTHOR, 2006).

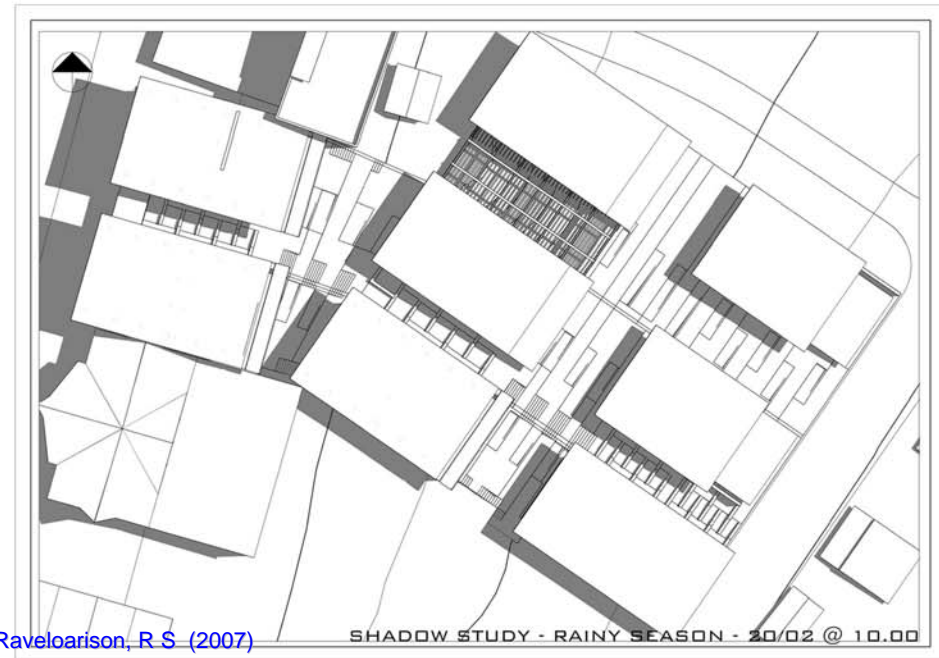


FIG. 149: SHADOW STUDY ON 20 FEBRUARY AT 10.00 - SITE PLAN (AUTHOR, 2006).

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FIG. 150:  
SHADOW STUDY ON 20  
FEBRUARY AT  
12.00 - SITE  
PLAN  
(AUTHOR,  
2006).

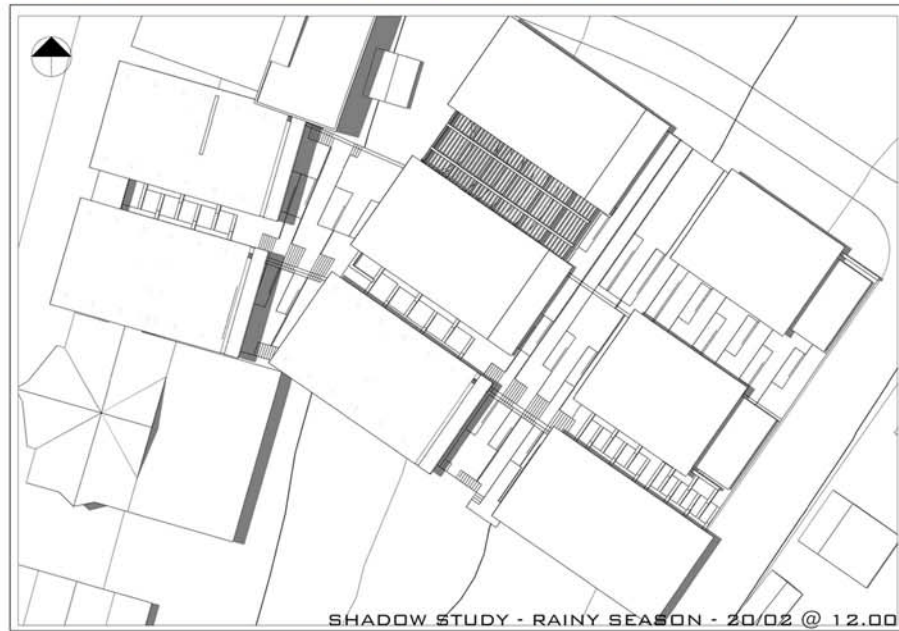


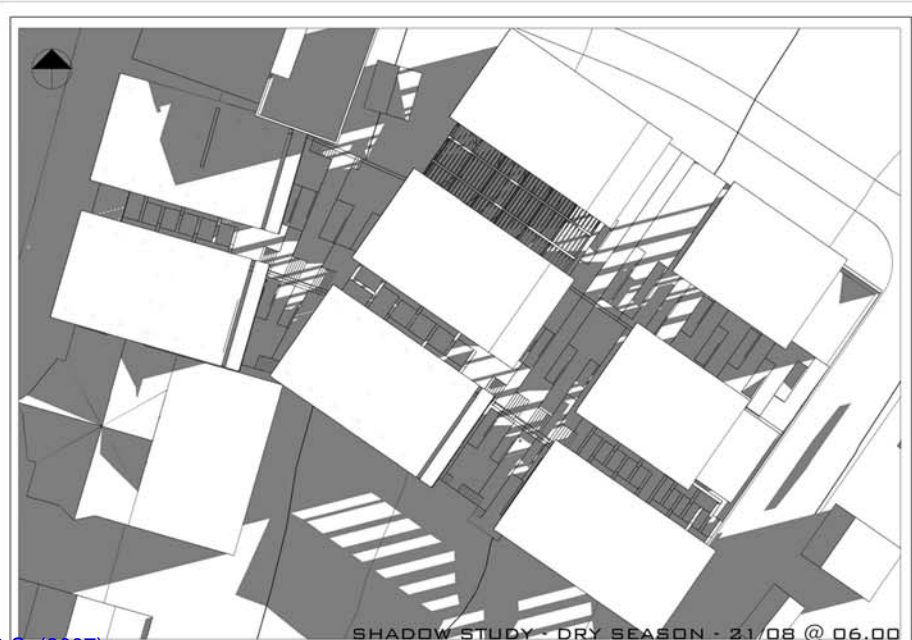
FIG. 152:  
SHADOW STUDY  
ON 20 FEBRU-  
ARY AT 16.00 -  
SITE PLAN  
(AUTHOR,  
2006).



FIG. 151:  
SHADOW STUDY  
ON 20 FEBRU-  
ARY AT 14.00 -  
SITE PLAN  
(AUTHOR,  
2006).



FIG. 153:  
SHADOW STUDY  
ON 21 AUGUST  
AT 06.00 - SITE  
PLAN (AUTHOR,  
2006).



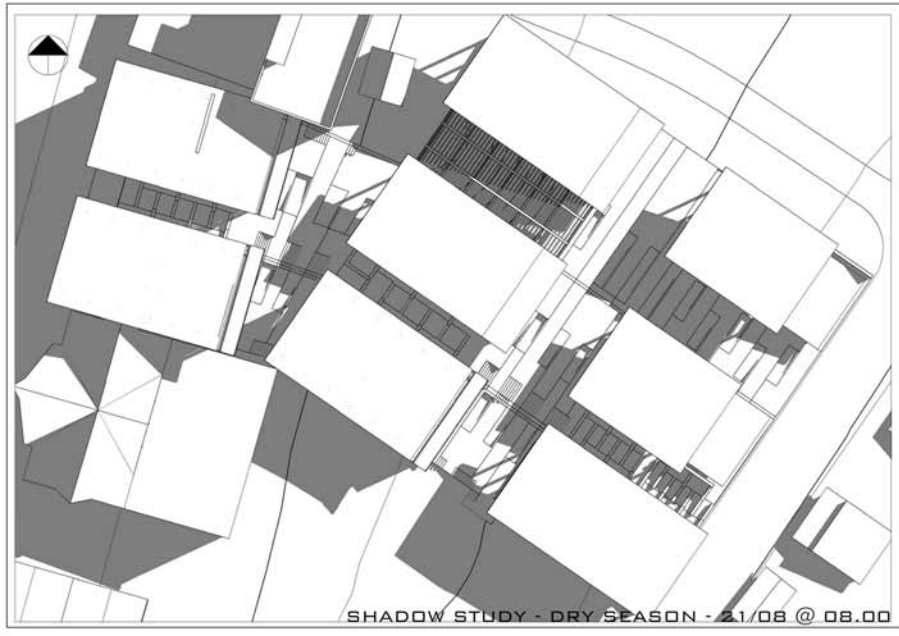


FIG. 154: SHADOW STUDY ON 21 AUGUST AT 08.00 - SITE PLAN (AUTHOR, 2006).

SHADOW STUDY - DRY SEASON - 21/08 @ 08.00

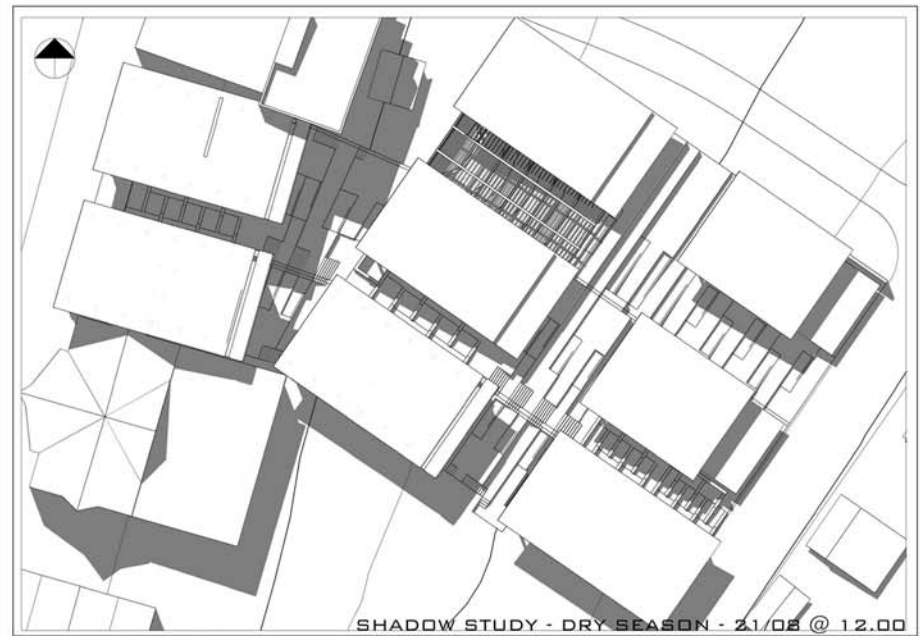


FIG. 156: SHADOW STUDY ON 21 AUGUST AT 12.00 - SITE PLAN (AUTHOR, 2006).

SHADOW STUDY - DRY SEASON - 21/08 @ 12.00

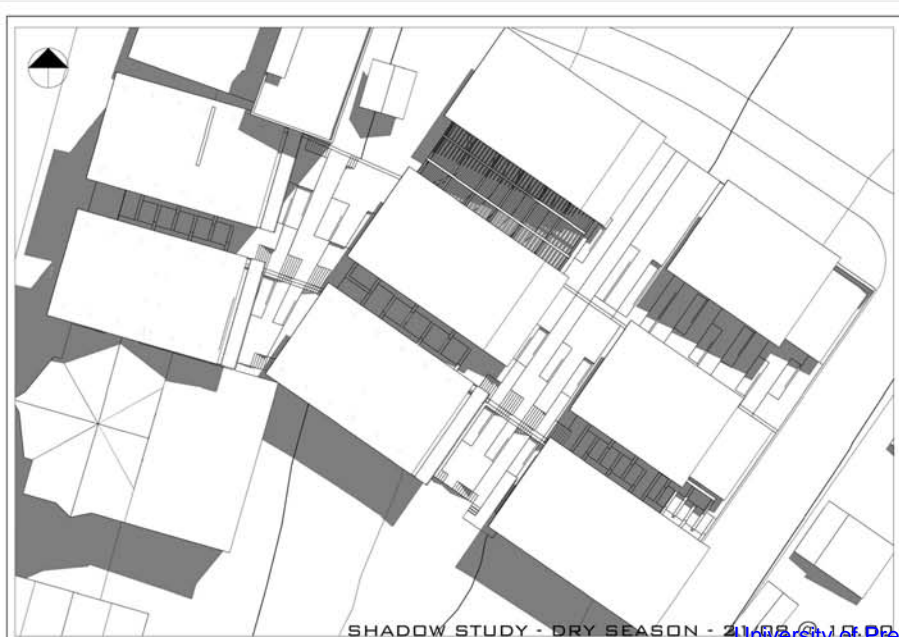


FIG. 155: SHADOW STUDY ON 21 AUGUST AT 10.00 - SITE PLAN (AUTHOR, 2006).

SHADOW STUDY - DRY SEASON - 21/08 @ 10.00

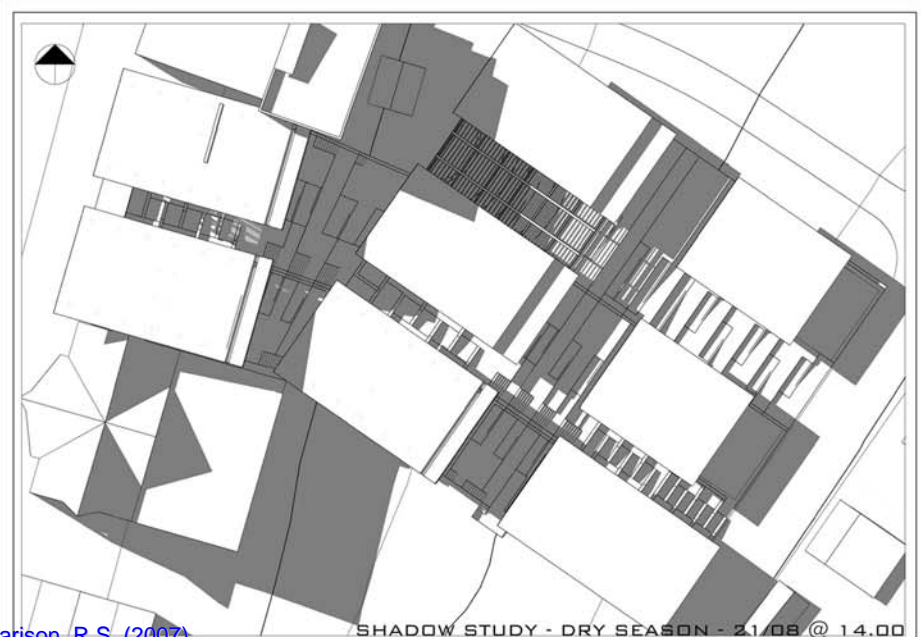


FIG. 157: SHADOW STUDY ON 21 AUGUST AT 14.00 - SITE PLAN (AUTHOR, 2006).

SHADOW STUDY - DRY SEASON - 21/08 @ 14.00

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## 3. SHADING DEVICES:

- openings as shading devices: sliding/folding screens as an outside skin system, consisting of bamboo rods or timber operable louvres mounted on a timber frame (see Fig. 158 & 161) or mounted on a dry wall system on the North and South facades (see Fig. 163)
- one-metre overall roof overhang - see Fig. 145: 100

FIG. 158: VERTICAL WEST SCREENS (AUTHOR, 2006).

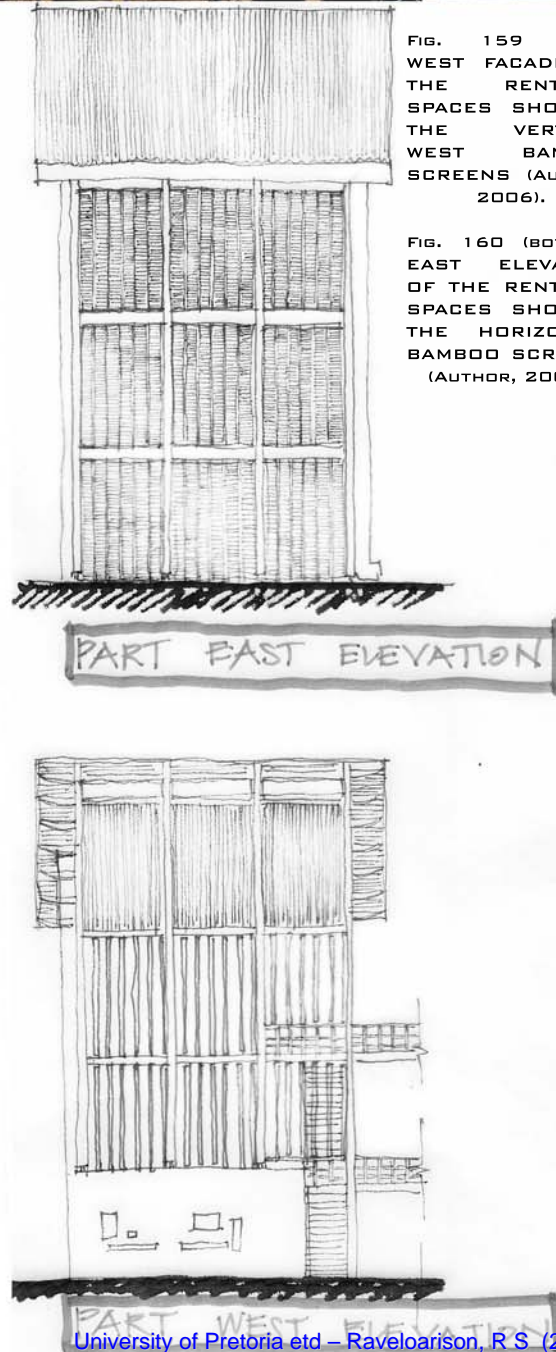
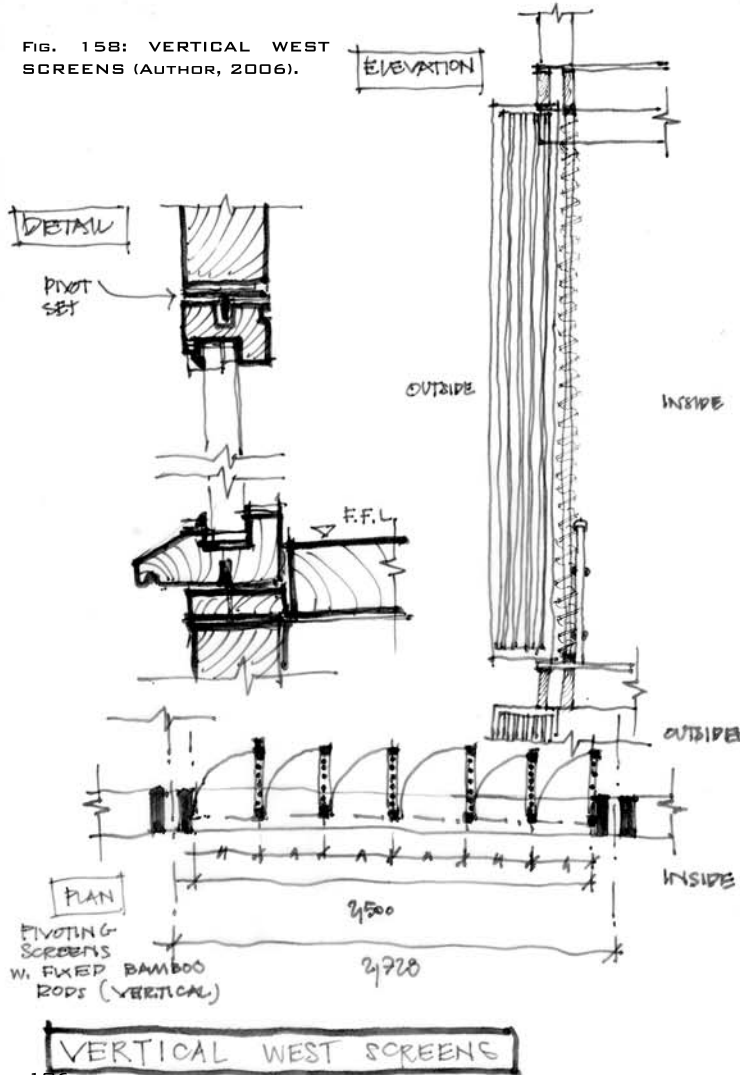


FIG. 159 (TOP): WEST FACADE OF THE RENTABLE SPACES SHOWING THE VERTICAL WEST BAMBOO SCREENS (AUTHOR, 2006).

FIG. 160 (BOTTOM): EAST ELEVATION OF THE RENTABLE SPACES SHOWING THE HORIZONTAL BAMBOO SCREENS (AUTHOR, 2006).

FIG. 161: HORIZONTAL EAST SCREENS (AUTHOR, 2006).

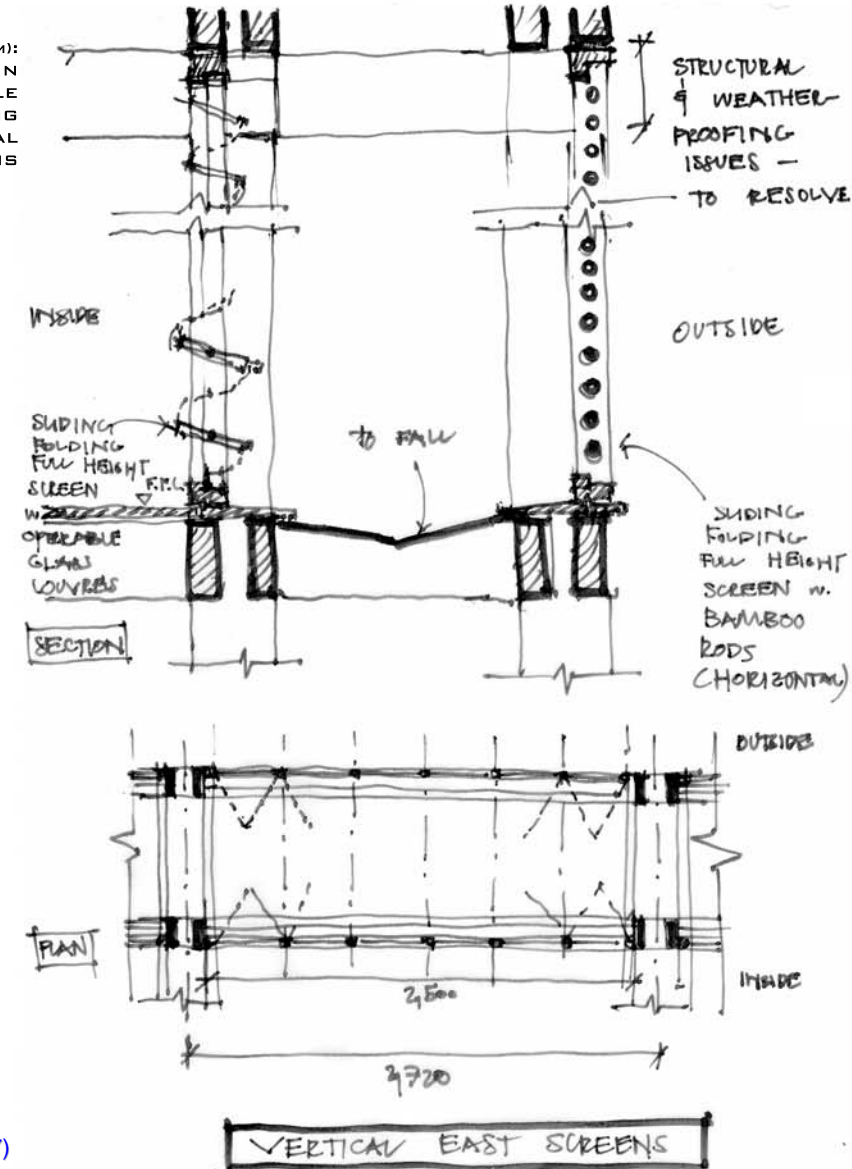






FIG. 162: NORTH ELEVATION DEMONSTRATING THE NORTH DRY WALLS WITH OPERABLE OUTER SKIN - OPERABLE TIMBER LOUVRES - AND INNER COMPONENT - OPERABLE GLASS LOUVRES (AUTHOR, 2006).

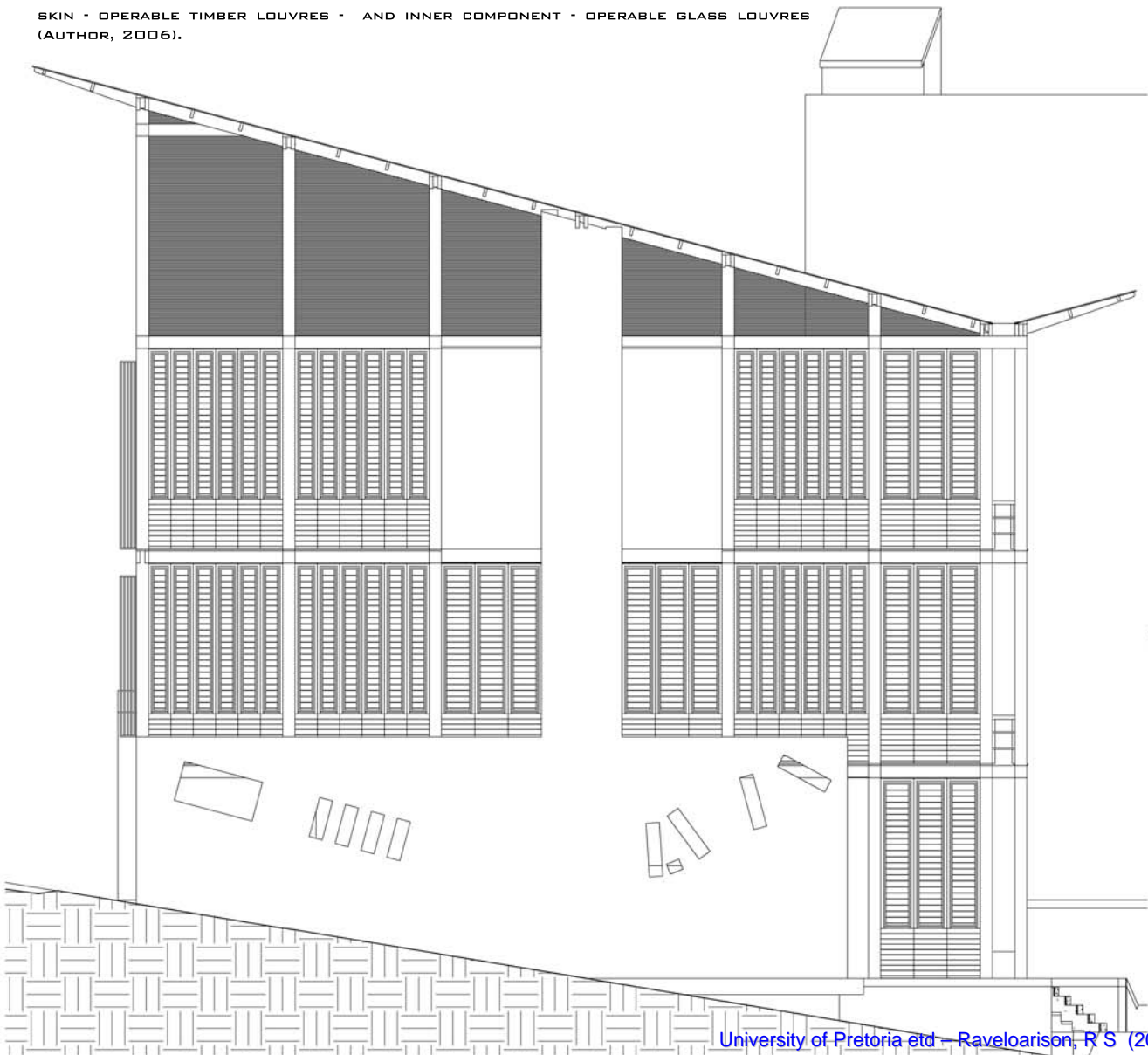
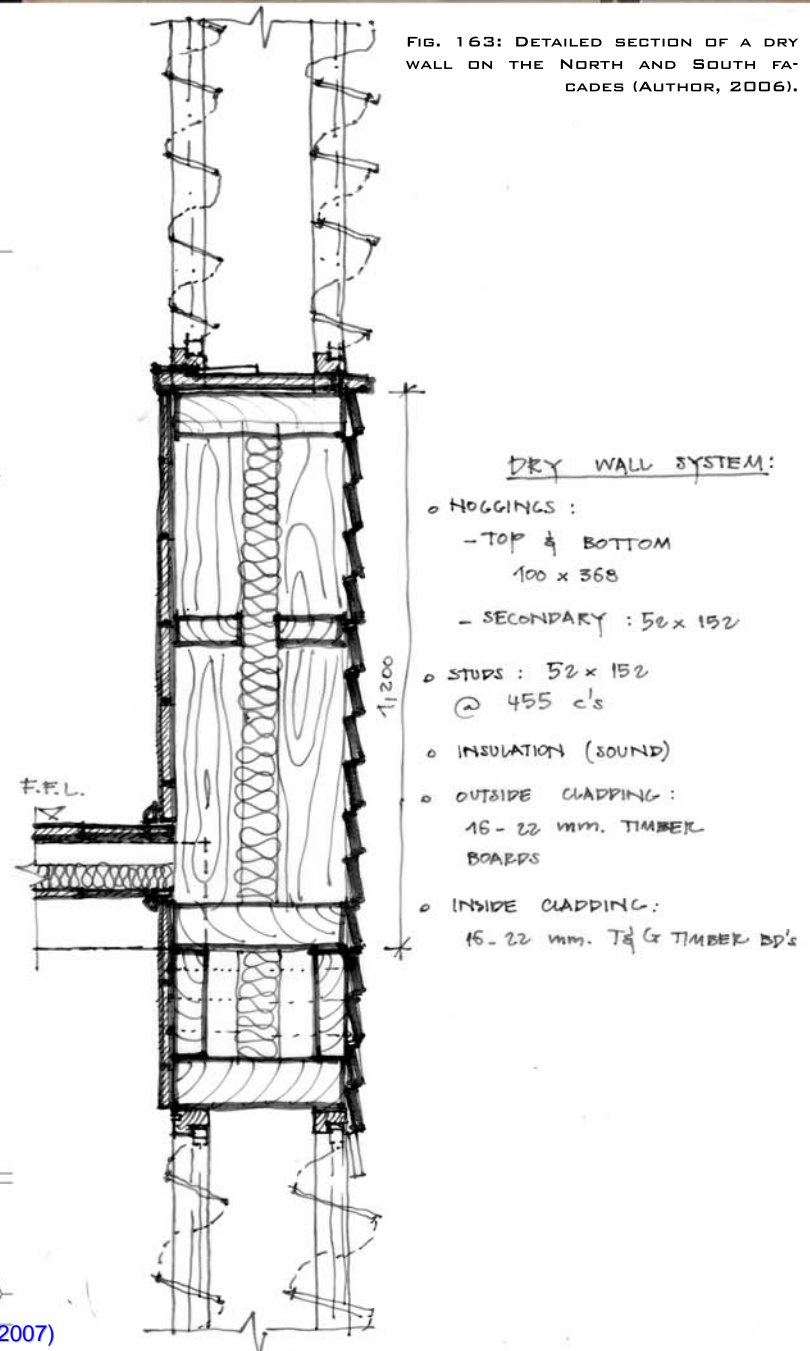
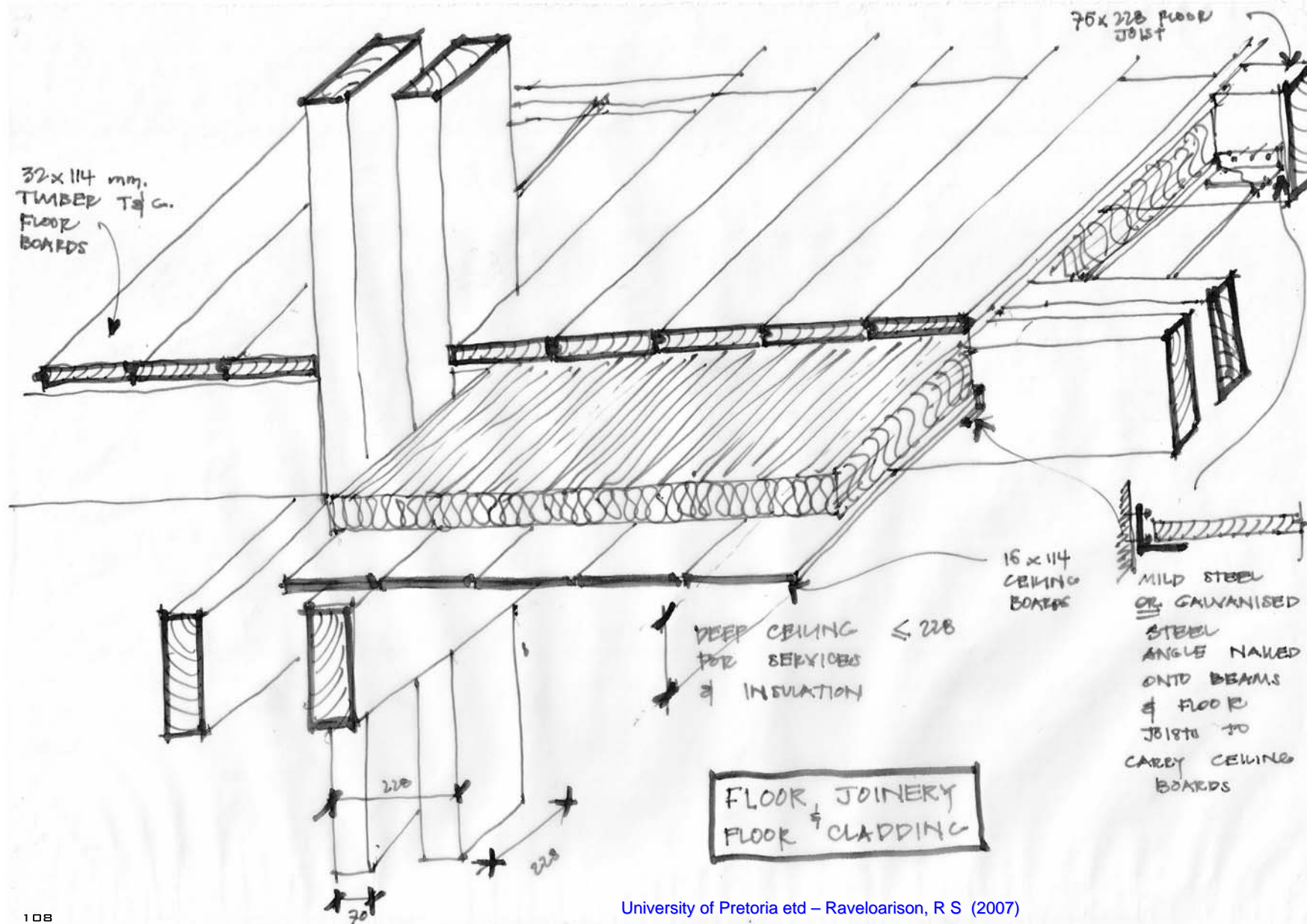


FIG. 163: DETAILED SECTION OF A DRY WALL ON THE NORTH AND SOUTH FACADES (AUTHOR, 2006).



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FIG. 164: THREE-DIMENSIONAL SKETCH EXPLORING FLOOR CLADDING AND STRUCTURE (AUTHOR, 2006).



### iii. HUMIDITY

- airy rooms, assisted by natural cross ventilation as demonstrated in page 88
- deep ceilings (see Fig. 164)

### iv. PRECIPITATION:

- sliding/folding screens as weatherproofing devices: as the inside skin with operable glass louvres
- fifteen-degree mono-pitched roofs with generous gutters and downpipes
- water feature as a storm water drainage device

### c. VIEWS AND

#### VISTAS:

- enhance relationships between the project and its context by framing views of the surroundings
- the views bring the site's *ethos*



## 2. STRUCTURAL TYPOLOGY:

### a. STEREOTOMICS:

According to the Spanish architect Alberto Campo Baeza, Stereotomics consists of, on one hand, providing a masonry base to a dwelling as a ground connector, as well as a frame for the outside views. On the other hand, the upper floor becomes a light frame component, as a sky connector, to underline the outside views.

In the proposed project, the base consists of the ground floor, half wrapped by a concrete retaining wall, supporting both the terraced levels and the upper floors, providing extra stability (see Fig. 166).

### b. TIMBER POST-AND-LINTEL STRUCTURE

To support the suspended timber floors and the lightweight timber roof, a post-and-lintel typology is used. Cable bracing on several bays provide structural stability (see Fig. 166).

The structural elements used are double-column and double-beam systems of 228 x 228 mm, with 70 x 228 mm members. The beams span at 2,500 mm while the columns come in modular heights of 4,000 mm.

### c. CONCRETE SERVICE CORE

To accommodate the wet services, the centre uses 900 x 900 mm concrete service ducts, acting as anchors to the structures (see Fig. 165).



FIG. 165: 1:50 STRUCTURAL WORKING MODEL (AUTHOR, 2006).

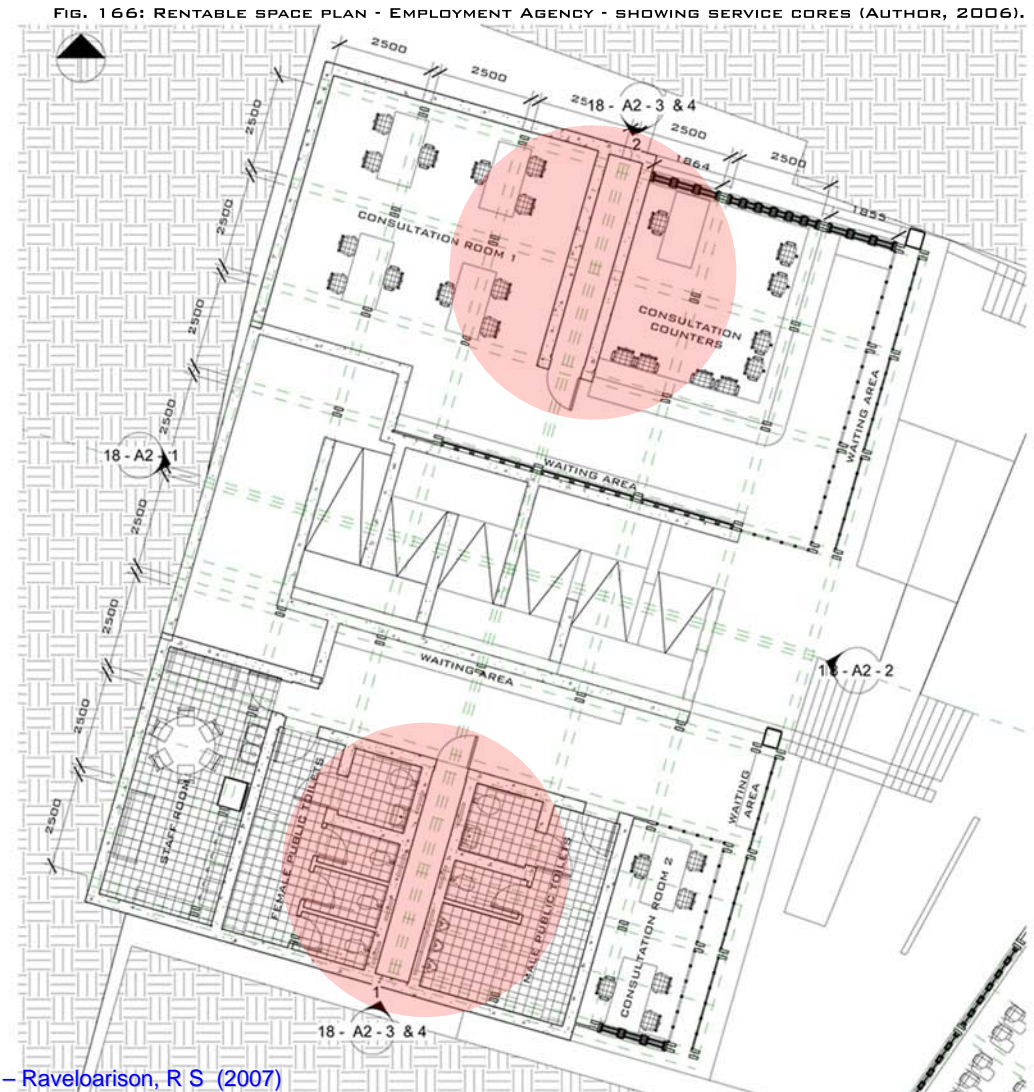
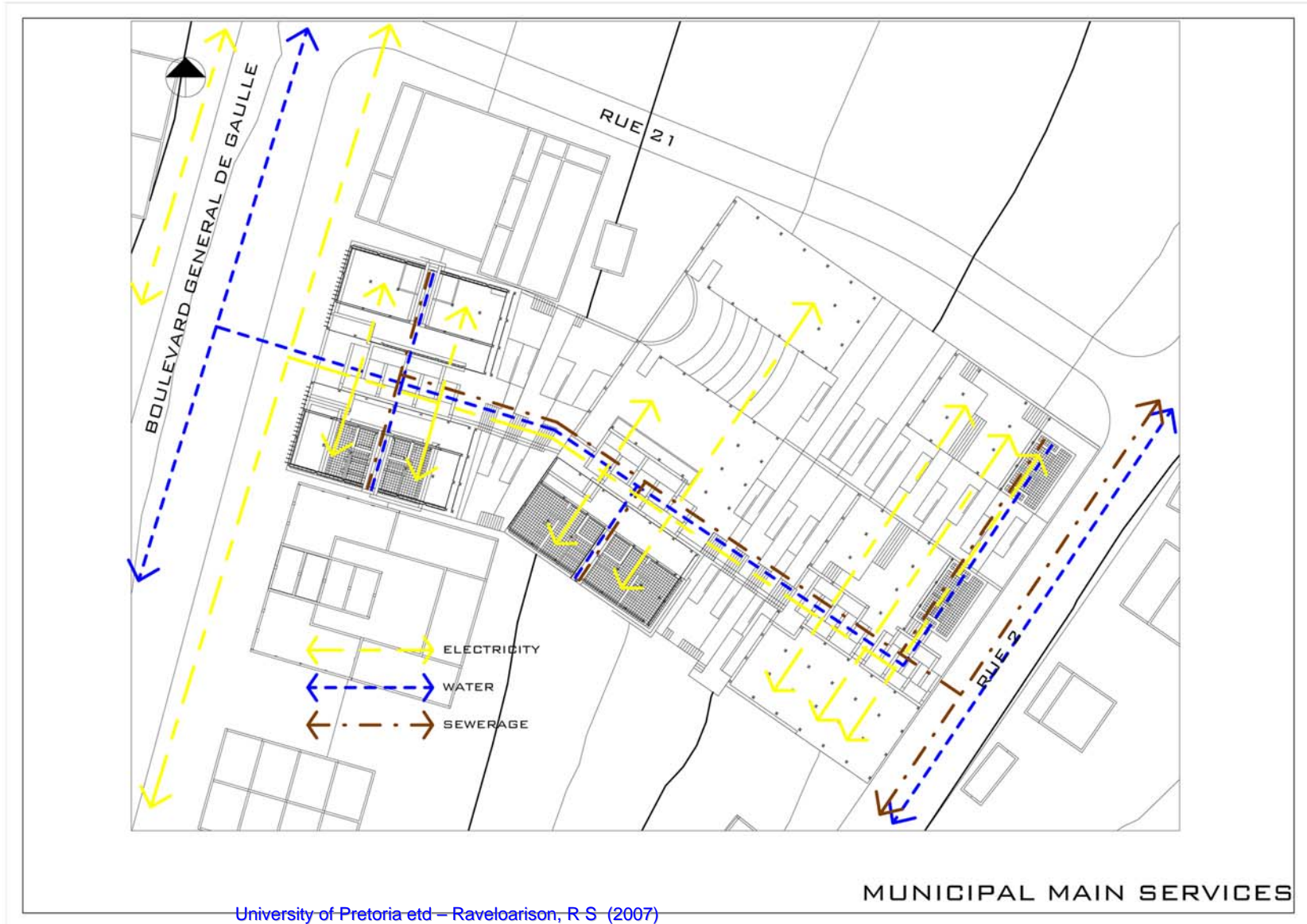


FIG. 166: RENTABLE SPACE PLAN - EMPLOYMENT AGENCY - SHOWING SERVICE CORES (AUTHOR, 2006).

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## 3. SERVICES: a. WATER SOURCE, ELECTRICITY, WASTE AND SEWERAGE MANAGEMENT

FIG. 167: SITE PLAN WITH MUNICIPAL MAIN SERVICES (AUTHOR, 2006).





### b. STORM WATER DRAINAGE

Stormwater drainage is treated as a water feature with open organic channels, so as to drain rain water while filtering it before it joins the municipal drainage at the bottom of the site.

FIG. 168: SITE PLAN WITH STORM WATER DRAINAGE FLOW DIAGRAM (AUTHOR, 2006).



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## c. INTERNET NETWORKING

Internet, once the Nosy Be P.I.C. settles, should be on the basis of wireless networking throughout the empowerment centre and the town.

## d. ACOUSTICS

Acoustics is assured by the following:

- dry wall system on the North and South facades, single-clad with timber boards on the outside and inside, with insulation blankets tucked in between
- double-skin system on the East and West facades
- for the floor situation, timber floor and ceiling boards are used with insulation blanket in between

## e. SAFETY

### i. FIRE

Fire requirements are met by implementing the following:

- use of fire-retarded wood
- dry wall system using double cladding
- use of 38 mm thick solid fire stops

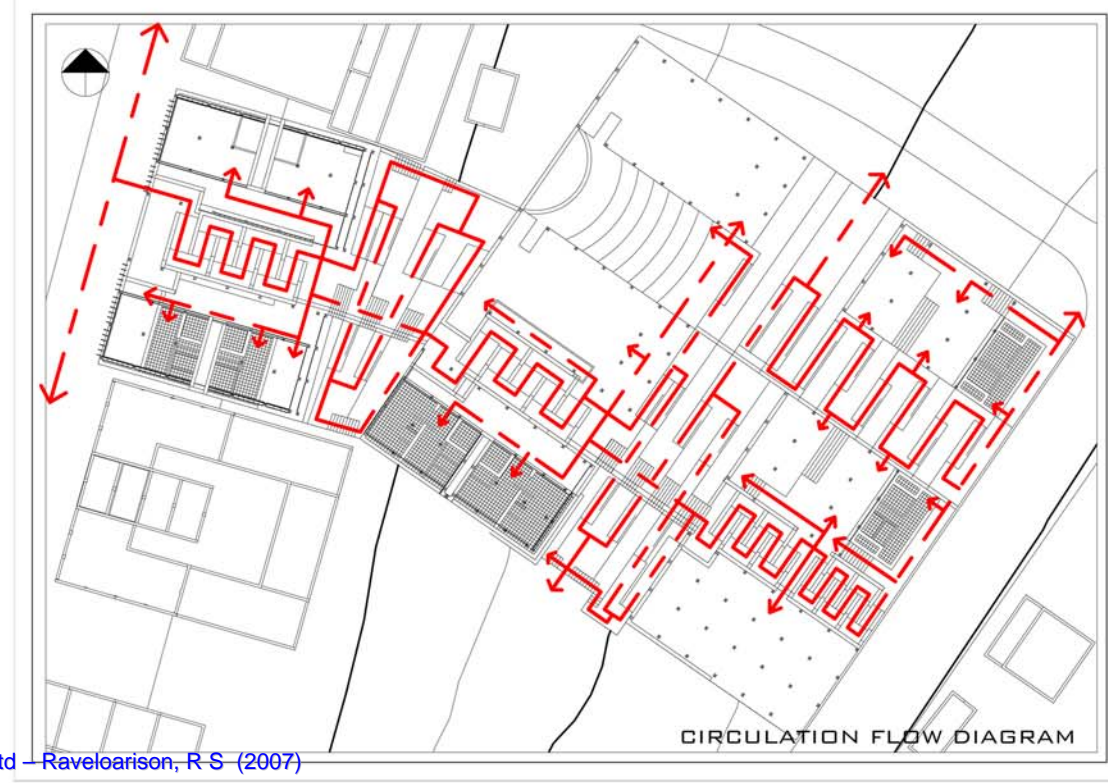
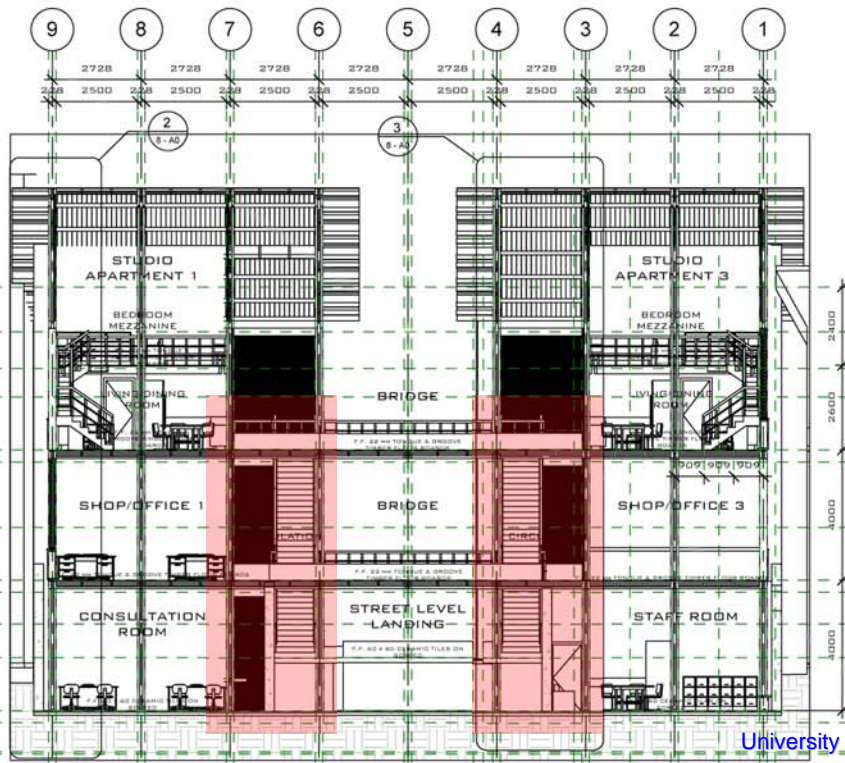
### ii. CIRCULATION

Each floor has two symmetrical stairs, each fulfilling the role of firescape in case of fire in either components. The latter are connected by a bridge (see Fig. 169).

The ground floor accommodates for circulation for everybody including the disabled. However, the upper floors are one and a half to three and a half storeys high, accessible only by staircases (see Fig. 170).

FIG. 1 69 (LEFT): LONGITUDINAL SECTION WITH VERTICAL AND HORIZONTAL CIRCULATIONS FLOW DIAGRAM (AUTHOR, 2006).

FIG. 1 70 (RIGHT): SITE PLAN WITH GROUND FLOOR CIRCULATION FLOW DIAGRAM (AUTHOR, 2006).





#### 4. TECTONICS EXPLORATION

##### a. LOCAL CRAFTSMANSHIP:

- masonry: stones, bricks, and concrete blocks
- concrete work
- woodwork and carpentry (see Fig. 171 - 173)

##### b. LOCAL MATERIALS:

- timber for structural and carpentry usage
- concrete (mixed and blocks)
- recycled coral stones (see Fig. 174)



FIG. 171: PERIMETER FENCING MADE OUT OF MANGROVE LOGS (PHOTO: AUTHOR, MARCH 2006).

FIG. 172: A FAMILY MAN WORKING ON MANGROVE LOGS TO MAKE A PERIMETER FENCE (PHOTO: AUTHOR, MARCH 2006).



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FIG. 173: FURNITURE WORKSHOP ON BOULEVARD GENERAL DE GAULLE EXTENDING ON THE WALKWAY (PHOTO: AUTHOR, MARCH 2006).

FIG. 174: DETAIL VIEW OF RUINED SODOMA WALL MADE OUT OF FACEBRICKS AND CORAL STONE (PHOTO: AUTHOR, JANUARY 2006).



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FIG. 175: CROSS SECTION THROUGH THE RENTED SPACES' GROUND FLOOR INVESTIGATING ON FOUNDATION AND RETAINING WALL SITUATIONS (AUTHOR, 2006).

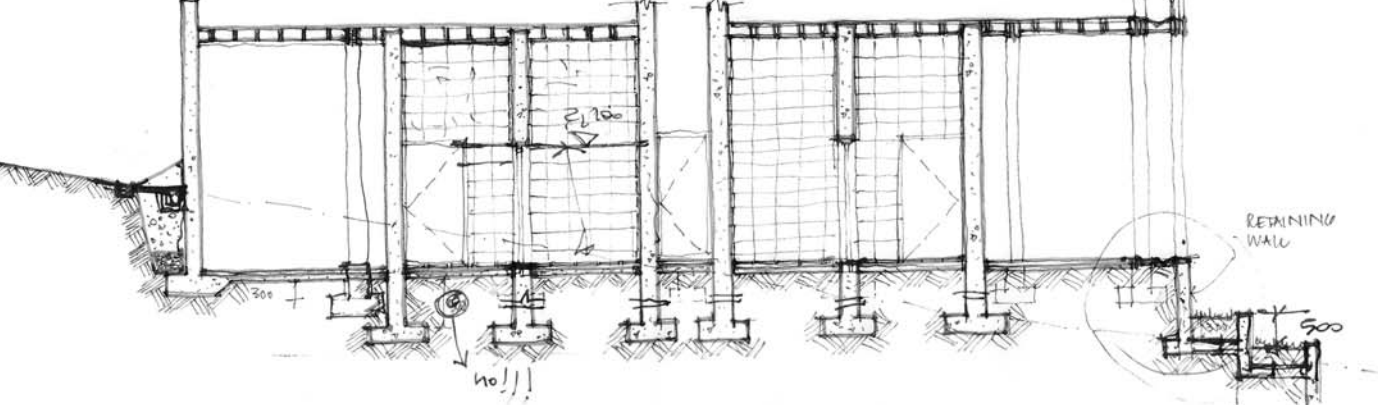
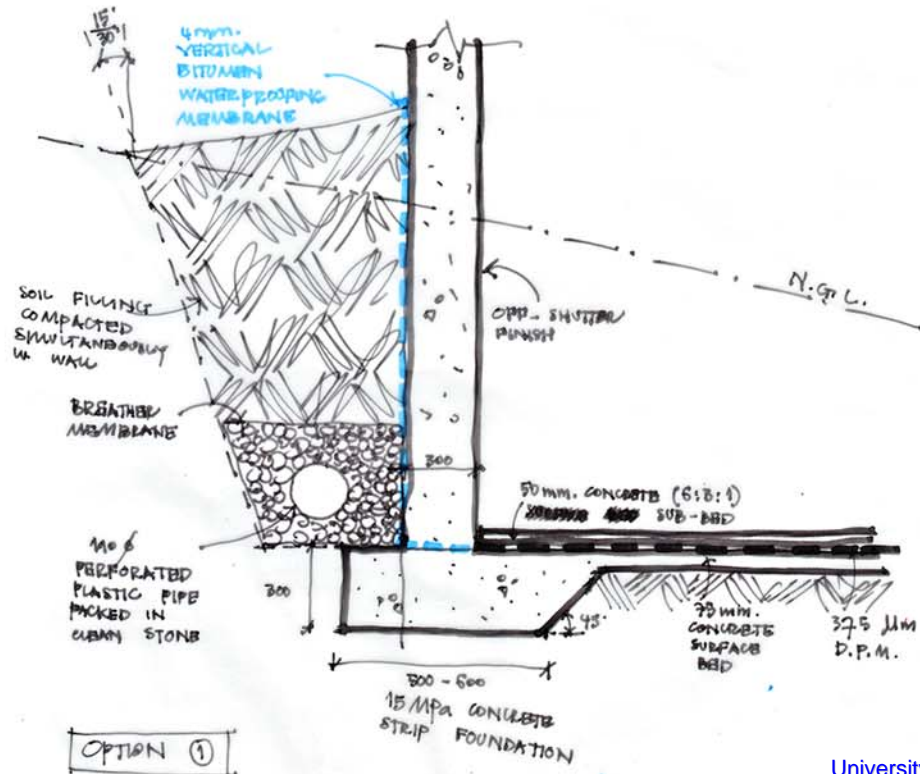


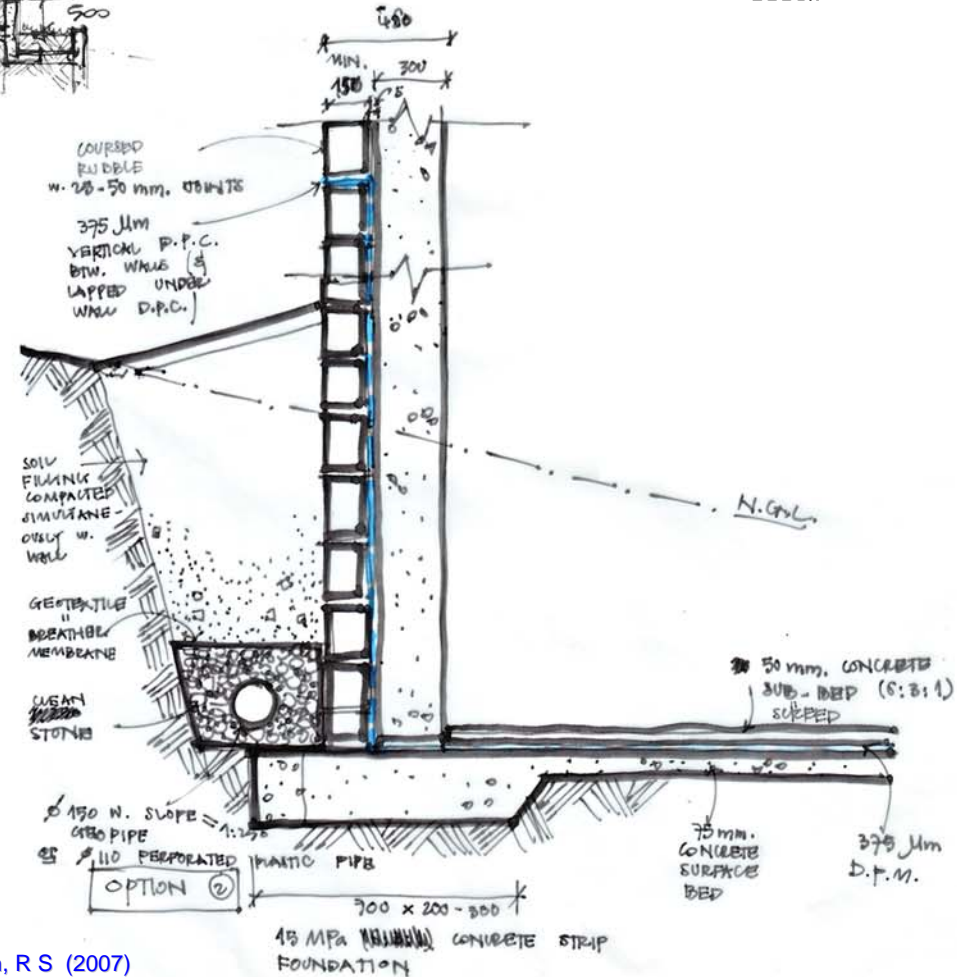
FIG 176: RETAINING WALL INVESTIGATIVE SECTION 1 (AUTHOR, 2006).



## C. GROUND CONNECTIONS:

i. MASONRY RETAINING WALL AND SURFACE BED SITUATION (see Fig. 175 - 177)

FIG. 177: RETAINING WALL INVESTIGATIVE SECTION 2 (AUTHOR, 2006).







ii. TIMBER DOUBLE COLUMN:

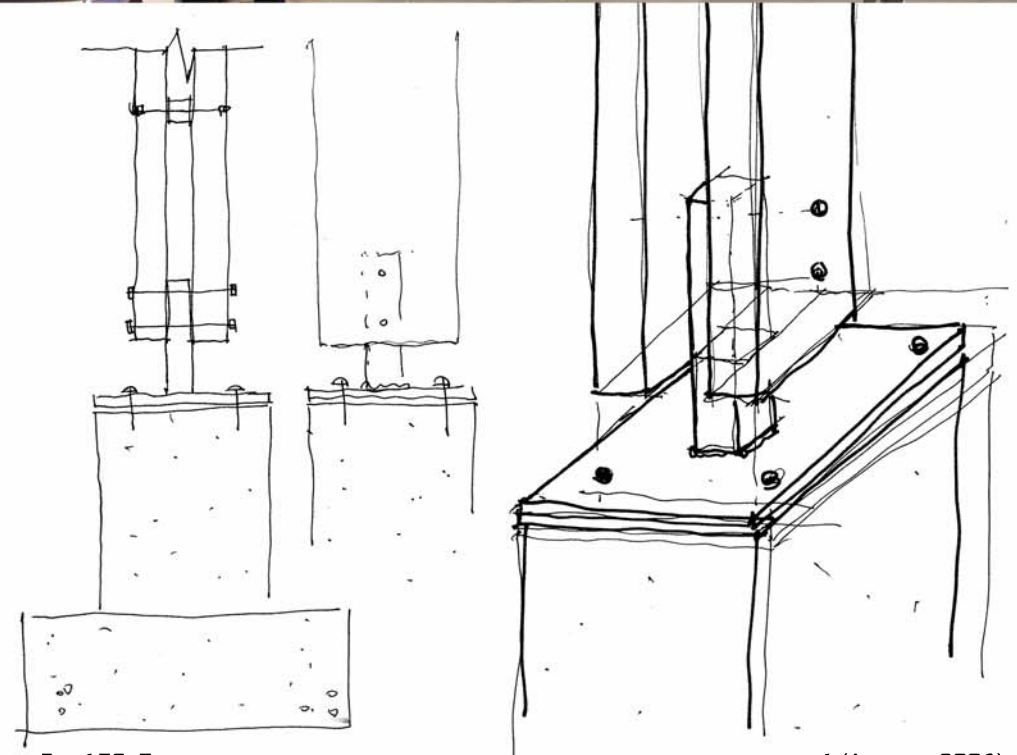
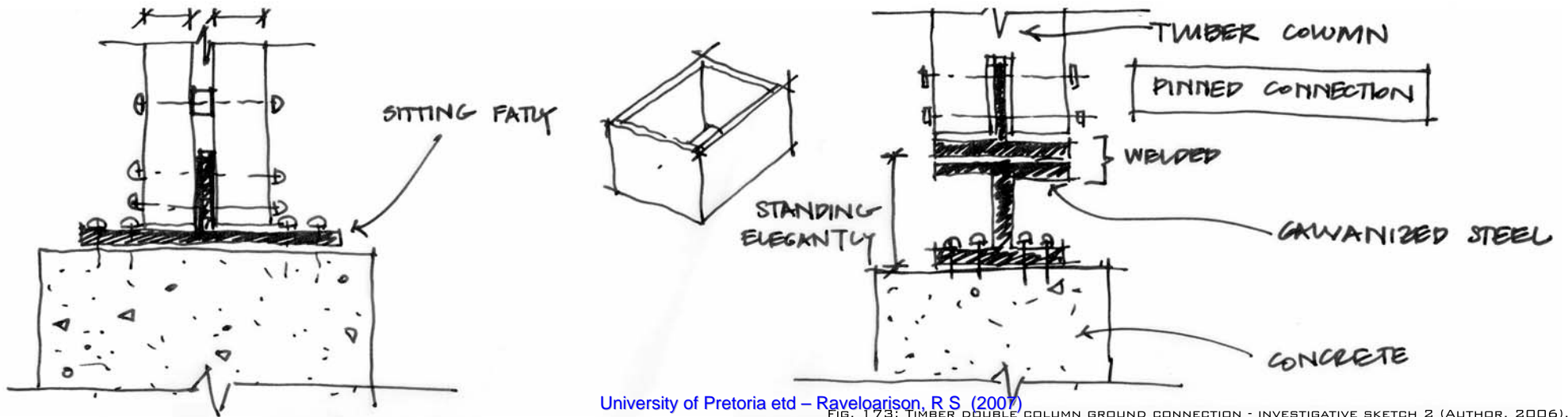


FIG. 178: TIMBER DOUBLE COLUMN GROUND CONNECTION - INVESTIGATIVE SKETCH 1 (AUTHOR, 2006).



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FIG. 173: TIMBER DOUBLE COLUMN GROUND CONNECTION - INVESTIGATIVE SKETCH 2 (AUTHOR, 2006).

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## d. STRUCTURAL CONNECTIONS:

FIG. 180: SKETCH INVESTIGATING JOINERY BETWEEN TWO PERPENDICULAR BEAM SYSTEMS AND ATTACHING THEM TO THE POST (AUTHOR, 2006).

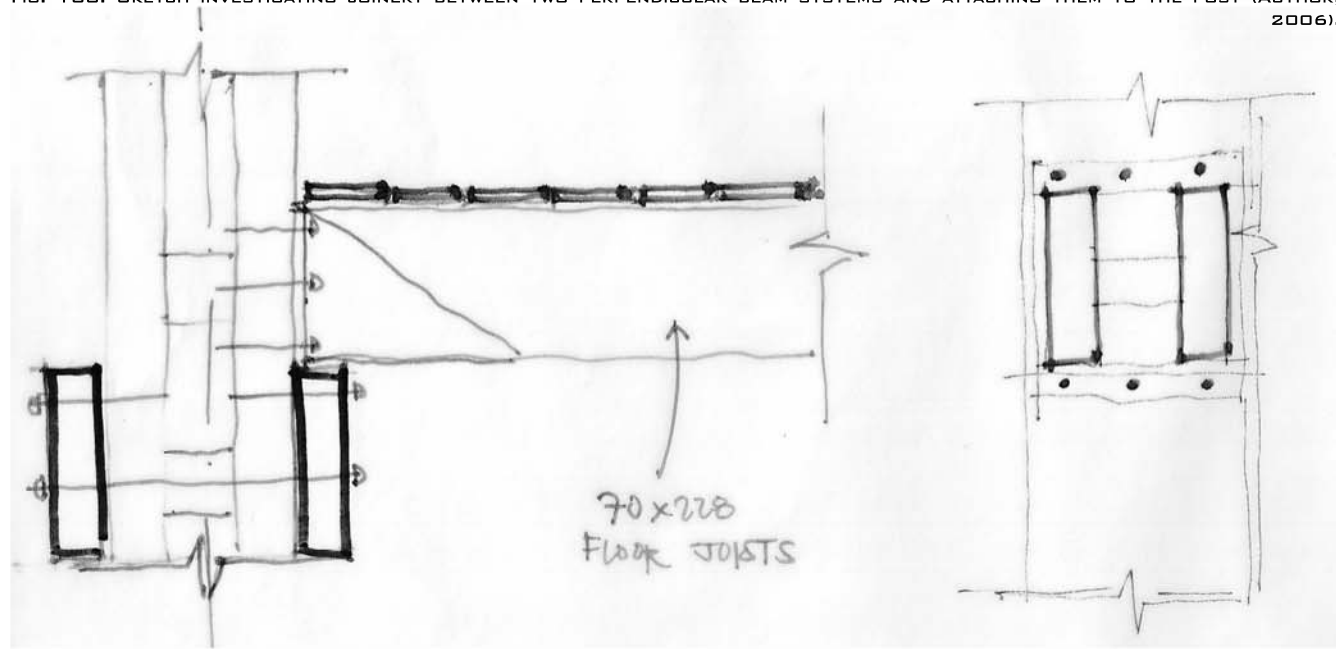
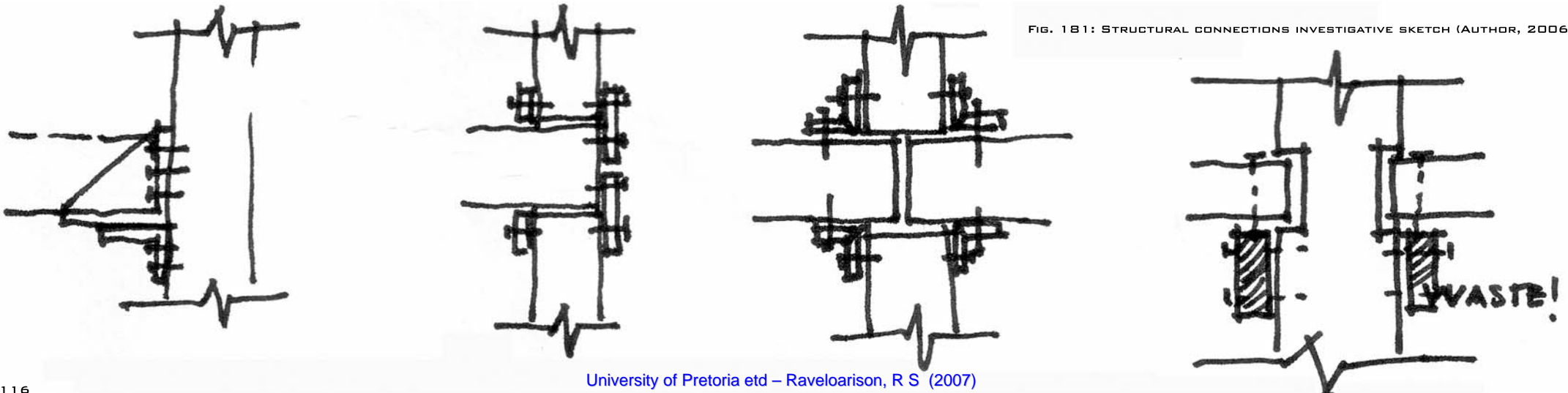


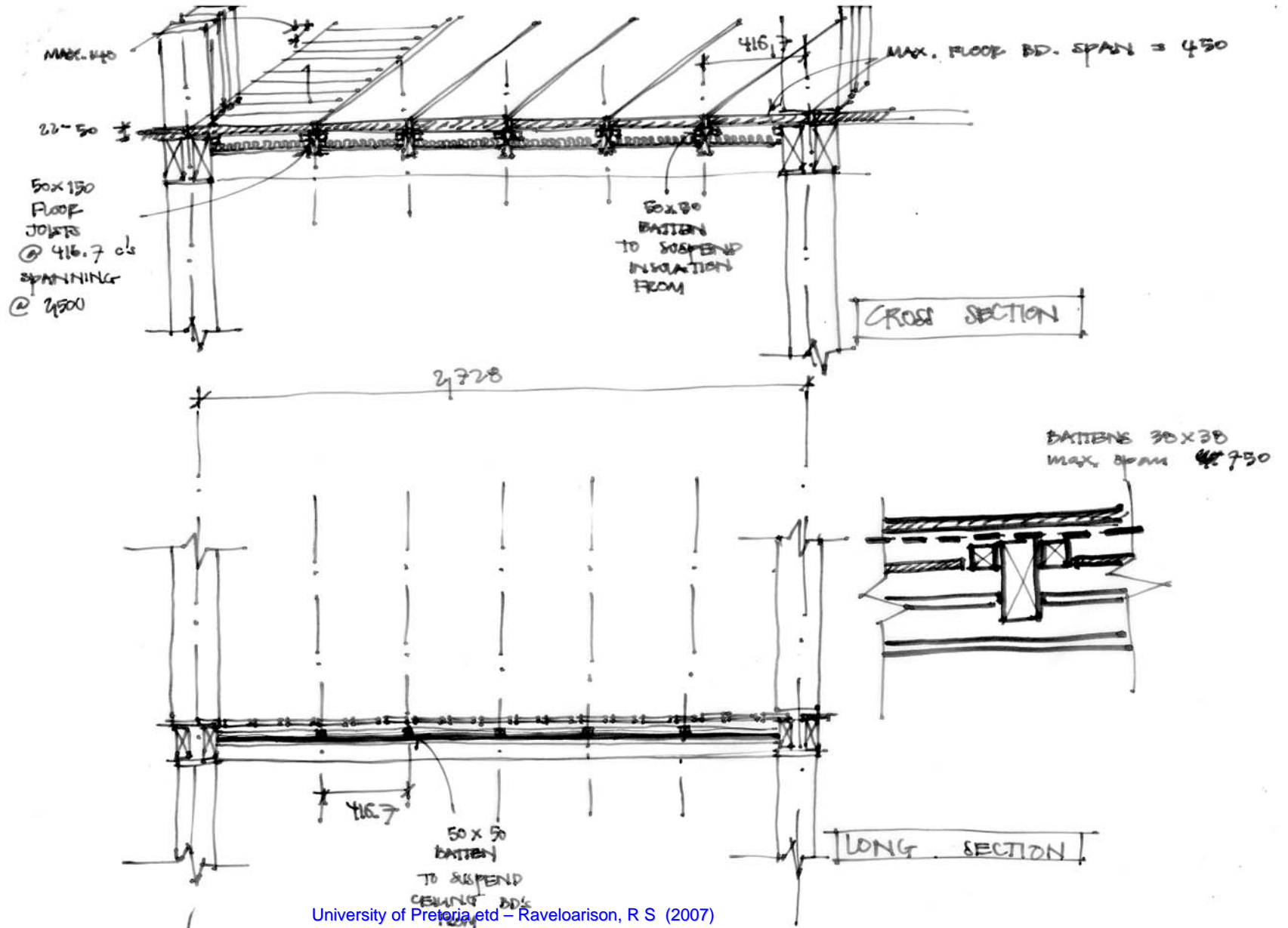
FIG. 181: STRUCTURAL CONNECTIONS INVESTIGATIVE SKETCH (AUTHOR, 2006).





e. STRUCTURAL TIMBER AND SUSPENDED TIMBER FLOOR

FIG. 1B2: TIMBER SUSPENDED FLOOR - INVESTIGATIVE SECTIONS (AUTHOR, 2006).



## f. SCREENS

### i. EAST AND WEST SCREENS

FIG. 183 (LEFT): SCREENS AS SKINS IN RELATION TO INSIDE AND OUTSIDE - INVESTIGATIVE SECTION AND ELEVATION 1 (AUTHOR, 2006).

FIG. 184 (RIGHT): DETAIL SECTION OF SCREENS IN RELATION TO FLOOR AND CEILING SITUATIONS - INVESTIGATIVE SECTION 2 (AUTHOR, 2006).

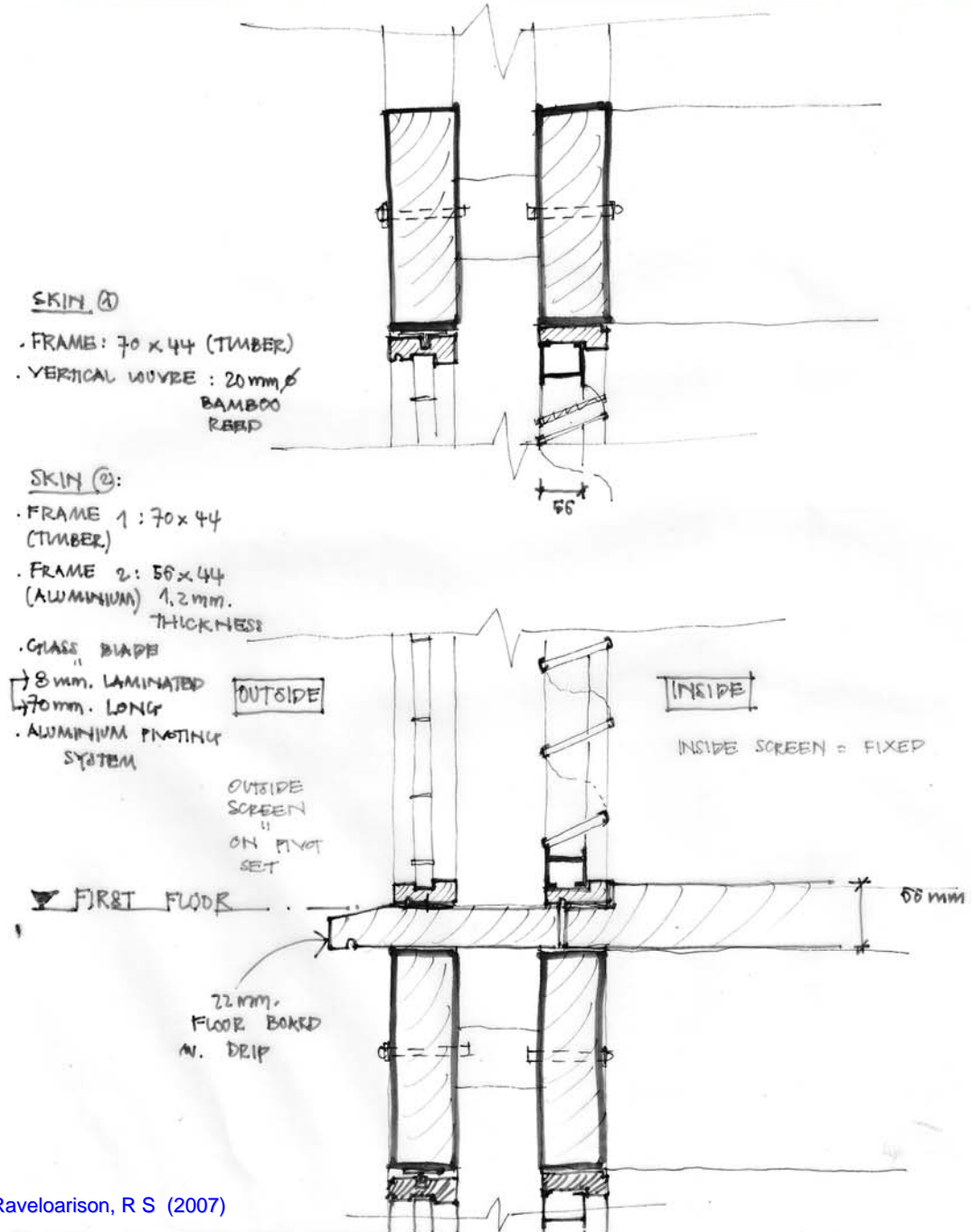
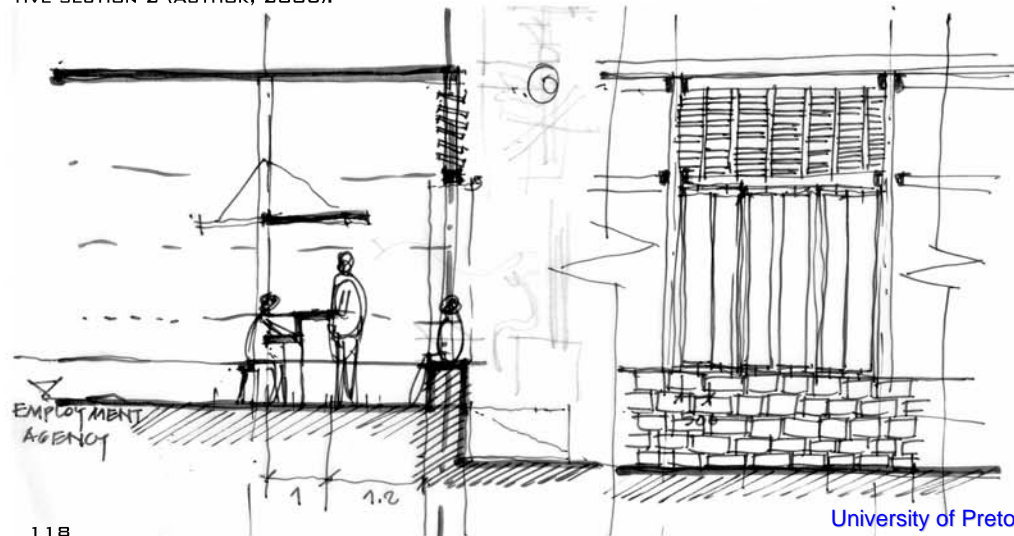




FIG. 186: INVESTIGATIVE SECTION 2 - SOUTH OPENING SITUATION ON THE SOUTH FACADE OF THE REFERENCE CENTRE (AUTHOR, 2006).

ii. NORTH SOUTH DRY WALL SYSTEMS

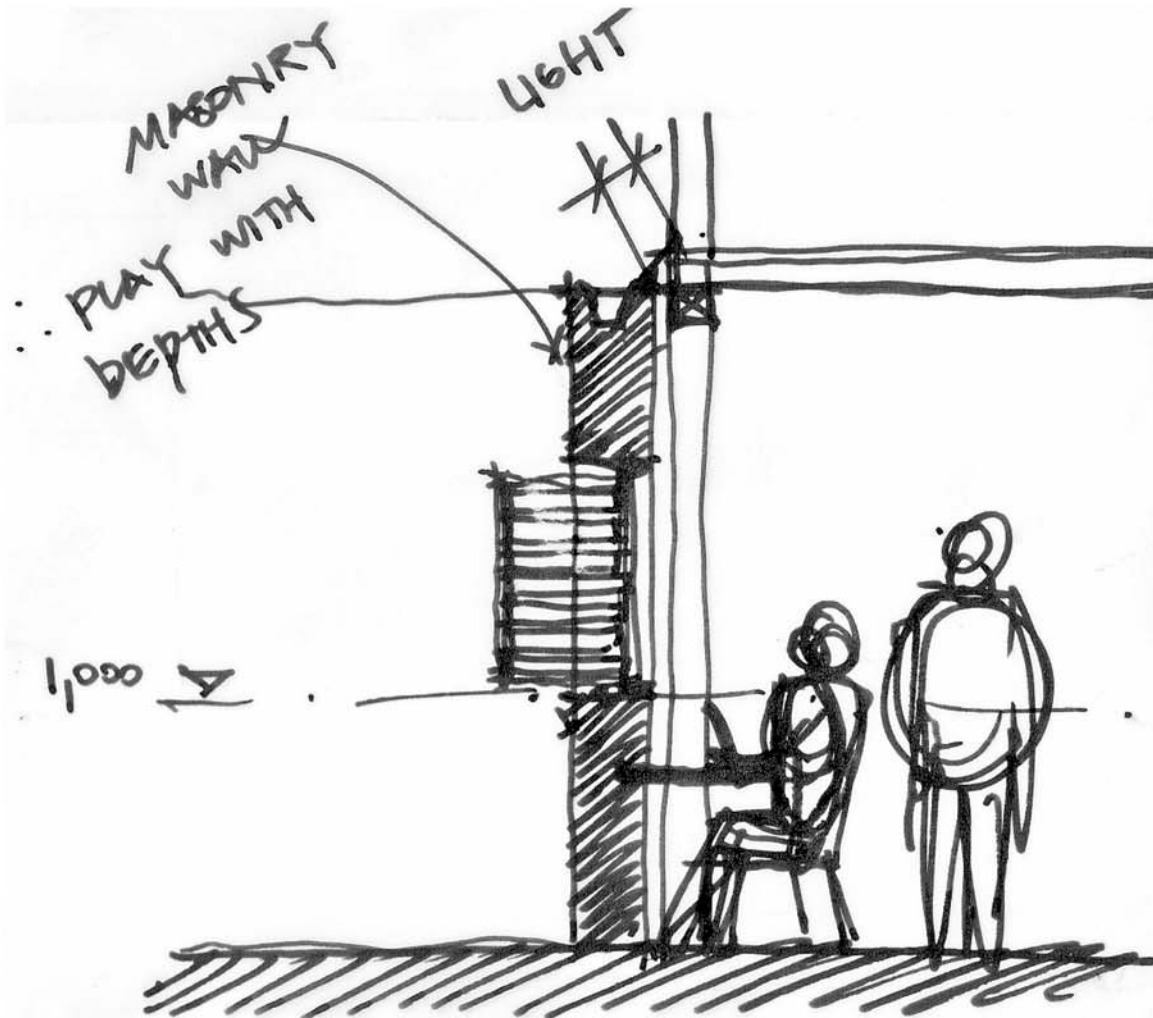
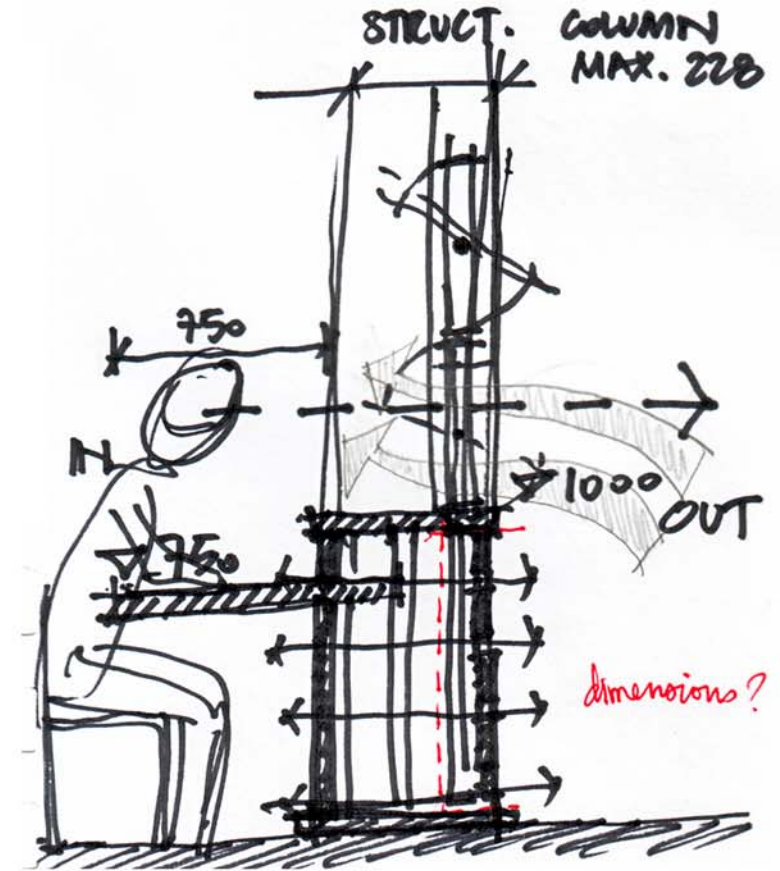


FIG. 185: INVESTIGATIVE SECTION 1 - SOUTH OPENING SITUATION ON THE SOUTH FACADE OF THE REFERENCE CENTRE (AUTHOR, 2006).  
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TECHNOLOGICAL ZONE FOR EXPLORE

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## g. DETAIL ELEMENTS

i. BALUSTRADE SEAT (see Fig. 187)

iii. STAIRS (see Fig. 188)

FIG. 187: DETAIL ELEMENT INVESTIGATIVE SKETCH OF BALUSTRADE SEAT (AUTHOR, 2006).

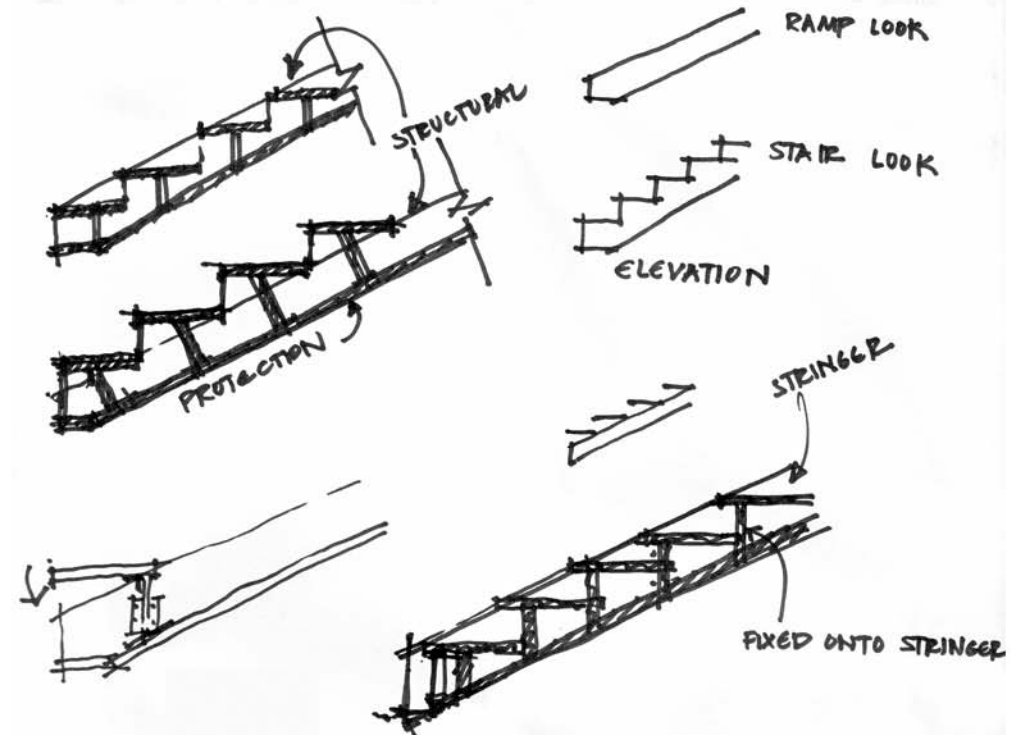
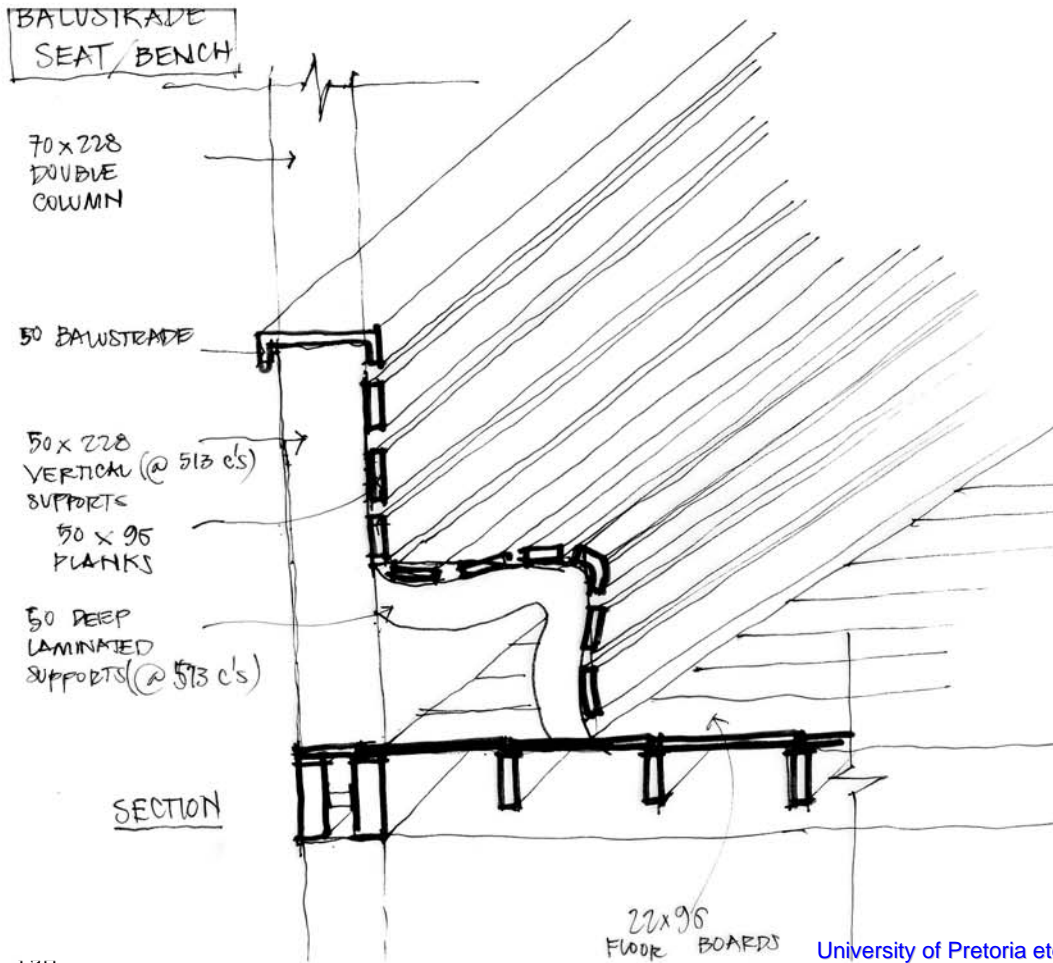


FIG. 188: DETAIL ELEMENT INVESTIGATIVE SKETCH OF STAIRS (AUTHOR, 2006).



h. ROOF

FIG. 189: ROOF END INVESTIGATIVE SECTION (AUTHOR, 2006).

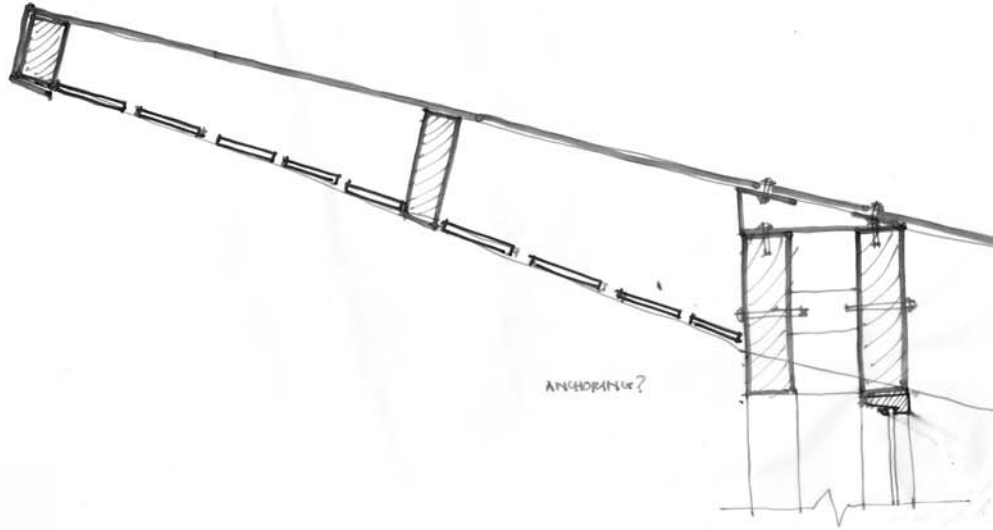
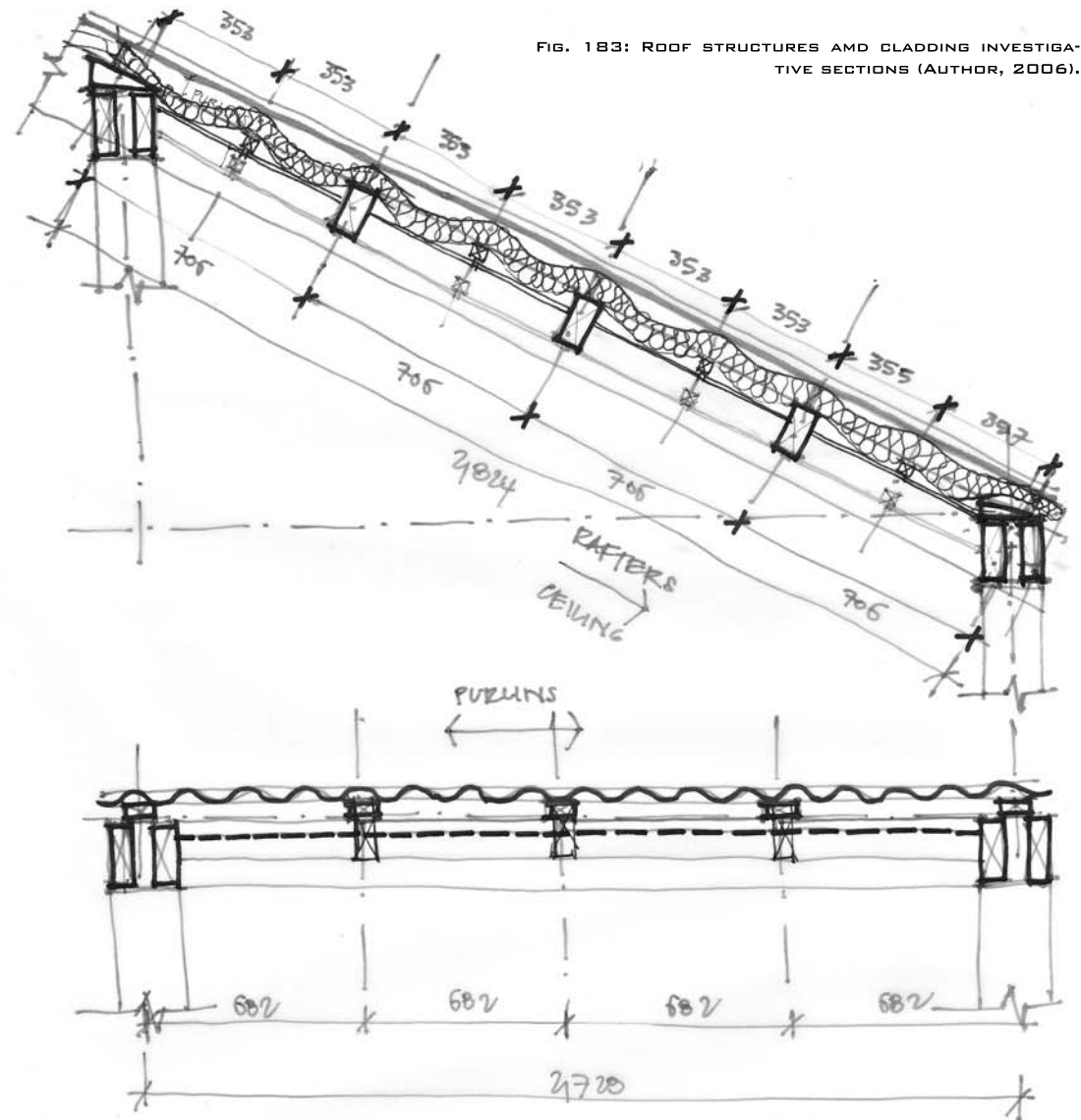


FIG. 183: ROOF STRUCTURES AND CLADDING INVESTIGATIVE SECTIONS (AUTHOR, 2006).



- o 17.5mm. COP-TEN SHEETING SPANNING @ 706 x 682
- o 76 x 52 mm. PURLINS SPAN = 706  
50 x 150 SPACING = 682 c/s
- o INSULATION = 50 mm. GLASS WOOL BRANKET

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## g. WATER FEATURE AS STORM WATER DRAINAGE

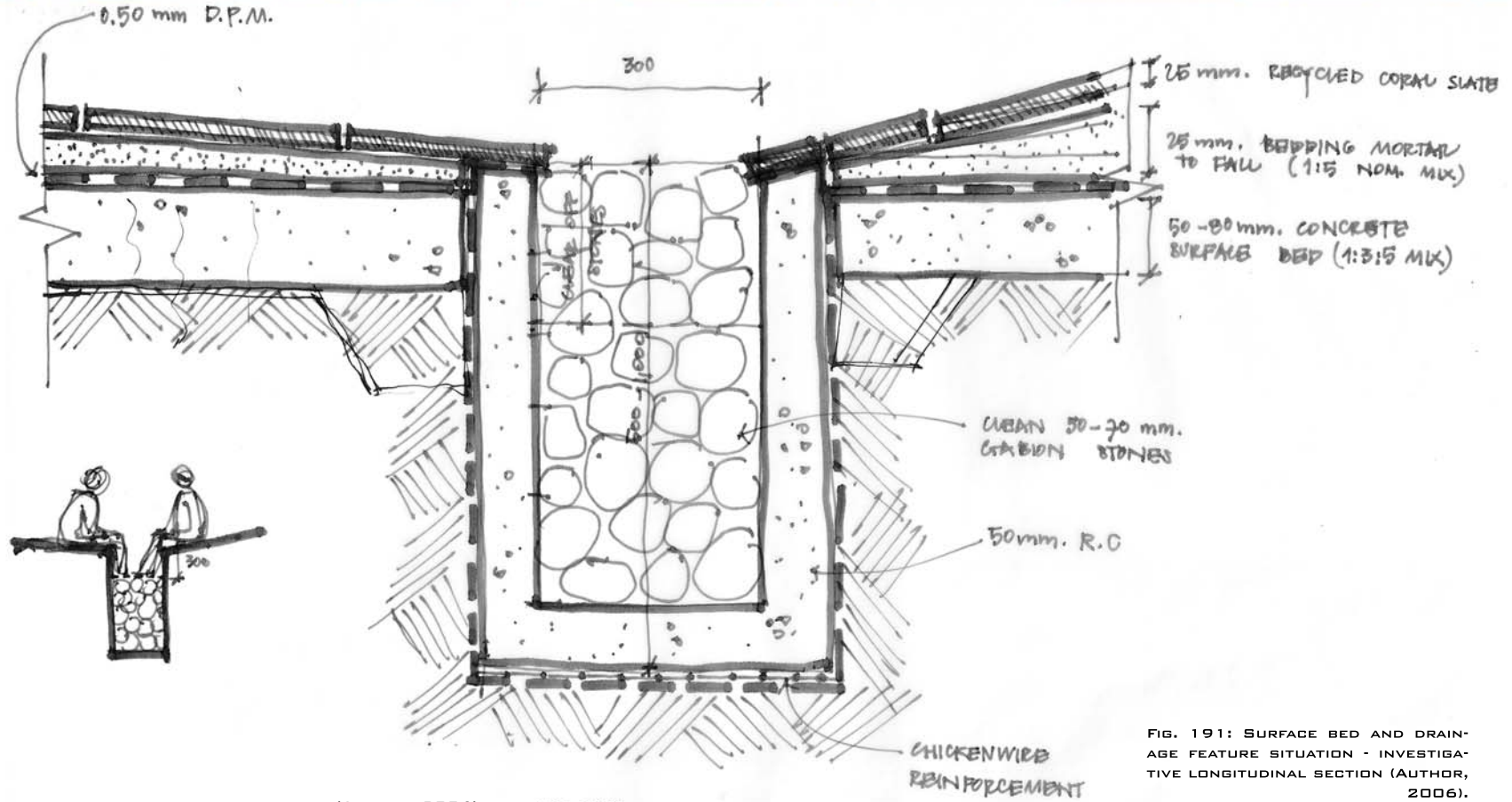


FIG. 191: SURFACE BED AND DRAINAGE FEATURE SITUATION - INVESTIGATIVE LONGITUDINAL SECTION (AUTHOR, 2006).

FIG. 192: OPEN CHANNEL AS STORM WATER DRAINAGE - INVESTIGATIVE DETAILED SECTION (AUTHOR, 2006).

