

# **Intersecting the Maputo Fishery Harbour**

Architecture as threshold between fixed and fluid

Paul Gregory Devenish

2012



# Intersecting the Maputo Fishery Harbour:

Architecture as threshold between fixed and fluid

Paul Gregory Devenish

Submitted in partial fulfilment of the requirements for the degree Magister in Architecture (Professional) in the Faculty of Engineering, the Built Environment and Information Technology.

University of Pretoria  
Department of Architecture  
June 2012

Project Address:  
Porto de Pesca de Maputo (Maputo Fisheries Port)  
Marques de Pombal Road, Maputo  
GPS Location: 25°58'31.55"S; 32°34'11.66"E

Main Function: Fish processing and Sale

Study Mentor: Marga Viljoen  
Studio Mentor: Dr. Jacques Laubscher





In loving memory of my grandmother who taught me how to live and love:

**Mercia Jesse Brown**  
**2 June 1917 - 6 August 2011**



**TABLE OF CONTENTS****TABLE OF CONTENTS**

P. ii

**LIST OF FIGURES**

vi

**CHAPTER 1: INTRODUCTION**

P.	03	PROJECT SUMMARY
	04	OUTLINE OF STUDY
	04	REAL WORLD PROBLEM
	05	SUB PROBLEMS
	05	DESIGN AIMS
	05	HYPOTHESIS

**CHAPTER 2: THEORY**

P.	09	PLASTICITY IN ACTION
	11	POLYVALENCY
	13	UNDERSTANDING 'ACTION'
	18	THEORY APPLIED TO SITE
	20	THE ROLE OF AMBIGUITY: IMAGINATION, DREAMS, HOPE
	23	ARCHITECTURE: TEMPORAL FORCE

**CHAPTER 3: CONTEXT AND MAPPING**

P.	26	CITY PROFILE
	28	PERIPHERY
	30	DEFINING THE BAIXA
	31	MAPPING
	32	CURRENT CITY FRAMEWORK
	33	MAPS

**CHAPTER 4: URBAN CONDITION**

P.	44	SITE: PORT CONDITION AND AXIAL CONDITION
	46	PORT CONDITION
	48	PORT AREA AND SURROUNDS
	52	AXIAL CONDITION: AVENIDA SAMORA MACHEL
	56	CASE STUDY: URBAN FORM

**CHAPTER 5: BRIEF AND PROGRAM**

P.	64	CRITERIA FOR SITE SELECTION
	65	LIST OF PROBLEMATIC ASPECTS
	67	TENURE AND POTENTIAL FUNDING
	67	INTERESTED AND AFFECTED PARTIES
	69	PROGRAM
	71	INHABITING THE BOUNDARY WALL
	72	CASE STUDY: PROGRAMMATIC FORM
	76	CASE STUDY: INDUSTRIAL FORM



**TABLE OF CONTENTS (CONTINUED)****CHAPTER 6: DESIGN DEVELOPMENT**

P.	084	THE HARBOUR PRECINCT
	087	PORT AS THRESHOLD
	090	INFRASTRUCTURE IN RESPONSE TO THE TEMPORAL
	090	THE AXIS
	094	DESIGN SYNTHESIS AND DEVELOPMENT
	100	PLANS
	102	FORMAL PRINCIPLES ILLUSTRATED

**CHAPTER 7: TECHNICAL DEVELOPMENT**

P.	106	PRINCIPLES
	108	FISH HANDLING AND DISTRIBUTION PROCESSES
	112	URBAN TERRACE
	114	UPPER LEVEL ACCOMMODATION
	115	PRIMARY STRUCTURE
	118	SECONDARY STRUCTURE
	122	WATER TREATMENT

**CHAPTER 8: DRAWINGS**

P.	126	PERSPECTIVES
	131	SITE PLAN
	132	PLANS
	134	SECTIONS
	138	DETAIL SECTION
	140	DETAILS
	142	MODEL

**CHAPTER 9: CONCLUSION**

P.	149	CONCLUSION
----	-----	------------

**APPENDIX A: URBAN HISTORY**

P.	154	TIMELINE
	158	BACKGROUND TO HISTORICAL DEVELOPMENT OF MAPUTO
	159	TRADING POST ON THE ISLAND: EARLY 19TH CENTURY
	161	THE BEGINNINGS OF A TOWN: LATE 19TH CENTURY
	163	EARLY 20TH CENTURY DEVELOPMENTS
	165	THE OFTEN OVERLOOKED "REED CITY" DEVELOPMENT
	165	ADDRESSING THE WIDER METROPOLITAN ZONE

**APPENDIX B: THEORY: HISTORIC REVIEW**

P.	171	THE RATIONAL
	173	THE COUNTER RATIONAL
	175	ARCHITECTURAL PRACTICE
	175	TIME AND 'CHANGEFULNESS' IN ARCHITECTURE
	176	FLEXIBILITY
	177	REACTIONS

**ACKNOWLEDGEMENTS**

P.	179
----	-----

**REFERENCES**

P.	180
----	-----



Author	Figure 1.1	Photograph of boat
Pleatfarmer(Alias), 2009	Figure 2.1:	Photograph of a Verner Pantan Mirror.
Kroko, 2008	Figure 2.2.1:	Montessori School in Delf, Herman Hertzberger, 1970: floor closed
	Figure 2.2.2 :	Montessori School in Delf, Herman Hertzberger, 1970: modules removed
	Figure 2.2.3 :	Montessori School in Delf, Herman Hertzberger, 1970:children seated
	Figure 2.2. 4:	Montessori School in Delf, Herman Hertzberger, 1970: design diagram
	Figure 2.2. 5:	Montessori School in Delf, Herman Hertzberger, 1970: children playing
Koolhaas et al., 2001: 225-26	Figure 2.3.1:	Urban Africa, photographic series: informal market 1
	Figure 2.3.2:	Urban Africa, photographic series: informal market 2
Merrill, 2010	Figure 2.4.1:	Streets, Bushes, Print series by Leigh Merril, archival pigment print
	Figure 2.4.2:	Streets, Jean Street, Print series by Leigh Merril, archival pigment print
	Figure 2.4.3:	Streets ,Fulton Street, Print series by Leigh Merril, archival pigment print
Tschumi, 1976	Figure 2.5.1:	Advertisements for Architecture, Bernard Tschumi, 1976-1977, Advertisement 1
	Figure 2.5.2:	Advertisements for Architecture, Bernard Tschumi, 1976-1977, Advertisement 2
Cassimo, 2011	Figure 2.6:	View across Maputo Fisheries Harbour looking west
Donovan, 2008	Figure 2.7:	Diller Scofidio Renfro's Blur Building, 2002
Author	Figure 2.8:	Architecture as temporal force sketch
	Figure 3.1:	Africa
	Figure 3.2:	Mozambique
	Figure 3.3:	Maputo Province
	Figure 3.4:	Metropolitan of Maputo
	Figure 3.5:	Maputo: Cement city
	Figure 3.6.1:	3-D model of the Baixa
	Figure 3.6.2:	Map showing the position of the Baixa 3-D model in relation to the 'cement city'
	Figure 3.7.1:	Original landform
	Figure 3.7.2:	Baixa: low lying area
	Figure 3.7.3:	Protected historic area
	Figure 3.7.4:	Urban mapping study area
	Figure 3.8:	Textures of the 'reed city'
	Figure 3.9 :	Textures of the 'cement city'
Author et. al. (Team Baixa)	Figure 3.10:	Transport network, Public transport and improvement projects: Metropolitan scale
	Figure 3.11.1:	Maputo Citywide Transport Networks
	Figure 3.11.2:	Public transport and city improvement Projects: Citywide Scale
	Figure 3.12.1:	Citywide green open spaces
	Figure 3.12.2:	Baixa study area open space network
	Figure 3.13:	Public Transport
	Figure 3.14:	Figure-ground study and pedestrian density
	Figure 3.15:	Heritage buildings (protected)
	Figure 3.16:	Predominant Functions
	Figure 3.17:	Formal and informal retail
Author	Figure 4.1:	Site in context of Harbour condition and Axis condition

Author	Figure 4.2:	Site in context of Harbour condition and Axis condition
Adapted by Author: Google Earth, GPS: 25°58'31.55"S; 32°34'11.66"E	Figure 4.3:	Port Functions: Barriers dividing the Old Baixa from the ocean
Author	Figure 4.4:	Panoramic view of dry dock adjacent to Maputo Fisheries Harbour
	Figure 4.5:	Panoramic view of Maputo Fisheries Harbour from dry dock site
	Figure 4.5 :	Panoramic view of Maputo Fisheries Harbour
	Figure 4.6:	Panoramic view of street in front Maputo Fisheries Harbour
	Figure 4.11:	City Cathedral
	Figure 4.12:	City Hall
	Figure 4.13:	Praça de 25 Junho
	Figure 4.14:	Fortaleza de Maputo
	Figure 4.15:	Avenida Samora Machel
Forjaz, 2004	Figure 4.16.1:	Independence Square Plan
	Figure 4.16.2:	Independence Square Perspective
	Figure 4.17.1:	Fisheries Museum Plan
	Figure 4.17.2:	Fisheries Museum Perspective 1
	Figure 4.17.3:	Fisheries Museum Perspective 2
Lobato, 1968	Figure 4.7.1:	Aerial view along Avenida Samora Machel looking north
	Figure 4.7.2:	Aerial view showing termination of Avenida Samora Machel
	Figure 4.7.3:	View along Avenida Samora Machel looking south
Author	Figure 4.8:	Avenida Samora Machel
	Figure 4.9:	Axis distinct from rest of city form
Adapted from (Ching, 2007, p.341)	Figure 4.10:	Axis terminating elements and its application in Avenida Samora Machel
Adapted by Author: Google Earth, GPS: 41°24'43.12"N; 2°13'26.47"E	Figure 4.18.1:	Aerial photograph of Barcelona showing Diagonal Axis
Amadalvarez(Alias), 2004	Figure 4.18.2:	Aerial perspective photograph of Plaza Forum 2004.
Bardou, 2011	Figure 4.19.1:	View from Plaza looking back along Diagonal Avenue
	Figure 4.19.2:	View from Plaza looking ocean through framed vista.
	Figure 4.19.1:	View from Plaza, architectural form articulating the movement of space beyond itself.
Adapted by Author: Google Earth, GPS: 41°24'43.12"N; 2°13'26.47"E	Figure 4.20:	Aerial photo of the Forum 2004 precinct showing position of left views.
Gregory, 2004: 60	Figure 4.21.1:	Exterior view of Forum 2004 Congress centre by Herzog & de Meuron
	Figure 4.21.2:	Interior view of Forum 2004 Congress centre by Herzog & de Meuron
	Figure 4.21.3:	Exterior view along Diagonal Avenue
Adapted by Author: Google Earth, GPS: 41°24'43.12"N; 2°13'26.47"E	Figure 4.22 :	Aerial photo of the Forum 2004 precinct
Author	Figure 5.1:	Informal street eatery outside the Maputo Fisheries Port
	Figure 5.2:	Image showing trawler landed in the Maputo Fisheries Harbour.
	Figure 5.3:	Image showing dhows landed in the Maputo Fisheries Harbour
	Figure 5.4:	Recent extension of fish sale area at the Maputo Municipal Market
Unknown, 2010	Figure 5.5:	Fish sale area at the Maputo Municipal Market
Author	Figure 5.6:	Informal street eatery outside the Maputo Fisheries Port
	Figure 5.7:	Informal afternoon street fish market outside the Maputo Fisheries Port
	Figure 5.8:	Informal afternoon street fish market outside the Maputo Fisheries Port

Adapted by Author: Google Earth, GPS: 40°24'46.43"N; 0°25'53.48"E	Figure 5.9:	Figure-ground plan of Benicarló showing position of fish market in red
Adapted by Author: Google Earth, GPS: 40°24'46.43"N; 0°25'53.48"E	Figure 5.12:	Exterior view of fish market from street.
	Figure 5.13:	Exterior view of deliveries and unloading side of building.
Miguel, 2007: 40	Figure 5.10:	Exterior view of collections side of building.
	Figure 5.11:	View showing the internal and external skin of fish market building.
Modified by author, from Miguel (2007: 38-42)	Figure 5.14:	Structure diagram: columnar perimeter to reveal planar void in centre
	Figure 5.15:	Circulation to use diagram
	Figure 5.16:	Repetitive to Unique diagram
	Figure 5.17:	Additive to Subtractive diagram:
	Figure 5.18:	Unit to whole diagram
Miguel, 2007: 37-43	Figure 5.19:	View across harbour
	Figure 5.20:	View up ramp to entrance
	Figure 5.21:	Internal view showing administration offices on upper level
	Figure 5.22:	External screen detailing
Adapted by Author: Google Earth, GPS: 25°54'5.04"S; 28°9'34.49"E	Figure 5.23:	Figure-ground plan of Highveld Business Park
Bakker, 2011	Figure 5.24.1:	East elevation
	Figure 5.24.2:	West elevation
	Figure 5.24.3:	First floor plan
	Figure 5.24.4:	Ground floor plan
Author	Figure 5.25:	View looking Southeast showing public entrance of the building
	Figure 5.26:	Image showing window between factory and laboratory
	Figure 5.27:	Steel sheeting adjacent to concrete wall with shadow gap
	Figure 5.28:	Delivery and collection area for factory
	Figure 5.29:	Steel sheeting forming shadow line above concrete
	Figure 5.30.1:	Circulation
	Figure 5.30.2:	Additive to subtractive
	Figure 5.30.3:	Unit to whole
Bakker, 2011	Figure 5.31.1:	Detail of window between factory and offices
	Figure 5.31.2:	Detail of southern wall
	Figure 5.31.3:	North - South Section through building
Author	Figure 5.32.1:	Repetitive to unique diagram
	Figure 5.32.2:	Geometry diagram
	Figure 5.32.3:	Symmetry and balance
	Figure 5.33:	View of main entrance of TriBeCA Coffee Factory
	Figure 6.1:	Harbour precinct development plan and phasing
	Figure 6.2.1:	Design development sketch
	Figure 6.2.2:	Design development sketch
	Figure 6.2.3:	Design development sketch
	Figure 6.3.1:	Section through harbour edges showings transfer process
	Figure 6.3.2:	Section through harbour edges showings transfer process
	Figure 6.4:	Design development sketch

Figure 6.5.1:	Design development sketch
Figure 6.5.2:	Design development sketch
Figure 6.6:	Design development series
Figures 6.7:	A study of the harbour edge condition of permeability
Figure 6.7.1:	Development series, sketch 1
Figure 6.7.2:	Development series, sketch 2
Figure 6.7.3:	Development series, sketch
Figure 6.8.1:	The grid
Figure 6.8.2:	Grid permeability
Figure 6.8.3:	Axial grid distortion
Figure 6.9:	Units, grids and grid systems
Figure 6.10.1:	Design development: contextual geometries explored on plan
Figure 6.10.2:	Design development: contextual geometries explored on plan
Figure 6.11.1:	Design development: contextual geometries explored in 3 dimension
Figure 6.11.2:	Design development: contextual geometries explored in 3 dimension
Figure 6.11.3:	Design development: contextual geometries explored in 3 dimension
Figure 6.11.4:	Design development: contextual geometries explored in 3 dimension
Figure 6.12:	Design development: contextual geometries explored on plan
Figure 6.13.1:	Design development: contextual geometries explored in 3 dimension
Figure 6.13.2 :	Design development: contextual geometries explored in 3 dimension
Figure 6.13.2:	Design development: contextual geometries explored in 3 dimension
Figure 6.14:	Design development: form in context plan
Figure 6.15.1:	Design development: form in context model
Figure 6.15.2:	Design development: form in context; rectilinear structure framed by a series of diagonal aprons.
Figure 6.16.1:	Design development: contextual geometries explored on plan
Figure 6.16.2:	Design development: contextual geometries explored on plan
Figure 6.17.1:	Design development: sectional explorations
Figure 6.17.2:	Design development: sectional explorations
Figure 6.17.3:	Design development: sectional explorations
Figure 6.18:	Concept sketch: the rectilinear form acts as datum to the diagonal screen
Figure 6.19.1:	Design development: the evolution of the plan
Figure 6.19.2:	Design development: the evolution of the plan
Figure 6.19.3:	Design development: the evolution of the plan
Figure 6.19.4:	Design development: the evolution of the plan
Figure 6.20:	Design development: sectional explorations in which the volume is reduced as the building comes into closer proximity to the water
Figure 6.21:	Ground floor plan
Figure 6.22:	First floor plan
Figure 6.23.1:	Inside / outside: lockable zones
Figure 6.23.2:	Main building as datum line to screen

Author	Figure 6.23.3:	Circulation to use
	Figure 6.23.4:	Rhythm: Repetitive to Unique
	Figure 7.1:	Floor being sprayed
	Figure 7.2:	Fish handling
	Figure 7.3:	Water filtration
	Figure 7.4:	Early design sketch exploring tectonic concept
	Figure 7.5:	Tectonic language
Adapted by author from Fisheries, FAO, 1988	Figure 7.6.1:	Drawing of typical fish boxes used to transport and temporarily store fish harvest
	Figure 7.6.2:	Drawing of a typical fish washing concrete table
	Figure 7.6.3:	Drawing of a typical fish weighing scale
	Figure 7.6.4:	Drawing of a typical fish filleting concrete table with drainage gutters and catchment
Author	Figure 7.7:	Diagram of fish handling and distribution process illustrated on ground plan
Adapted by author from Fisheries, FAO, 1988	Figure 7.8.1:	Drawing of a typical insulated fish and ice concrete storage tank
	Figure 7.8.2:	Drawing of a typical poly ethylene air tight fish offal storage container
	Figure 7.8.3:	Drawing of a typical fish auction and sale steel reinforced concrete table
Author	Figure 7.9:	Short section through restaurant and ablutions
	Figure 7.10:	Long section showing terracing of primary structure
	Figure 7.11:	First floor plan
	Figure 7.12.1:	Primary Structure perspective
	Figure 7.12.2:	Primary Structure exploded view
Allen, 2008	Figure 7.12.3:	Concrete finish , rough sawn timber sheeting used for formwork
Author	Figure 7.13:	Structure Diagram
	Figure 7.14:	Secondary Structure perspective
Youngman, 2008	Figure 7.15:	Aluminium roof sheeting
Reynaers Aluminium, 2011	Figure 7.16.1:	Diagram showing axonometric view of aluminium window system
	Figure 7.16.2:	Diagram showing axonometric view of aluminium window system
Author	Figure 7.17:	Typical section through building facade
SunPlan AG, 2009	Figure 7.18.1:	Diagram showing axonometric view of aluminium louvres
	Figure 7.18.2:	Diagram showing exploded axonometric view of aluminium louvres
	Figure 7.18.3:	Photo showing the application of alluminium louvred facade
GKD-USA, 2000	Figure 7.19.1:	GKD metal fabric, Escalé 5 x 1
	Figure 7.19.2:	GKD metal fabric, Escalé 7 x 1
	Figure 7.19.3:	GKD metal fabric, Helix 6
Author	Figure 7.20:	Ground floor plan showing position of water treatment and use processes
Bauer et. al. 2010: 63	Figure 7.21:	Diagram of simple grey water filtration system
Author	Figure 8.1 - 8.6:	Perspectives
	Figure 8.7:	Site Plan
	Figure 8.8 - 8.9:	Floor Plans
	Figure 8.10 -8.11:	Sections
	Figure 8.12:	Detailed Section
	Figure 8.13 - 8.15:	Details

Author	Figure 8.16 - 8.21	Model
Koolhaas et al., 2001	Figure 9.1:	Abstract Painting: Abstraktes BILD, Gerhard Richter, 1990
Croucher, 2012	Figure 9.2:	Architectural Pinhole photograph 1
	Figure 9.3:	Architectural Pinhole photograph 2
Morais, 2001	Figure 10.1:	Fort & trading settlement on an island swamp - 1876
	Figure 10.2:	First phase of swamp reclamation & layout of formal street grid -1887
	Figure 10.3:	Circular demarcation of city limits & extension of street grid -1900
	Figure 10.4:	Second phase of swamp reclamation & extension - 1915
	Figure 10.5:	Organic extension of erfs in second phase swamp reclamation - 1940
	Figure 10.6:	Extension of the city to the north - 1955
Jenkins, 2009: 15	Figure 10.7:	1969 Map
	Figure 10.8:	1979 Map
	Figure 10.9:	1989 Map
Jenkins, 2009: 4	Figure 10.10:	View of early settlement across the marshland from the mainland
Morais, 2001	Figure 10.11:	1876 Plan of the early settlement of Lourenço Marques showing island separated from the mainland by marshland.
Redrawn by author from Morais, 2001	Figure 10.12.1:	1876 Plan of the early settlement of Lourenço Marques showing island separated from the mainland by marshland.
	Figure 10.12.2:	Diagrammatic grid layered over the 1887 Plan for the expansion onto the mainland
	Figure 10.12.3:	Diagram showing the Establishment of the City Hall axis
	Figure 10.13:	Figure-Ground map of Lourenço Marques – 1903
	Figure 10.14:	Figure-Ground map of Lourenço Marques - 1940
Morais, 2001	Figure 10.15:	Municipal Map: Zoning and network plan -1953
	Figure 10.16:	Municipal Map: Actual network and land occupation -1953
Jenkins, 2000: 11	Figure 10.17:	View towards the city centre from the 'Reed City'
Eisen's Primitive Hut superimposed by author with Bentham's Panopticon	Figure 11.1:	Charles Eisen's engraving of the Vitruvian primitive hut overlaid on Jeremy Bentham design of the Panopticon
Rougeau, 2008	Figure 11.2:	Fountain, 1917, Marcel Duchamp, 1964 Replica
Wood, 2011	Figure 11.3:	Photograph of artist Marcel Duchamp sitting and smoking in front of his artwork
Arango, 2010	Figure 11.4:	Interior photograph of Maison de Verre, designed by Pierre Chareau, 1931
Pilloton, 2007	Figure 11.5:	Nakagin Capsule Tower, designed by Kisho Kurokawa, 1972
Shulma, 1997	Figure 11.6:	Eames House, Charles and Ray Eames, 1952



## CHAPTER 1: INTRODUCTION

P.	03	PROJECT SUMMARY
	04	OUTLINE OF STUDY
	04	REAL WORLD PROBLEM
	05	SUB PROBLEMS
	05	DESIGN AIMS
	05	HYPOTHESIS

**Project summary**

This dissertation details the design of a fish processing and distribution building in the Fishery Port of Maputo. The 'port' is explored as a threshold between a city and the ocean and the perceived spatial permanence of city form is brought into dialogue with the constantly changing forces of the harbour across this threshold. The cyclic fluidity of civic life mediates this dialogue to achieve an architecture conscious and manifest of the temporal.

*...the boat is a floating piece of space, a place without a [fixed] place, that exists by itself, that is closed in on itself and at the same time is given over to the infinity of the sea and that, from port to port... goes in search of the most precious treasures ... [It is] the great reserve of the imagination. The ship is the heterotopia par excellence, in civilizations without boats, dreams dry up... (Foucault, 1986: 27).*



## Outline of study

There are two main components to this dissertation. One is a theoretical investigation to arrive at a normative position within architectural discourse. This normative position is in response to a positive position which identifies attempts to establish a freedom of use, reuse and adaptability within the ordering processes of architecture. The second component of the dissertation is the resolution of a building design as an extension and demonstration of the objectives outlined in the normative position. The selection of a site is based on its characteristic opportunities in demonstrating these objectives. Real world (site specific) problems are identified through a contextual analysis and in combination with the objectives of the normative position an architectural brief is established.

The informal sale of fish to the public populates the area surrounding the entrance to the fishery port despite the lack of infrastructure provided for this activity. The relationship between the functions of the harbour and the public at large is, therefore, seen to be strongly established on a social level. Fishing, as an activity, is subject to cycles such as tides, seasons, weather and time of day; aspects informing its ritualistic qualities. These ritualistic qualities are, however, subject to individual differentiations; rendering a condition of temporality and change within a framework of the cyclical. Of the various port activities in close proximity to the city of Maputo, the fishery port is subsequently viewed as the most strategic site for the investigation of the above intentions.

## Real World Problem

Functionally, topologically and physically, the port is seen to mediate the relationship between the harbour and the city. As a result of functional and spatial restrictions of enclosure and separation, the active social relationship (between the fishing harbour and urban participants) is marginalised. The flow of resources through the port to the city is therefore restricted.

## Sub Problems:

1. A lack of adequate auction facilities for the local distribution of catch lowers the incentive for artisanal fishermen to dock and unload their catch at the Maputo Fishery Port.
2. Facilities in the Maputo Fishery Port cater mainly toward large scale frozen fish handling intended largely for export. The harbour is predominantly used by artisanal fishermen whose target is local sale. Despite this there is a lack of facilities for the handling of iced fish for local consumption. This greatly increases the chances of spoiling the catch. (Nyambir, 2002: 12)

## Design Aims:

The primary aim of the design is to investigate ways of opening areas of the port to the city and resultantly the general public.

By considering associated activities, trades, industries and distribution within the fishery harbour, the aim of the design is to re-configure these activities from a spatial ideology of enclosure and restriction to one that harnesses flows of people and resources (through the port) as catalysts to non-enclosed place-making.

## Hypothesis:

A dialogue exists between the resources of the harbour and the congestion of varied human activity in its adjacent open spaces. Through considerations of the dynamic actions and events that unfold within this dialogue and its association with the static - the port may be established as an accessible platform and its social practices may find thorough expression. In this way the tendency of architecture to 'colonise' the social practice that it seeks to house, through enclosure, is displaced by human flux.



## CHAPTER 2: THEORY

P. 09	PLASTICITY IN ACTION
P. 11	POLYVALENCY
P. 13	UNDERSTANDING 'ACTION'
P. 18	THEORY APPLIED TO SITE
P. 20	THE ROLE OF AMBIGUITY: IMAGINATION, DREAMS, HOPE
P. 23	ARCHITECTURE: TEMPORAL FORCE

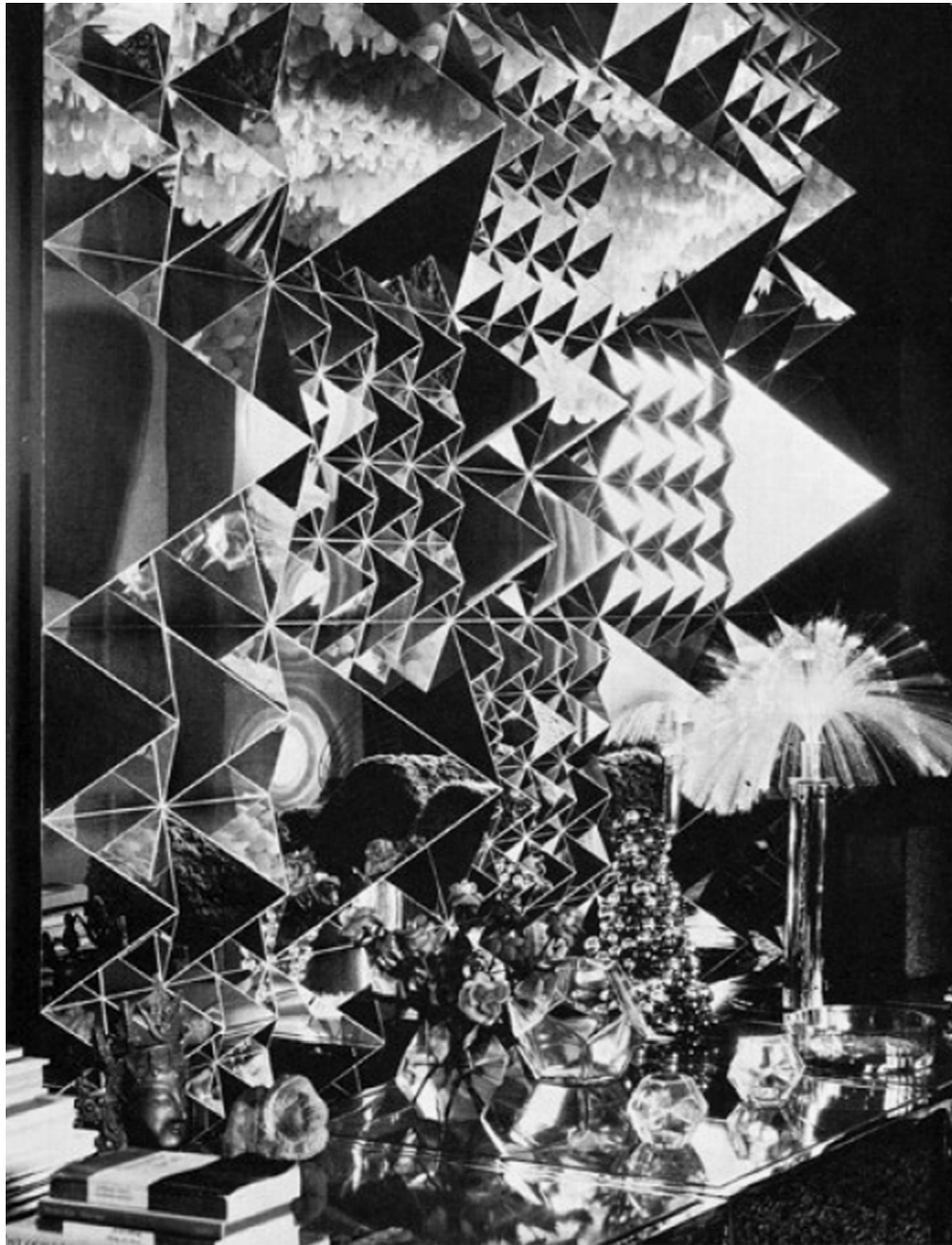


Figure 2.1: Photograph of a Verner Panton Mirror.

By confronting and challenging an expectation of the function of reflection in the context of vanity, the artwork allows for the realisation of a multifaceted point of view. In this process the action of 'making-up oneself' is acknowledged as one that extends beyond a production process into a realm of image, identity and perspective

### Plasticity in Action

In establishing a normative position in architecture the essential inquiry becomes one of the drivers of architecture form. It is the position in this dissertation that architecture can be read as the built form manifesting from human action as well as the built form that houses human action. In this respect Rem Koolhaas locates architecture between the formal and the social (Cunningham and Goodbun, 2009: 47); he speaks of architecture as that which brings context to and ascribes form for human practices. (Dickson and Dovey, 2002: 5).

In Appendix B the architectural developments of the 20th century - as they relate to the relationship between function and design as well as the realignment of the roles of both designer and the user - are outlined. The historical dislocation of architectural form from human activity as well as attempts in the architectural profession to deal with this dislocation are discussed. Function, in architectural practice, deals with predetermining action; a built form appropriate to that action is then resolved. In this chapter it will be demonstrated that by definition; the word 'action' (as it relates to human practice) is grounded simultaneously within the repetitive and the ritualistic as well as within a process of differentiating creativity and therefore, can only partially be predetermined. While it is acknowledged that buildings often need to be changed or adapted in their lifetime (technological flexibility) it is also important to emphasise that the static forms of architecture (as they relate to the social) need to respond to an inherent plasticity of human action.

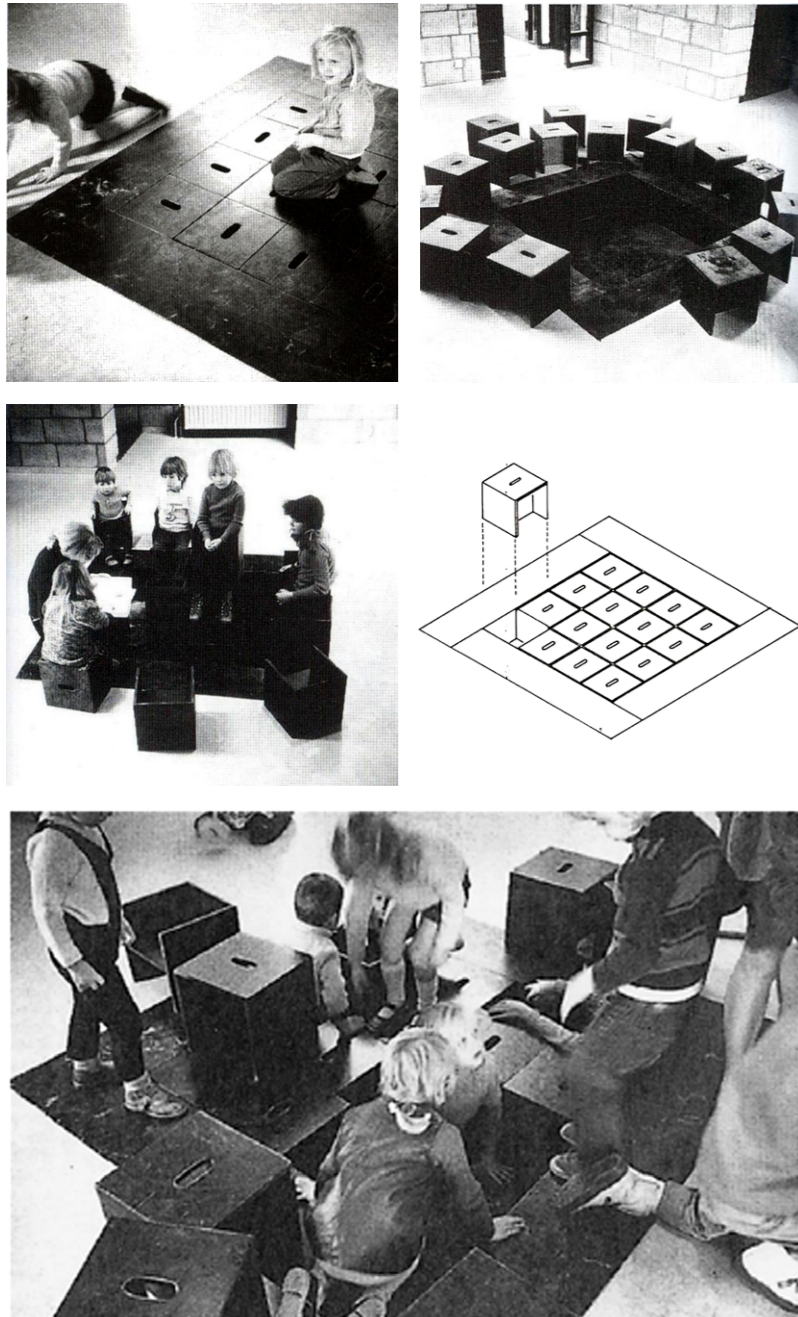


Figure 2.2.1 (top left): floor closed

Figure 2.2.2 (top right): modules removed, floor opened

Figure 2.2.3 (mid-left): children seated

Figure 2.2.4 (mid-right): design diagram

Figure 2.2.5 (bottom): children playing

Figures 2.2: Montessori School in Delf, Herman Hertzberger, 1970. An example of modular polyvalence in architecture.

## Polyvalency

Hertzberger (2001: 147) describes polyvalence as having, at its core, the concept of 'changefulness as a permanent'. He proposes the investigation of distinct forms that can accommodate a variety of human actions without themselves dictating specific function. The important idea to grasp in this is not that people's essential activities differ – sleeping, sitting, eating, etc. – but rather that each person's way of conducting these activities is unique. The built form becomes an argument of spatial relationships and typology rather than the functional segmentation of the built work. The user in this instance becomes Hill's creative user (discussed in Appendix B) whose engagement with the built form involves the act of creating one's own action.

This principle is illustrated in Hertzberger's design for a Montessori school in Delft, Holland (Figures 2.2.1- 2.2.5). Wooden cubic blocks are movable and removable from a hole in the ground. While this motion could be described as flexibility there is a plurality in the interpretation of use of the entire body of components. In its closed position there is no suggestion of a designated function for these blocks. When the blocks are removed, three different planes of inhabitation exist; in the hole, on its edge or on the blocks. This coupled with a variety of arrangement possibilities produces a functionally non-specific, yet distinct architectural resolution that accommodates playing, seating, standing, assemblage and storage.

Of critical importance in the resolution of polyvalent forms is an understanding of the nature of the human actions inhabiting them. The next section of this chapter will investigate an underlying philosophy of human actions and events. Furthermore the relationship between event and milieu will be discussed in an effort to understand the ways in which architectural environment and human action can influence and inform one another. This influence will form the basis of a normative position in architecture.





Figure 2.3.1 (above): Image of informal market 1

Figure 2.3.2 (below): Image of informal market 2

Urban Africa, photographic series

### Understanding 'action'

***A life without speech and without action... is literally dead to the world; it has ceased to be a human life because it is no longer lived among men.***

(Arendt, 1998: 176). In The Human Condition, Hannah Arendt discusses human plurality and its subsequent characteristics of equality and distinction. Under this discussion she establishes that the qualifying aspects of human life (as distinct from other forms of life) is a person's unique ability to articulate his/her own distinction from other people (1998: 175). In this respect Arendt established the dependence (beyond basic necessity) between human beings. Her idea being that a qualifying quality of humans is the drive to disclose their identity to other humans.

Arendt identifies the two ways in which people disclose and affirm themselves to other people; namely, in 'action' and in 'speech'. Action (to act) has its origins in the Latin term *agere*, meaning 'to set in motion' or 'to drive'; in this sense action can be seen as the equivalent to 'initiative' or the beginning of a thing. As a means of disclosing oneself as distinct, action therefore establishes a legacy:

***...Thus, nothing acts unless [by acting] it makes patent its latent self.***

(Dante quoted by Arendt. 1998: 175)

In action we create something new in the context of the forms already created by past actions (often of others); therefore the world of prophecy is seen to be inseparable from the world of memory and the temporal quality of action is revealed. Important to note, however, is the source of action as discussed in the beginning of this chapter; namely, from a human drive for simultaneous equality and distinction.



Figure 2.4.1 (top): Bushes, archival pigment print



Figure 2.4.2 (Centre): Jean Street, archival pigment print



Figure 2.4.3 (Bottom): Fulton Street, archival pigment print

Streets, Series of print artworks done by Leigh Merrill demonstrating the collective yet individual nature of human culture in the private realm of San Francisco

### Understanding 'action' (continued)

Viewed from a different perspective, Gilles Deleuze (1990: 148) discusses, in The Logic of Sense, 'action' as that which is produced by the offspring of 'event'; namely man's nature. Furthermore, the 'event' can be described as having two distinguishing features:

***On one hand, it belongs to the undetermined, the chaotic, and the temporal, that is, it is a singularity; on the other, it seizes and constellates as much material as possible, it is worldly, spatializing, and persists in its being.*** (Kwinter, 2001:168).

Within the framework of these ideas, man's nature - as the offspring of events - is seen as both grounded and determined in each passing moment but also simultaneously shaped by a chaotic limitless set of possibilities and virtualities.

In this sense we can say that we exist in and around forms created in a past. The creation of forms in the future proceeds in reaction with or against those that we already inhabit. The manifestation of new forms can be described as an event in which those of the past undergo distortions and amendments. The individuals inhabiting and creating them bring all their potential virtualities and possibilities to the surface and in an act of distinction, they create.

In the next section of this chapter these principles of simultaneous equality and distinction are grounded in the site - establishing the port as a principle laboratory to the theoretical investigation of action and event in architecture.



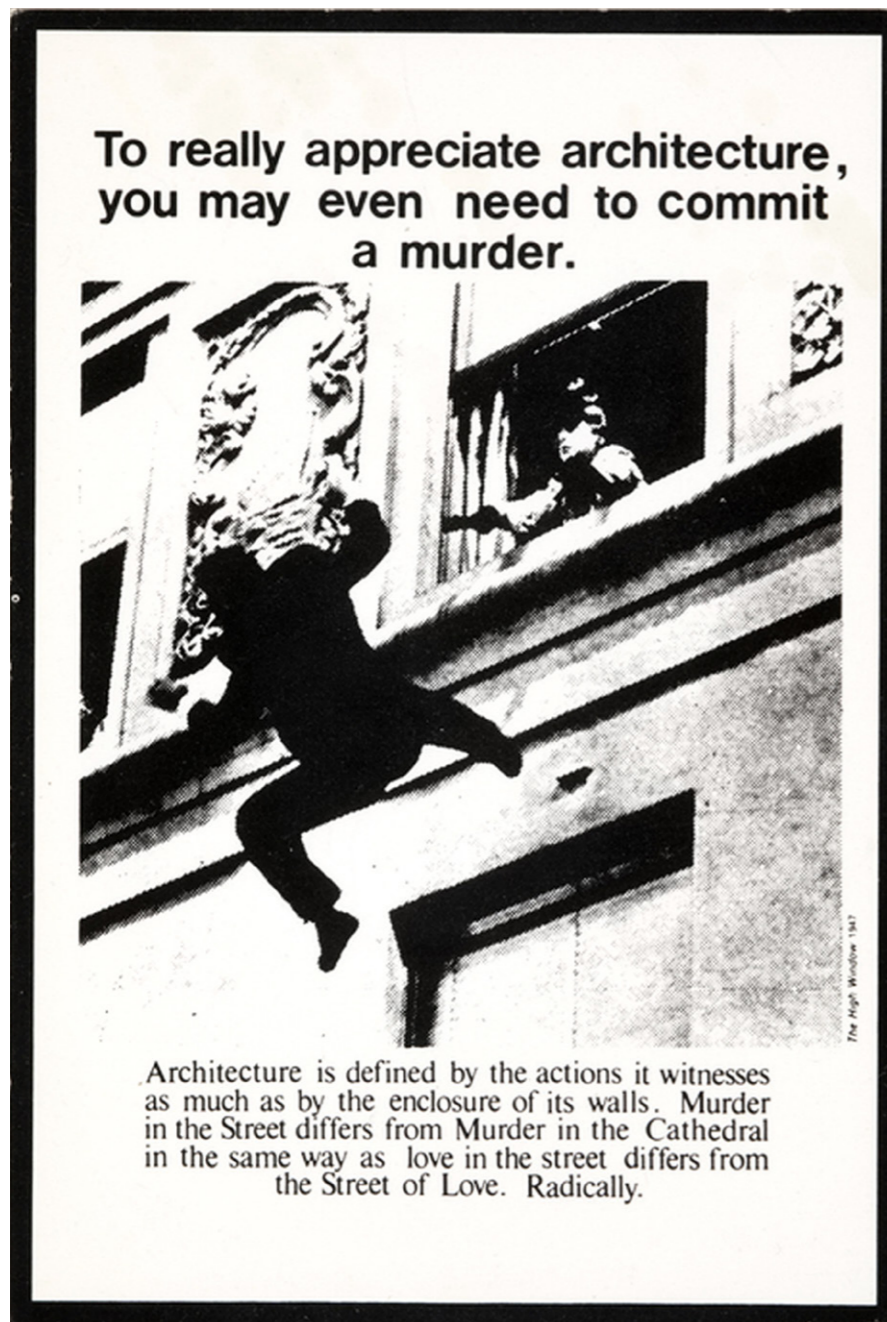


Figure 2.5.1:  
Advertisements for Architecture,  
Bernard Tschumi, 1976-1977,  
Advertisement 1

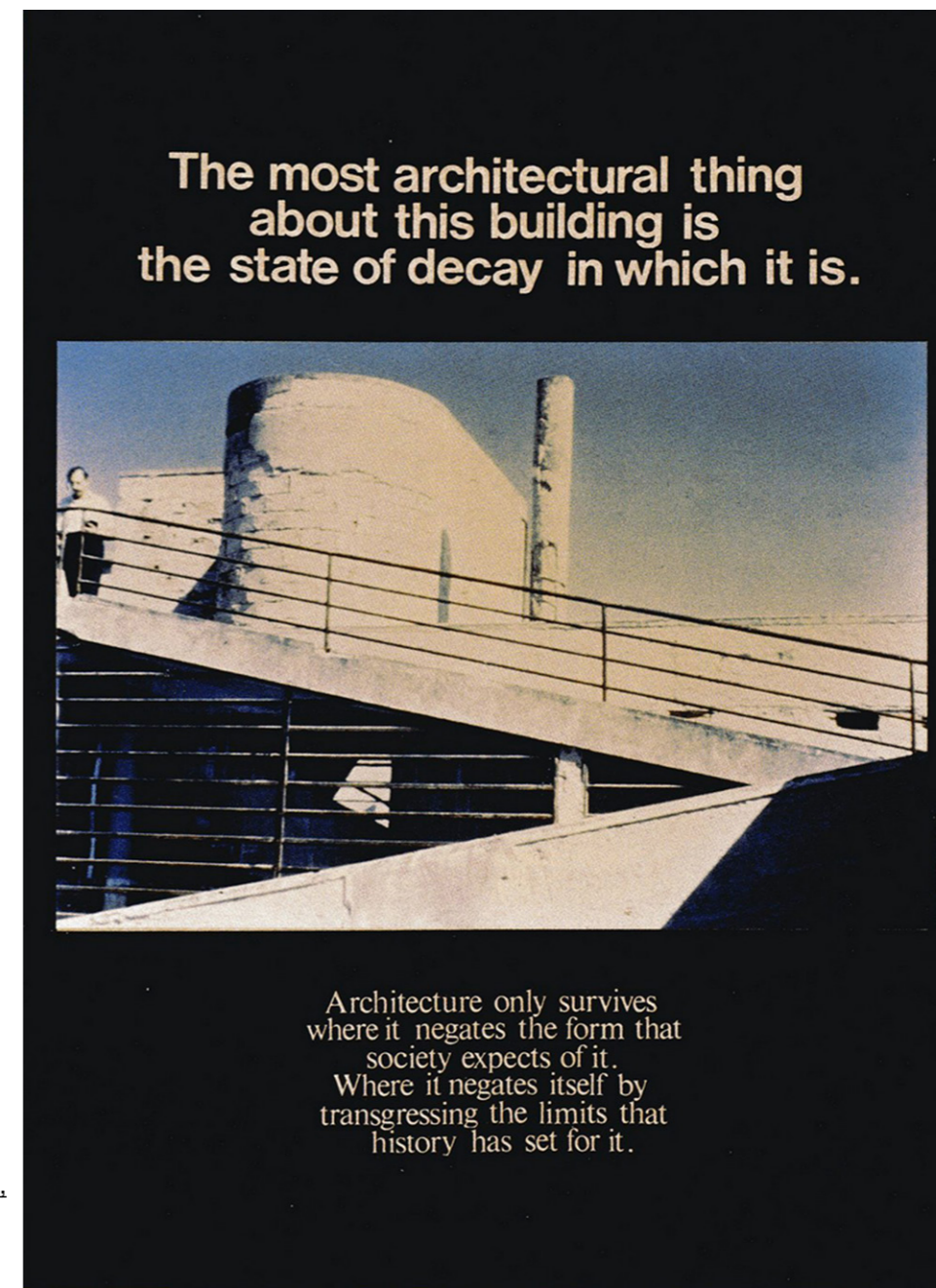


Figure 2.5.2:  
Advertisements for Architecture,  
Bernard Tschumi, 1976-1977,  
Advertisement 2



## Theory Applied to Site

***The event... [is] both an embracing and an excavation of a milieu. The milieu in turn is carved by the event and bears its shape. Every event is defined and exhausted by the production of a new milieu; it is a forcing to the surface of once virtual relations that have now become actual.***

(Kwinter, 2001:168)

The site of interest to this dissertation is that place where actions and events take place. From the discussion on event this place can be described as the spatial construct where private meets public, where the individual meets and affirms himself/herself to the 'other', or where that which is local finds itself exposed to the global greater unknown.



Figure 2.6: View across Maputo Fisheries Harbour looking west

## Port:

The term 'port' has its origins in the Latin word porta, meaning gateway or entrance and for this reason the term is closely linked to notions of threshold and transition in architecture. The port essentially establishes the means to connect the 'local' with a network of regions outside of its own immediate context. For this reason ports can be read as places of flux and dynamic where migration or resources bring the intentions of permanence in architecture into continuous question:

***Ports are fundamentally places of flows, portals that mediate local/global flows. The harbour or dock connecting the city/ state to the world shares this function with the 'port' connecting my computer to the World Wide Web. Ports were generally the first sites of global colonisation, funneling flows of people, products, capital and ideas.*** (Dovey, 2004: 9)

In *Of Other Spaces*, Michel Foucault discusses a shift from a finite perception of space to a more infinite one. He considers that at the point (in space or time) where the local discovers the greater unknown; emplacement (characterised by hierarchical, ordered spatial relationships) is replaced with extensions (understood as traces of unpredictable movement and spatial relationships) - he characterises these as heterotopias (Foucault, 1986: 23).

As the link between the city and the boat, the seaport is read as a typifying example of this point where the local discovers the greater unknown. For this reason it is harnessed as the site from which the design investigation develops.

*Sometimes the house of the future is better built, lighter and larger than all the houses of the past, so that the image of the dream house is opposed to that of the childhood home.... Maybe it is a good thing for us to keep a few dreams of a house that we shall live in later, always later, so much later, in fact, that we shall not have time to achieve it. For a house that was final, one that stood in symmetrical relation to the house we were born in, would lead to thoughts — serious, sad thoughts—and not to dreams. It is better to live in a state of impermanence than in one of finality.* (Bachelard, 1958: 61)



Figure 2.7: Diller Scofidio Renfro's *Blur Building*, Yverdon-les-Bains, Switzerland 2002

### The role of ambiguity: Imagination, Dreams, Hope

A term that features strongly that is yet to be discussed is 'resource' which has its origins in the Latin *resurgere* (re- + *suregere*) meaning 'to rise' or 'to begin'; the term is therefore strongly associated with 'action' as defined previously. The distinction between resource and action is, however, that a resource is the means to action; it is the physical matter that becomes subject to action and to initiative but without which that action and initiative could not wholly manifest. Resources become the activators of the virtualities leading up to an event - they specify the list of possible events.

The important role that variance plays in resource efficiency is put forward in Amelie Guyot's *Spaces for enchantment and the unknown*. In a study done in rural areas in the Western Cape, Guyot (2009: 24) notes that the material wealth that people aspire toward is significantly standardised based on the forms of resources that they are continuously subjected to as desire objects. The basic principle is that where demand is high for a limited set of resource those resources will be rapidly depleted. Guyot (2009: 64) establishes that one's ability to imagine distinct forms of action creates a more varied interpretation of; and resultantly a lesser demand on resources. The boat and the port have been discussed as temporal spaces of constant flux. As heterotopias they act principally as devices for the imagination. They represent the ever possible event and enrich that event with a concentration of varied resources and in this process they establish a desire beyond the local.

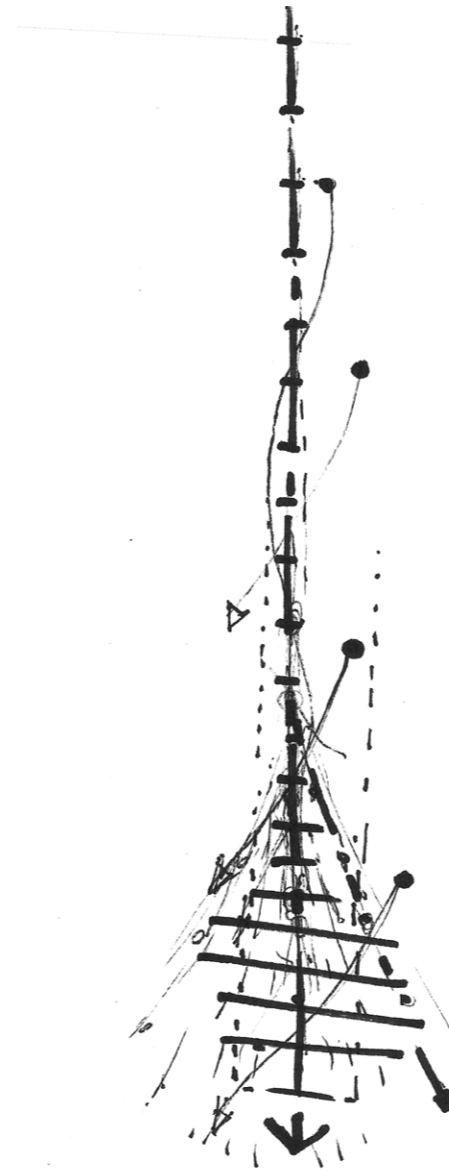


Figure 2.8: Architecture as temporal force

### Architecture: Temporal Force

Contemporary architecture frequently focuses on the fluidity of place and seeks its informants within a complex layering of history, movement and the flux of virtual space. In his paper, *Mythforms: Techniques of migrant place-making*, Paul Carter (2003: 93) describes a contemporary urban condition of migrant place making. He describes the resultant design mechanisms as traces and extensions which stand in contrast to what he refers to as ‘formal placism’ in which enclosure and hierarchy dominate. McKenzie Wark explains that within this condition design informants become vectors: entities that have a fixed length but no fixed position:

***[This] suggests an architecture that, on the one hand, creates megastructures, which are planes of relatively long duration, across which a great deal will flow. On the other hand, upon this plane, is architecture lite, which constructs a prop for an attractor, a “stall” literally, a temporary stop, of much shorter duration. Under the corrosive force of the vector, architecture becomes liquid.*** (Wark, 2000: 37)

The premise that architecture responds to and resolves a set of human conditions is posited in the introductory paragraph of this chapter. Through an understanding of the concept of event, human action is situated between the temporal and the permanent. Architecture is both that which houses and that which manifests from events. It therefore follows that architecture too sits between the temporal and the permanent. It responds to contextual order and sense of emplacement, while at the same time (in a distortion process) it responds to the vectorial force of ‘trace’ and the impermanence of the actions it houses.



## CHAPTER 3: CONTEXT AND MAPPING

P.	26	CITY PROFILE
	28	PERIPHERY
	30	DEFINING THE BAIXA
	31	MAPPING
	32	CURRENT CITY FRAMEWORK
	33	MAPS

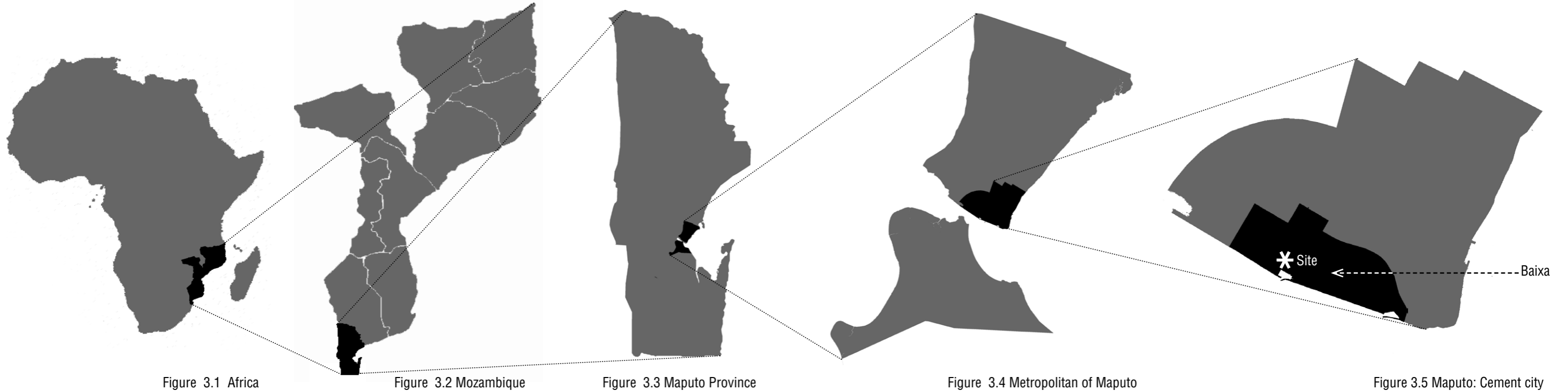


Figure 3.1 Africa

Figure 3.2 Mozambique

Figure 3.3 Maputo Province

Figure 3.4 Metropolitan of Maputo

Figure 3.5 Maputo: Cement city

### City Profile

The city of Maputo is situated on the eastern side of Maputo Province; located in the southern portion of Mozambique. The city is however designated as its own province and does not fall under the jurisdiction of the Maputo Province. The capital city of Maputo Province is Matola, which is governed under its own municipality. However, Maputo and Matola can be described as one single greater metropolitan area despite their separate governance and planning.

The city of Maputo consists of two distinct areas, namely “Cidade de Cimento” or the Cement City and the “Canicos” or the Reed City; also described as the formal and informal city respectively. The historical growth of the metropolitan area from island to mainland and the expansion of vast informal areas on the city’s periphery is discussed in Appendix A. The causes involved in the formation of these two distinct city zones as well as the subsequent present day relationship between them is demonstrated.





Figure 3.8 (above): Textures of the 'Reed City'

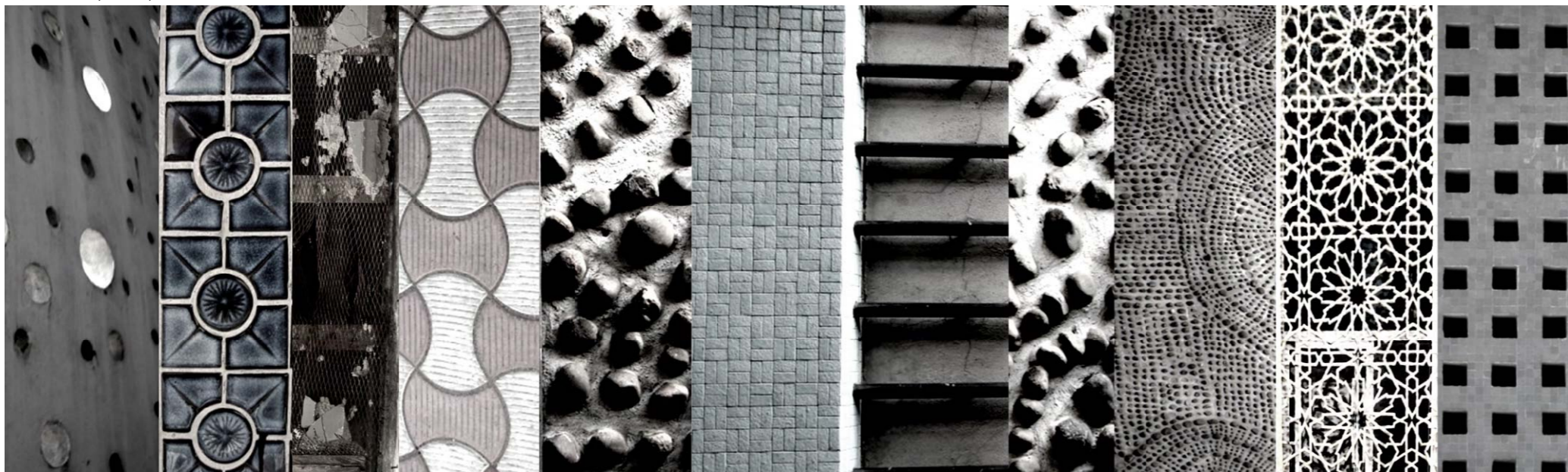


Figure 3.9 (above): Textures of the 'Cement City'

### Periphery

Read in opposition to one another, these two portions of the Maputo Metropolitan area can be seen to unfold in a polarity of economic levels. This polarity is particular to the colonial city form (Andrag, 2007: 1). However, it is important to note that this condition is not completely unique to colonial African cities; the inhabitants of the margins of global cities have always been, as the title aptly describes, marginalised: *To be in the margin is to be part of the whole but outside the main body... the railroad tracks were a daily reminder of our marginality. Across those tracks were paved streets, stores we could not enter, restaurants we could not eat in, and people we could not look directly in the face... We could enter that world but we could not live there. We had always to return to the margin.* (Hooks, 1989: 206)

The Greater city of Maputo is no exception. It once centred around the Cement City which itself centred around the Baixa (historic city centre). This historic centre has become just one within a large web of poly-centrality. The Baixa (adjacent to the harbour) can be read simultaneously as an economic centre for the city but also as a gateway for resources and migrants into the city and therefore an edge or periphery of the city. Both local and global; the city centre exhibits an urban form characterised through strong emplacement while in the same instance it is conversely characterised through strong extensions.



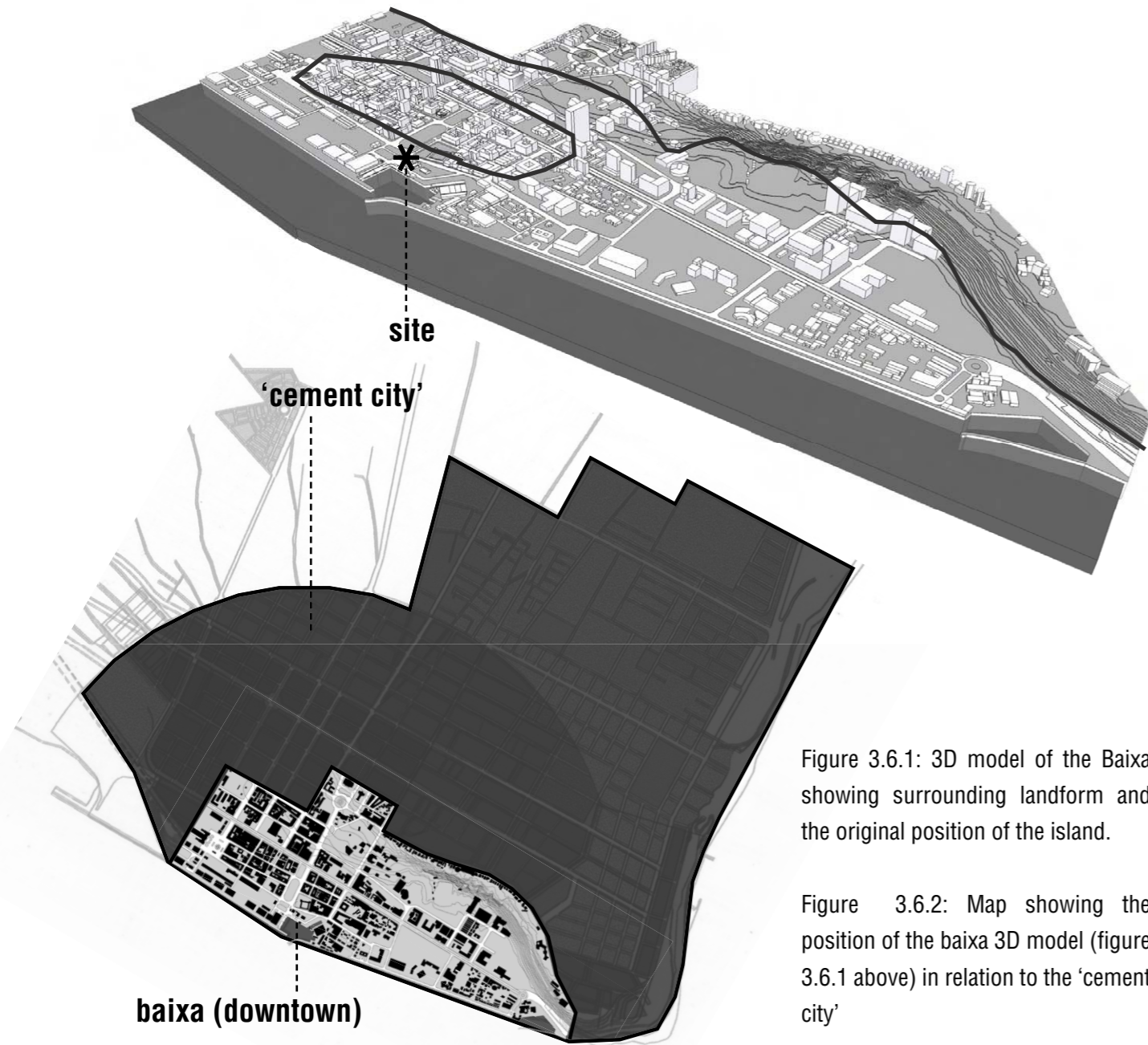


Figure 3.6.1: 3D model of the Baixa showing surrounding landform and the original position of the island.

Figure 3.6.2: Map showing the position of the baixa 3D model (figure 3.6.1 above) in relation to the 'cement city'

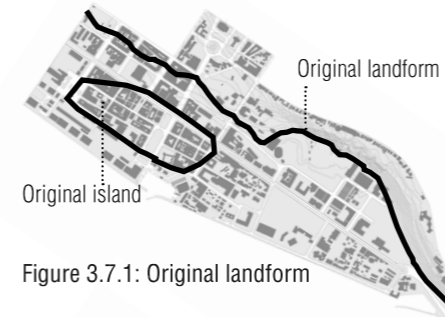


Figure 3.7.1: Original landform

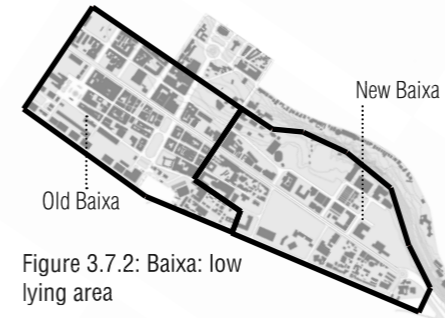


Figure 3.7.2: Baixa: low lying area



Figure 3.7.3: Protected historic area

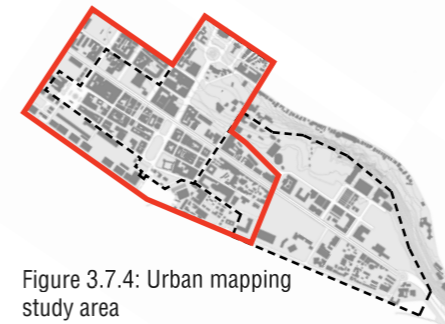


Figure 3.7.4: Urban mapping study area

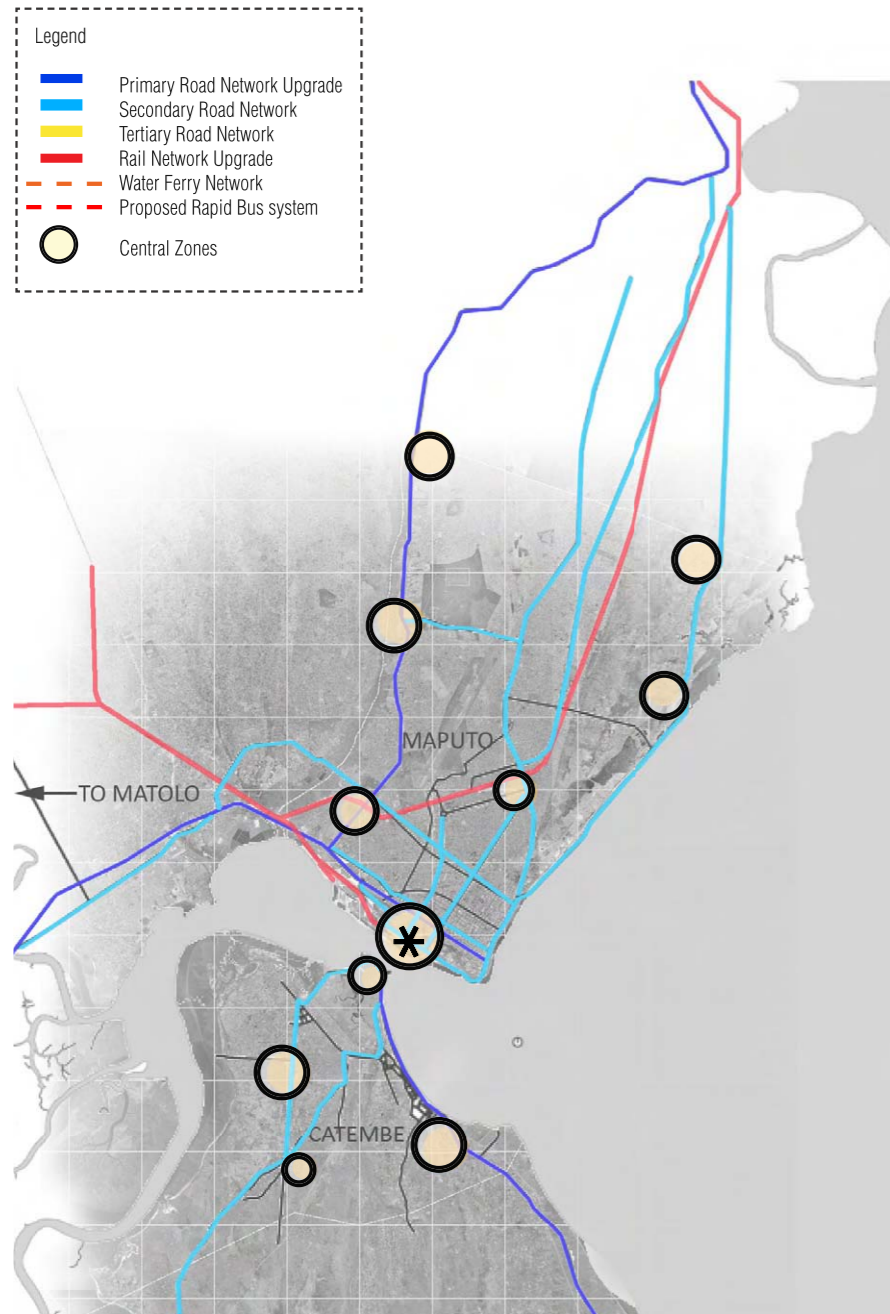
### Defining the Baixa

The urban investigation in this dissertation forms part of an international design collaboration in which the revitalisation of Maputo's historic Baixa district serves as the active laboratory for learning. The collaboration is with students from the University of Pretoria, the University of Eduardo Mondlane in Maputo and TU Delft in Holland and took the form of several key workshops throughout 2011. One of the key discussion during the first workshop in February 2011 was locating the boundaries and definitions of the "Baixa". The term "Baixa" is a Portuguese word that translates roughly as downtown and is used to denote the low lying area of the city. In Maputo the Baixa forms the oldest part of the city. The Baixa is the city's central business district, its heart and its arrival point for many modes of transport; the boundaries or limits of these concepts are demonstrated in figures 3.7.1 - 3.7.3. The study area outlined in figure 3.7.4 is a consequence of these definitions, perceptions, and the emphasis placed on revitalisation and heritage.

### Mapping

'Formal placism', as discussed in chapter 2, informs the initial investigation of the context and seeks to identify and understand these qualities of boundary; hierarchy; heritage; and entry, access and movement across the study area. These conditions are demonstrated in figures 3.12.1 - 3.15. The second aspect of the mapping study then focuses on use and inhabitation within this formal system and is demonstrated in figures 3.14, 3.16 & 3.17, of specific interest in this regard is the degree to which the peripheral condition of informality informs use and action in formal context.





**Current city framework**

Presently the urban development of Maputo is regulated under the PEUMM Framework of 2008. In this framework various important centres in the metropolitan are identified and earmarked for the development of a polycentral metropolitan. Emphasis is placed on the present zoning around these centres as well as the transport links between them. Figures 3.10 - 3.11.2 demonstrate these centres and networks as well as current proposed network upgrades

Figure 3.10: Transport network, Public transport and city improvement projects: Metropolitan scale

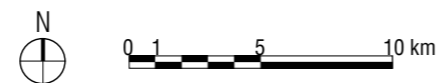


Figure 3.11.1: Maputo Citywide Transport Networks

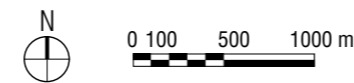
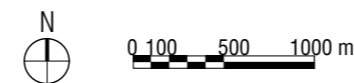


Figure 3.11.2: Public transport and city improvement projects: Citywide Scale

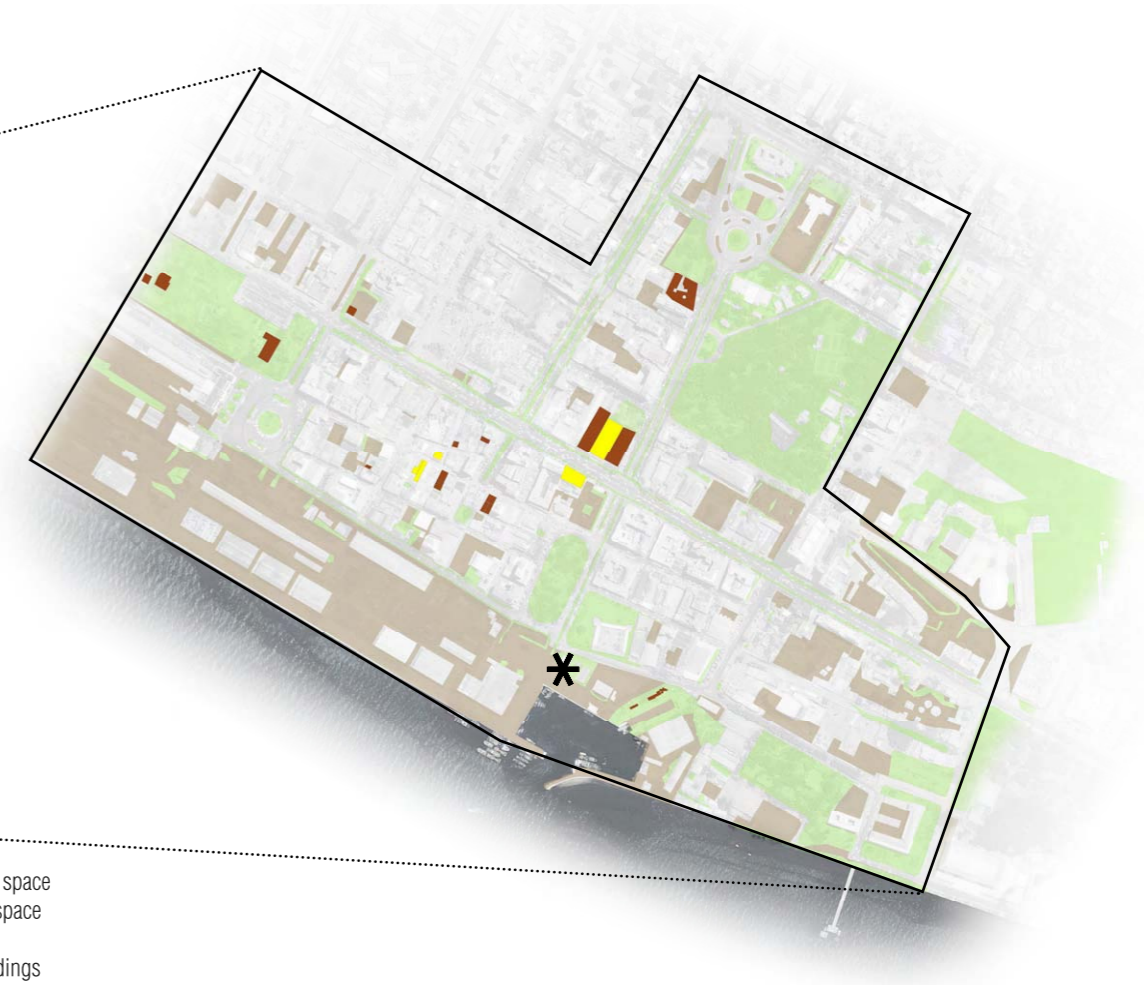






- Parks and gardens
- Natural/undeveloped vegetation
- Vacant/partially vegetated

Figure 3.12.1: Citywide green open spaces



- Green open space
- Hard open space
- Ruins
- Vacant buildings

Figure 3.12.2: Baixa study area open space network

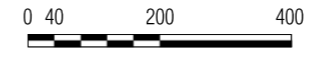






Figure 3.13: Public Transport

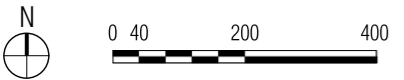
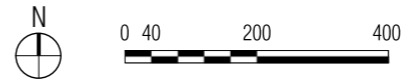


Figure 3.14: Figure-ground study and pedestrian density



3.15.1 Conselho Municipal  
(City Council)  
1903-1905



3.15.2 Catedral  
(Our Lady Cathedral)  
1936- 1944  
Gothic style



3.15.3 Radio Mozambique  
1948  
Modern style  
Tropical climate  
response: brise soleil



3.15.4 Telecommunications  
of Mozambique  
1946-1948  
Art Deco style



3.15.5 Centro Cultural  
Franco, Moçambique  
(French cultural Centre)  
1898



3.15.6 Casa do Ferro  
(Iron House)  
1892  
Prefabrication iron and steel



3.15.7 Statue Samora  
Moses Machel  
Inaugurated 1989  
Reinforced concrete,  
marble, bronze



3.15.8 Tribunal Supremo  
(Supreme Court)  
1890  
Colonial style



3.15.9 Mercado Centrale  
(Central Market)  
1901-1903  
Cast-iron construction dome



3.15.10 Predio Pott  
1891-1905  
Steel frame construction  
built for late consul to Transvaal



3.15.11 Correios de Moçambique  
(Central post office)  
1903



3.15.12 Imprensa Nacional  
(National Press)  
1857



3.15.13 Museu de Moeda  
(Museum of Money)  
1873  
Portuguese Government Building  
Proclaimed historic monument in 1964



3.15.14 Caminhos de Ferro  
de Moçambique  
(Central Station)  
1908-1910



3.15.15 Monumento a  
Primeira Guerra Mundial  
(WW1 Monument)  
Inaugurated 1935



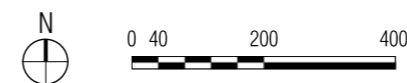
3.15.16 Casa dos Azuleijos  
(House of Tiles)  
1879



3.15.17 Fortaleza de Maputo  
Rebuilt: 1851-1867  
Old fort: circa 1780-1796



Figure 3.15: Heritage buildings (protected)

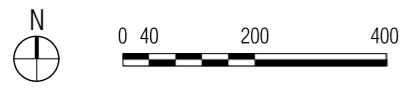






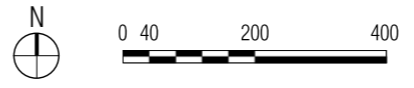
- Residential
- Commercial: Retail and Services
- Commercial: Offices
- Industrial: Fishing
- Industrial: Warehouse and Manufacturing
- Transport
- Cultural, Arts and Entertainment
- Institutional, Public Administration
- Construction related Business

Figure 3.16: Predominant Functions



- Formal retail
- Stationary informal retail
- Mobile informal retail

Figure 3.17: Formal and informal retail





## CHAPTER 4: URBAN CONDITION

P.	44	SITE: PORT CONDITION AND AXIAL CONDITION
	46	PORT CONDITION
	48	PORT AREA AND SURROUNDS
	52	AXIAL CONDITION: AVENIDA SAMORA MACHEL
	56	CASE STUDY: URBAN FORM



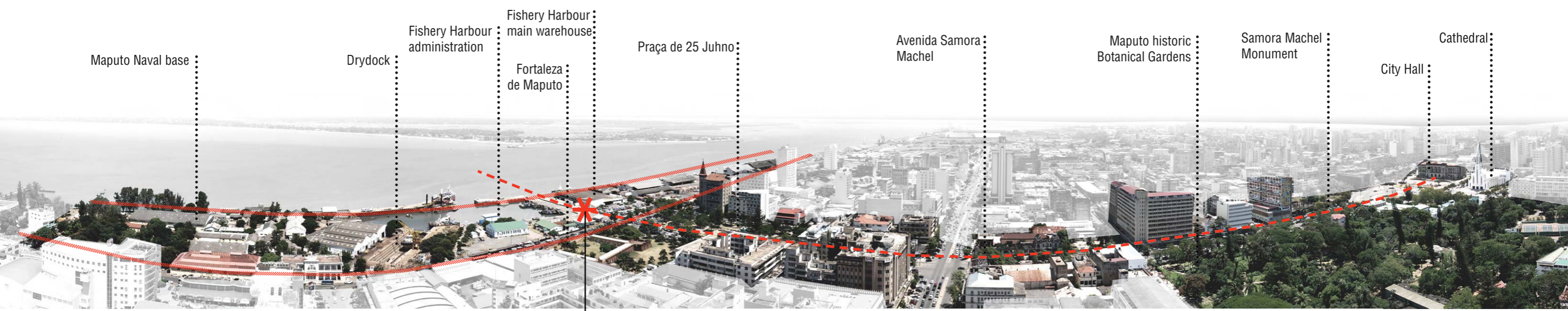


Figure 4.1: Site in context, Harbour condition and Axis condition shown

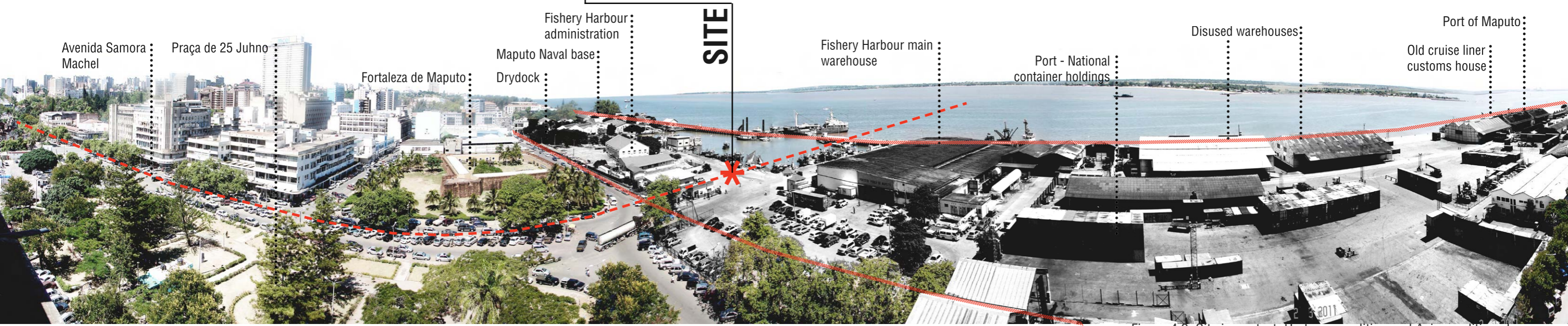


Figure 4.2: Site in context, Harbour condition and Axis condition shown



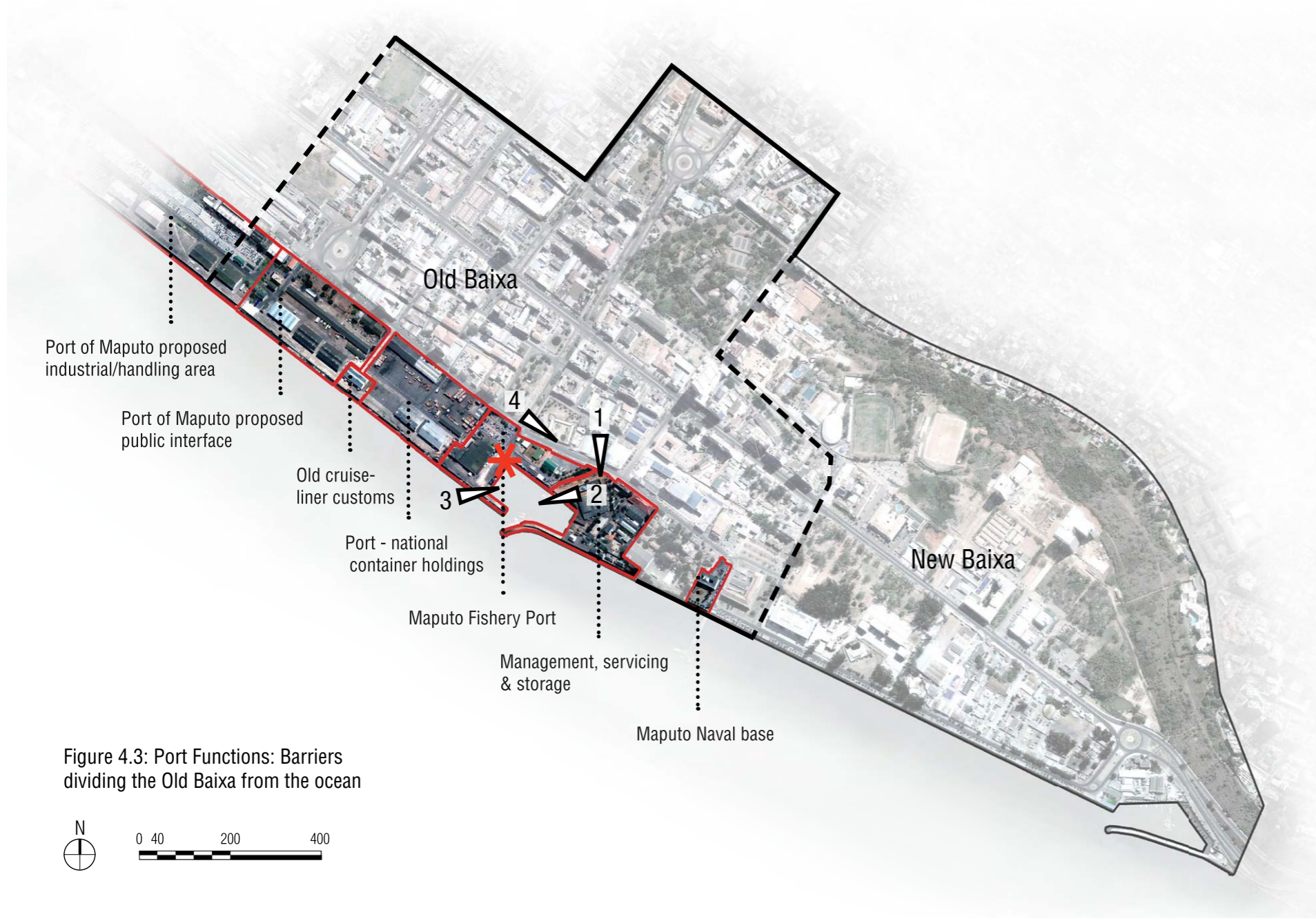


Figure 4.3: Port Functions: Barriers dividing the Old Baixa from the ocean

**Port Condition - Confronting the barrier**

The general aim of the design project in this dissertation is to investigate the establishment of a public interface between the port and the city. On an urban scale this interface should strengthen the connection between downtown Maputo and the surrounding bay. On a localised scale the public interface should position the port as an establishment that is accessible to the general public.

The port precinct is shown in the figure 4.3 (left) and can be read as a significant barrier between the Old Baixa and the Bay of Maputo. The vast majority of large scale industrial port activities have shifted and expanded in a north westward direction beyond the inner city region. Given its state of partial disuse, we assume from port management speculation that the sections of the Maputo Port labelled 'Port - National container holdings' and 'Port of Maputo proposed public interface' will undergo extensive redevelopment in the future and that much of this redevelopment will be of a private and commercial nature (McPherson, 2011).

Kim Dovey refers generally to the relocation of global ports beyond the confines of inner cities and from this, he positions the partially disused urban port of the late twentieth century at the forefront of adaptive and experimental reuse and development. He cites that the redevelopment of the urban port often unfolds in a tension between global and local place identity - which has as its result functional gentrification - and between public and private interests through commercial exclusions (Dovey, 2004: 9). This tendency parallels closely to the port of Maputo in which emphasis is placed by Maputo Fisheries Port (MFP) officials on the historic and cultural significance of the marine port in relation to the city (Nyambir, 2002: 13).





Figure 4.4 (above): Panoramic view of dry dock adjacent to Maputo Fisheries Harbour



Figure 4.5 (above): Panoramic view of Maputo Fisheries Harbour from dry dock site





Figure 4.5 (above): Panoramic view of Maputo Fisheries Harbour



Figure 4.6 (above): Panoramic view of street in front Maputo Fisheries Harbour, showing informal street eatery



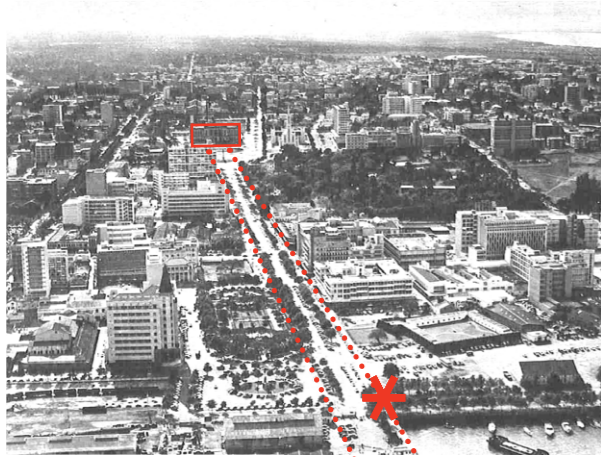


Figure 4.7.1 (top): Aerial view along Avenida Samora Machel looking north  
Figure 4.7.2 (middle): Aerial view showing termination of Avenida Samora Machel in the Maputo Fisheries Harbour  
Figure 4.7.3 (bottom): View along Avenida Samora Machel looking south

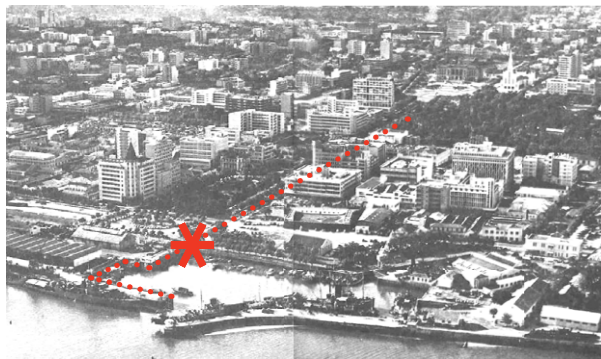


Figure 4.8: Avenida Samora Machel

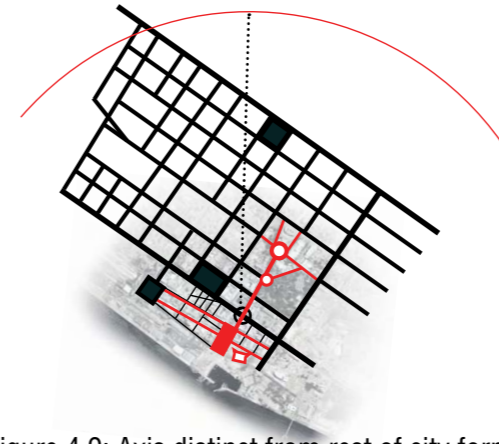
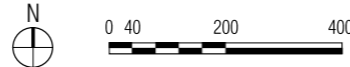
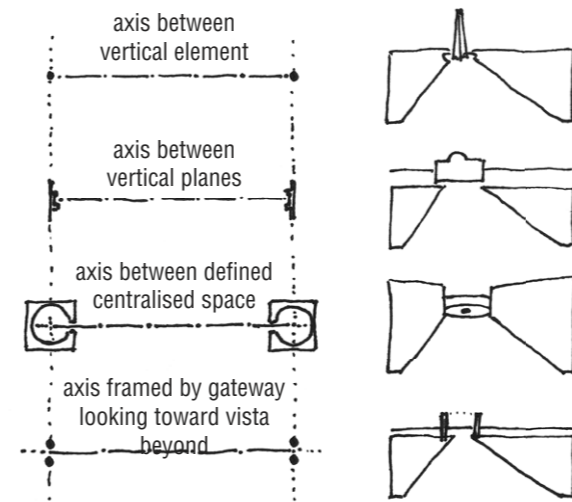


Figure 4.9: Axis distinct from rest of city form



Axis guideline for termination of Avenida Samora Machel: centralised space linked to gateway looking toward ocean vista beyond



Figure 4.10: Axis terminating elements and its application in Avenida Samora Machel

**Axis Condition - Avenida Samora Machel**

The Municipality of Maputo has identified Avenida Samora Machel to be upgraded as a main pedestrian promenade in the city. It is proposed by city planners that this upgrade be based on 'la Ramblas' in Barcelona with the establishment of a wide landscaped island in the middle of the road.

Presently this avenue links landmarks such as the City Hall and the cathedral (figures 4.11 & 4.12) to Praça de 25 Junho and the Fortaleza de Maputo (figures 4.13 & 4.14). As a means to strengthen this framework José Forjaz has designed two projects situated at either end of this avenue. The first of these 2 projects is the Independence Square, designed in 2006 (figures 4.16.1 & 4.16.2) which aligns with the category "defined centralised space" demonstrated in figure 4.10. The second project is the Fisheries Museum, designed in 2008 (Figures 4.17.1- 4.17.3).

In this dissertation both of these projects are included as a means to enrich the framework. The design project in this dissertation together with the Fisheries Museum form a gateway across Avenida Samora Machel. In line with the ideas established in figure 4.10 Avenida Samora Machel is framed by this gateway to reveal an entry point to the Fisheries Harbour as well as to frame a vista of the harbour and ocean beyond.





Figure 4.11: City Cathedral



Figure 4.12: City Hall



Figure 4.13: Praça de 25 Junho



Figure 4.14: Fortaleza de Maputo



Figure 4.15: Avenida Samora Machel

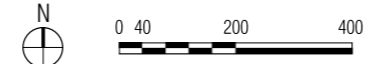


Figure 4.16.1: Independence Square Plan



Figure 4.16.2: Independence Square Perspective

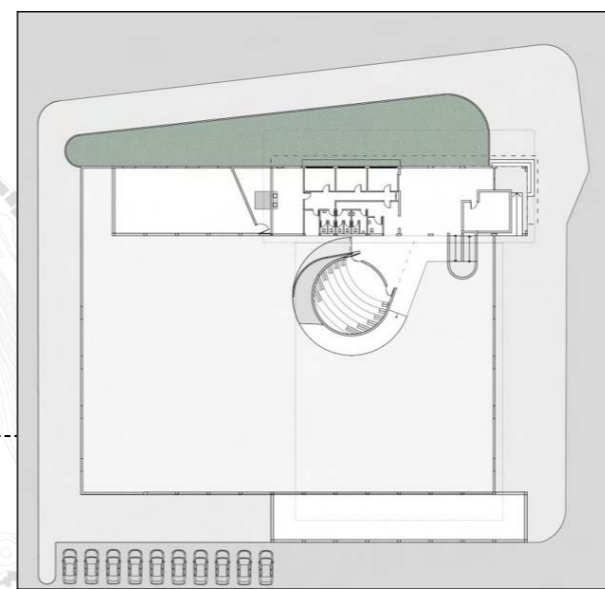


Figure 4.17.1: Fisheries Museum Plan



Figure 4.17.2: Fisheries Museum Perspective 1



Figure 4.17.3: Fisheries Museum Perspective 2



## CASE STUDY: URBAN FORM

Cultural Forum precinct 2004, Barcelona, Spain  
 GPS Location: 41°24'43.12"N; 2°13'26.47"E

Projects:

- Forum 2004 Congress centre by Herzog & de Meuron
- Plaza Forum 2004 and Photo-voltaic Pergola by Martinez Lapena-Torres
- Forum 2004 Bathing strip by Beth Gali
- Coastal park and amphitheater at Forum 2004 by Foreign Office Architects
- Torre Diagonal Zero Zero by Enric Massip-Bosch



Figure 4.18.1 (left): Aerial photograph of Barcelona showing Diagonal Avenue axis and the position of Plaza Forum 2004 at its point of termination.

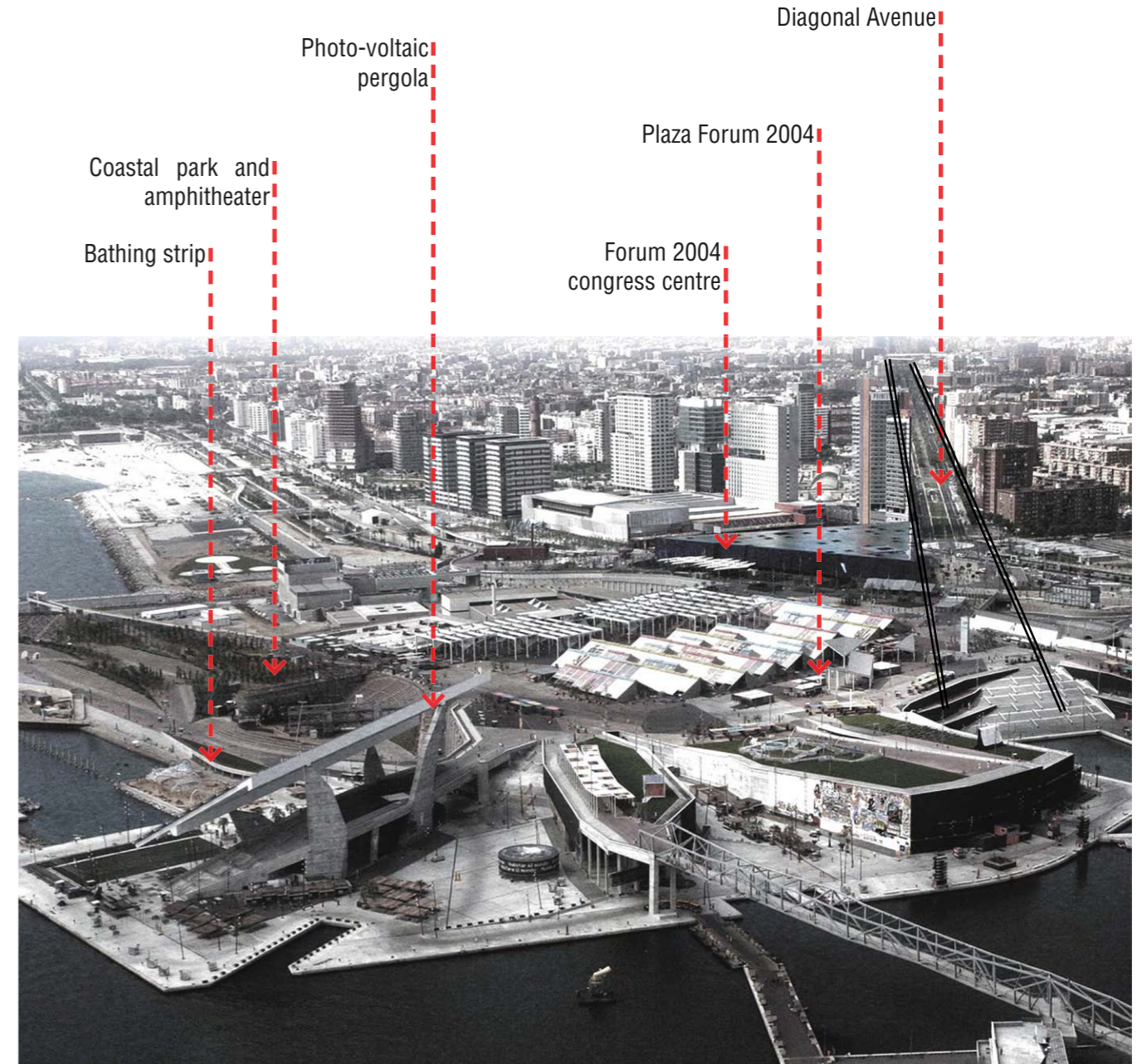


Figure 4.18.2 (right): Aerial perspective photograph of Plaza Forum 2004.



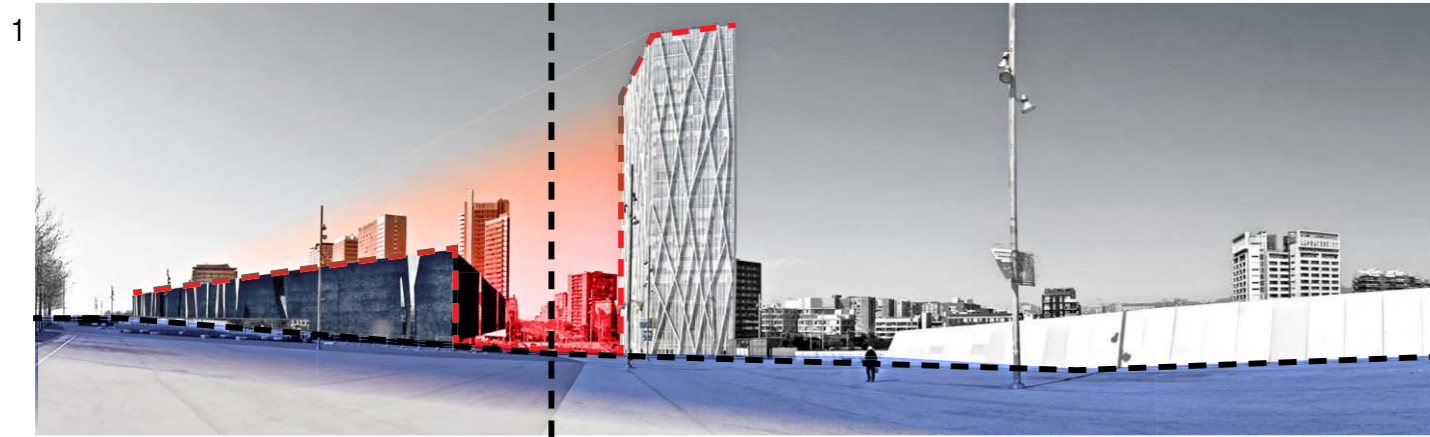


Figure 4.19.1 (left): View from Plaza looking back along Diagonal Avenue. Gateway framing axis is shown.



Figure 4.19.2 (left): View from Plaza looking towards the ocean through framed vista.



Figure 4.19.3 (left): View from Plaza, architectural form articulating the movement of space beyond itself.

As part of the World Cultural Forum 2004 the city of Barcelona commissioned the development of its northern waterfront as an extension to the 1992 Olympic waterfront development precinct further to its south (Fagerstrom, 2003: 34). Of primary interest in this dissertation is the site's location at the termination point for one of the city's primary axes; namely, Diagonal Avenue, shown in figure 4.18.1 and 4.18.2. The axis is framed by both the Forum 2004 Congress centre by Herzog & de Meuron and Torre Diagonal Zero Zero by Enric Massip-Bosch (figure 4.19.1) which together demarcate a gateway for the termination/culmination of an axis (as discussed in figure 4.10).

Beyond this gateway, however, the axis does not continue in a single straight line. Rather a series of dynamic forms (figures 4.19.1 & 4.19.2) are established which together host an events plane. The axis is periodically offset as it moves through this events plane to create a finger/branch network of viewing platforms.

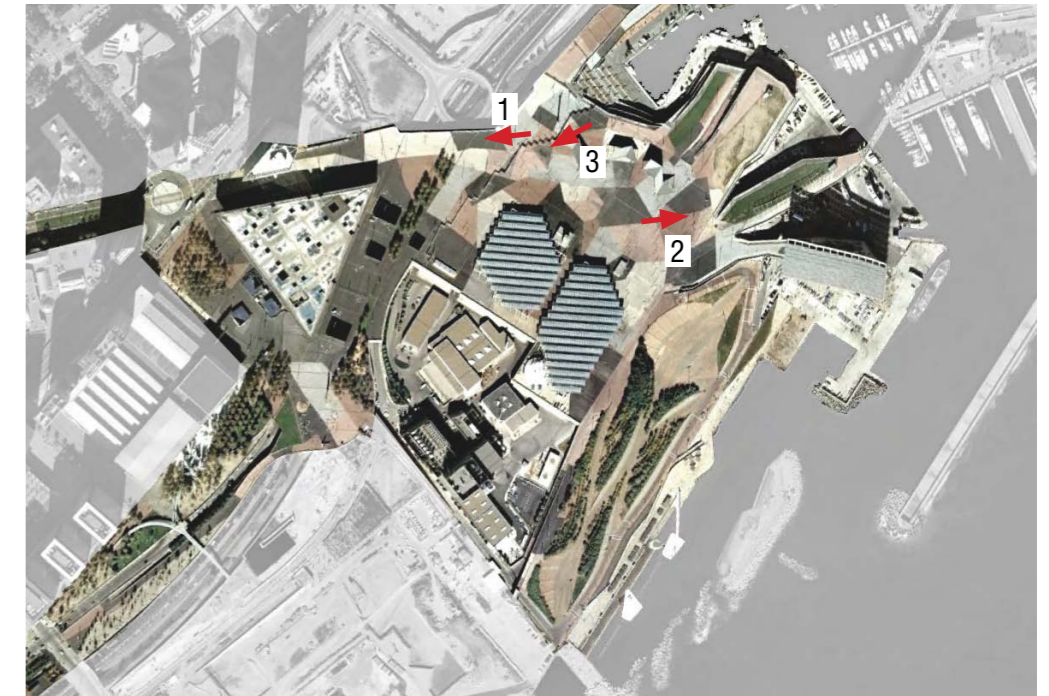


Figure 4.20 (Right): Aerial photo of the Forum 2004 precinct showing position of left views.





Figure 4.21.1 (far left): Exterior view of Forum 2004 Congress centre by Herzog & de Meuron

Figure 4.21.2 (immediate left): Interior view of Forum 2004 Congress centre by Herzog & de Meuron

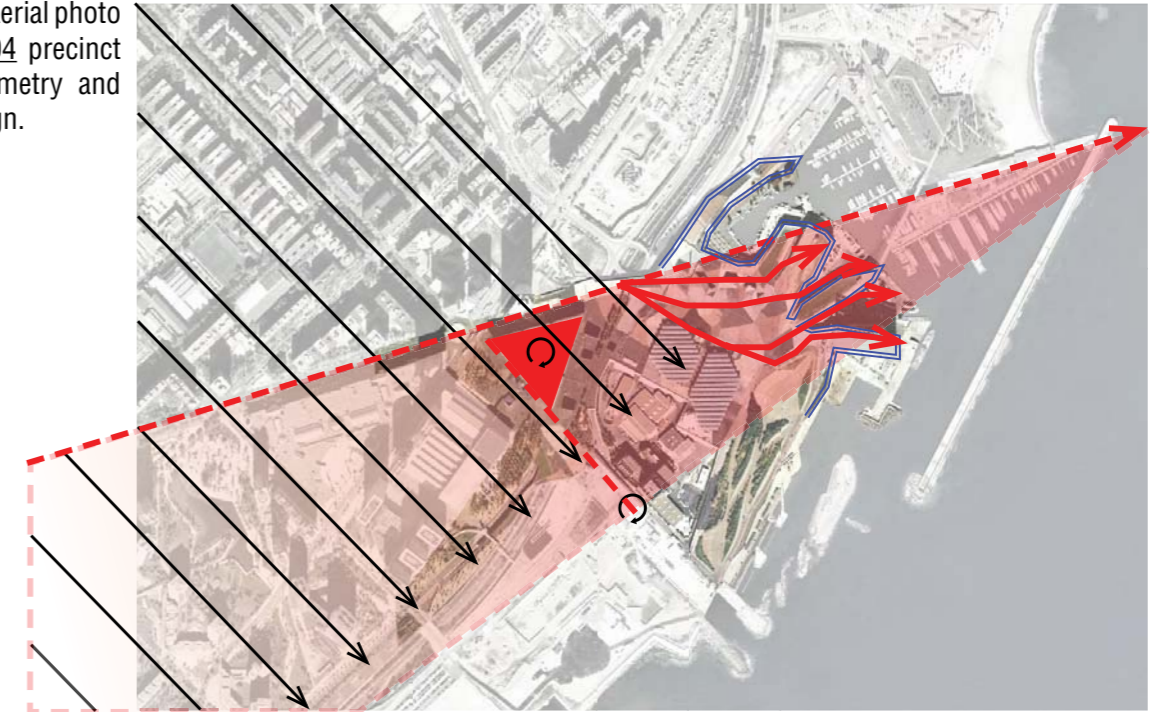


Figure 4.21.3 (left): Exterior view along Diagonal Avenue, Forum 2004 Congress centre by Herzog & de Meuron to the right.

These offsets can be read as design informants that are generated by alternative and opposing contextual geometries. The Forum 2004 Congress Centre building edge aligns with the city grid. The diagonal that cuts through the grid implies a force or a movement. The alignment of the building, as seen in figure 4.22, therefore, rotates 1° off the contextual grid orientation. The architects attribute this to an acknowledgement of the force and movement implied by the diagonal (Herzog & de Meuron, 2004).

Where two distinct geometries meet, one is likely to dominate. The grid is seen as repetitive and rhythmic while the diagonal is distinct, its force and movement therefore dominate. In the Plaza Forum 2004 this tension in urban form establishes an events plane with multiple referential points over and above the Diagonal Avenue. Fingers of vistas surround a landform of trace and distorted offset.

Figure 4.22 (Right): Aerial photo of the Forum 2004 precinct showing urban geometry and its influence on design.





## CHAPTER 5: BRIEF AND PROGRAM

P.	64	CRITERIA FOR SITE SELECTION
	65	LIST OF PROBLEMATIC ASPECTS
	67	TENURE AND POTENTIAL FUNDING
	67	INTERESTED AND AFFECTED PARTIES
	69	PROGRAM
	71	INHABITING THE BOUNDARY WALL
	72	CASE STUDY: PROGRAMMATIC FORM
	76	CASE STUDY: INDUSTRIAL FORM

### Criteria for site selection

In Chapter 2 the theoretical site of interest is identified as the urban port, which is host to action, event and the meeting of global and local form identities. Of the various functions along the Maputo Port strip of land, the Maputo Fisheries Port (MFP) is seen to have a diverse spectrum of economic role players: the site is host to both the commercial fisheries sector as well as the artisanal. Industrial fishing boats collect and process their harvest in the fisheries warehouse and the bulk of this harvest is exported. Local artisanal fishermen negotiate the sale of the harvest to agents on the ground who then, in turn, sell the fish to the general public either on the street outside the harbour in the afternoon or at one of the various markets within the city.

Within the framework of port redevelopment the MFP is selected as the site for the design investigation due to the fishing industries strong links to the general public. This has bearing on two aspects of the design:

1. An opportunity to make portions of the MFP public.
2. An opportunity to redevelop the site without replacing its port functions, thereby strengthening the marine identity of the area.



Figure 5.1: Informal street eatery outside the Maputo Fisheries Port on Marques de Pombal Street.

### List of Problematic Aspects

Tomas Nyambir (2002: 9-15) names potential opportunities for the improvement and development of the MFP. Although he wrote the text a decade ago it is still applicable today as the port remains largely unchanged. For this reason several of Nyambir's observations and recommendations form part of the design brief for the redevelopment of the MFP:

- The bay of Maputo is surrounded by the fishing villages of Matola, Catembe and Inhaca. With Maputo inner city as a main centre for distribution and sale of fish, the MFP is a primary location for fishermen from these villages to unload and sell their catch and to prepare boats for sail. While the majority of boats using the harbour are artisanal and concerned primarily with local distribution, the facilities provided are strongly geared towards the handling of frozen fish (as mass commercial produce). The harbour has minimal facilities catering towards local distribution - where the demand is high for fresh, iced produce - for these reasons the harbour is under utilized (Nyambir, 2002: 12). Furthermore the local distribution of fish into Maputo is given little platform within the harbour with the majority of fresh fish sales marginalised to just beyond the fence on the street's edge (figures 5.6 -5.8). This is read as a primary example of a functional segregation of scales of economy between the port and the historic core of the Baixa (discussed in the 'Outline of the Study' in chapter 1).
- Nyambir also observes: **Insufficient attention [is] paid by fishing port authorities to the importance of the urban quality surrounding the port and of how port-related activities can be transformed into new opportunities for leisure and recreation to open up the city to tourists.** (Nyambir, 2002: 13).





Figure 5.2: Image showing trawlers landed in the Maputo Fisheries Harbour.



Figure 5.3: Image showing dhows landed in the Maputo Fisheries Harbour with trawlers in the background.

## Tenure and Potential Funding

The Mozambican government maintains ownership of the MFP which is managed by the Ministry of Fisheries. The Ministry works closely with various financially independent organisations that fund developments within the fisheries sector. Some of these include the Fisheries Development Fund, the National Fisheries Research Institute and the National Small-scale Fisheries Development Institute. The primary benefactor of the project is likely to be the Small-scale Fisheries Development Institute due to its aim of improving facilities for small-scale artisanal fishermen.

## Interested and affected parties

The following agents influence and determine the brief and program for the design investigation:

**a. Port Management and Administration:** Presently the artisanal fishing sector of the MFP is poorly managed. There is little up to date information regarding the number of boats landed in the harbour as well as details on the type and volume of fish caught. This lack of information is potentially harmful to the long term sustainability of the fisheries sector - specifically the lack of regulation of threatened species and harvesting methods. By providing facilities for management and researchers in close proximity to a new fish processing facilities this poor management is intended to be alleviated. By improving communication across these lines, management gains access to the knowledge of local fishermen regarding potentially illegal foreign harvesting and other activities within the Mozambican waters.



Figure 5.4: Recent extension of fish sale area at the Maputo Municipal Market



Figure 5.5: Fish sale area at the Maputo Municipal Market

**b. Local Fishermen:** As already stated there is a need for the provision of processing facilities intended for local sale and consumption. These facilities include ice, temporary chill storage and adequate auction space for the sale of large quantities of fish. Artisanal fishermen mainly use one of two types of vessels, namely, small scale trawlers (figure 5.2) and dhows (figure 5.3). Those using dhows are involved in the transfer of more than just fish. After unloading their catch, they often stock up with supplies for their local villages. The trawlers are more exclusively involved with the handling of fish and therefore often dock over night.

**c. Fish traders:** The daily afternoon sale of fish from the harbour occupies the street fronting the MFP (figures 5.6 - 5.8) These traders are mostly women, some of whom are the relatives of fishermen whilst others act as independent agents. The street represents a space where trade is free and no rent is paid, however, these traders battle with a lack of adequate access to fresh water, a lack of ice and a lack of waste disposal. This lack of facilities coupled with the outdoor and exposed condition of street vending lead to frequent spoiling of portions of the catch that aren't sold promptly.

### Program

The program for the design investigation is an extension and accommodation of existing activities on the site as well as a provision for the problems identified in this chapter. The building can therefore be described as a **Fish Processing, Auction and Public Distribution Centre** and can be divided into zones according to this description. The intention is that these zones (processing, auction and distribution) relate to a common set of urban infrastructure as well to a common urban design spatial gesture but that they behave independently with a freedom of expansion, flow and movement around and between them.





Figure 5.6: Informal street eatery outside the Maputo Fisheries Port on Marques de Pombal Street.



Figure 5.7: Informal afternoon street fish market outside the Maputo Fisheries Port on Marques de Pombal Street. Scene 1



Figure 5.8: Informal afternoon street fish market outside the Maputo Fisheries Port on Marques de Pombal Street. Scene 2

### Inhabiting the boundary wall

In Chapter 4 (with reference to figure 4.3) the fence at the entrance to the MFP is largely criticised as an poor response to the surrounding urban form, it is further criticised for its exclusion of the general public from an event that it has a direct relation to. The reasons for the establishment of fences in a private economic sector cannot, however, be wholly ignored. These reasons include security and the exclusion of public from semi industrial, potentially hazardous activities.

While the intention of the design investigation is to make the harbour accessible to the general public, there is still a need for the restriction of certain areas. The idea is that portions of the design become a so called 'inhabitable wall'; serving as an infrastructure to trade and simultaneously functioning as a barrier of exclusion and security for restricted portions of the harbour.

**Today the wall is a machine for guarding land against occupation by the poor, the masses... The property line, originally a concept and abstract legal division designed to divide, enclose, and exclude, has materialised into a vertical wall whose surface has become an attractor for use, contamination, and the establishment of new economies. The wall has come to be taken for granted as an infrastructure that supports and serves a host of economies and small-scale industries. The wall itself can be used as the support for carpets, or security gates; in conjunction with a drain, it forms a thickened swath of space between the plot/compound and the street. This space is occupied by vulcanizers, petty traders, and can even accommodate sleeping in its width. The wall can also become a three-dimensional barrier, with a depth of 3 to 4 feet, that can be used as a marketable space.** (Koolhaas et. al., 2001: 663)



## CASE STUDY: PROGRAMMATIC FORM

Fish Market, Benicarló, Spain

GPS Location: 40°24'46.43"N; 0°25'53.48"E

Project Team :

Architects: Eduardo de Miguel & José María Urzelai

Developer: Valencian Regional Government,  
Infrastructure and Transport Ministry

Surveyor: David Navarro

Contractor: CYES

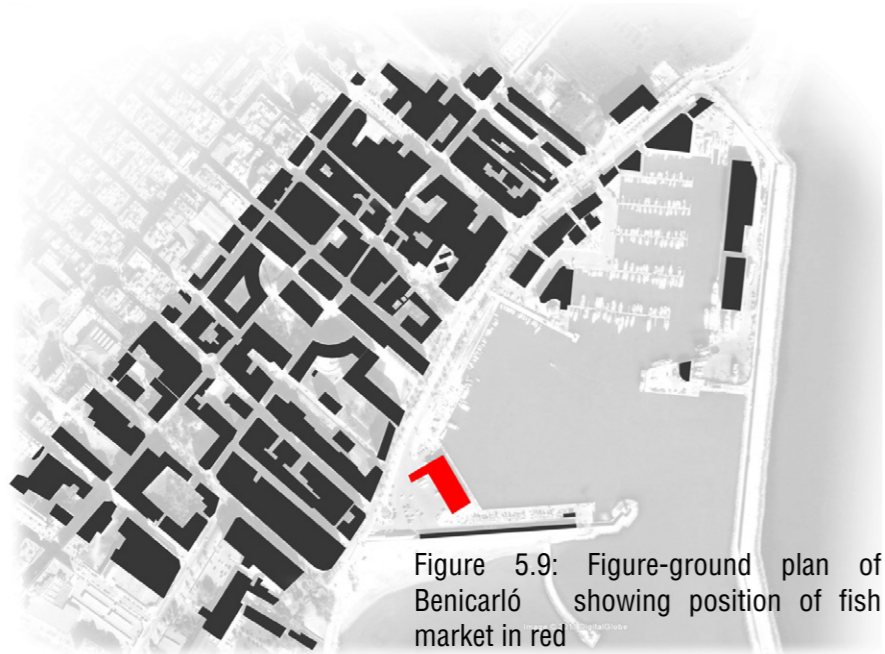


Figure 5.9: Figure-ground plan of Benicarló showing position of fish market in red



Figure 5.10 (left): Exterior view of collections side of building.



Figure 5.11 (left): View showing the internal and external skin of fish market building.

*The building was intended to be forceful, displaying itself as infrastructure and gathering around it all the land-based fishing-related activities.*  
(Miguel, 2007: 38)



Figure 5.12 (right): Exterior view of fish market from street.



Figure 5.13 (right): Exterior view of deliveries and unloading side of building.



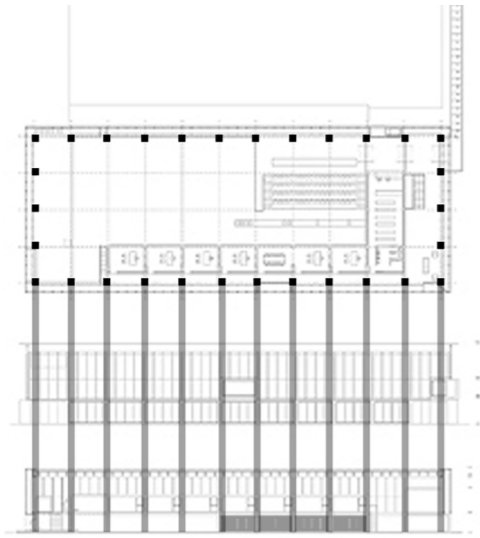


Figure 5.14: Structure diagram: columnar perimeter to reveal planar void in centre

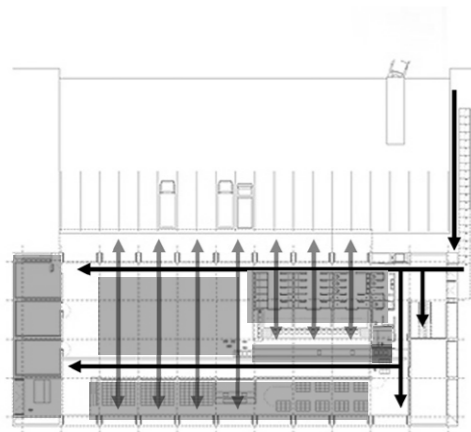


Figure 5.15: Circulation to use diagram



Figure 5.16: Repetitive to Unique diagram: the primary structure is revealed in repetitive rhythm on the building's exterior, this repetition is interrupted in the revelation of primary points of entry.



Figure 5.17: Additive to Subtractive diagram: additive form is separated from the ground plane in the expression of the extension of harbour functions freely through the building.



Figure 5.18: Unit to whole diagram



Figure 5.19: View across harbour



Figure 5.20: View up ramp to entrance

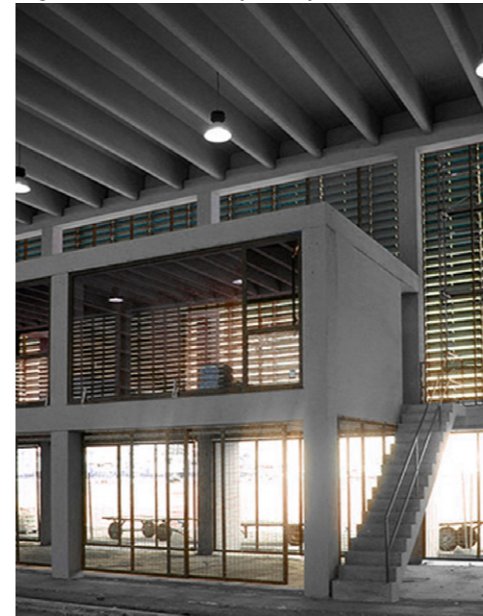


Figure 5.21: Internal view showing administration offices on upper level

### Design Principles

Responding to the competition brief to design a fish market for the rehabilitation of the Port of Benicarló, architects Miguel and Urzelai established the concept of consolidating all the functional requirements of the building within a single continuous skin of containment and to limit and condense the infrastructural requirements of the building to one of its halves on plan. Administrative functions are elevated so as to create as much freedom on the ground floor plane as possible. Through a permeability of ground floor edges the building serves as a simple well connected extension of fishery harbour functions. In response to the requirements of flexibility demanded in a harbour environment the building assumes a program of infrastructure supporting a simple and free ground floor plane.

1. Reinforced concrete ring beam
2. 400 mm reinforced concrete pillar
3. Reinforced concrete ribbed floor slab cast in situ
4. 100 x 40 mm hot dipped galvanized steel rectangular hollow section
5. 100 x 40 mm hot dipped galvanized steel double rectangular hollow section, welded
6. 120 x 180 x 15 mm steel anchoring plate
7. 300 x 15 mm steel continuous flange
8. M 18 - 20 stainless steel anchoring bolt
9. 12.7 x 76.2 x 4 mm wire mesh grating
10. 8 mm laminated safety glass, fixed in double neoprene gasket
11. 3 mm stainless steel tray screwed to mullions
12. 600 x 270 x 15 mm extruded ceramic stoneware

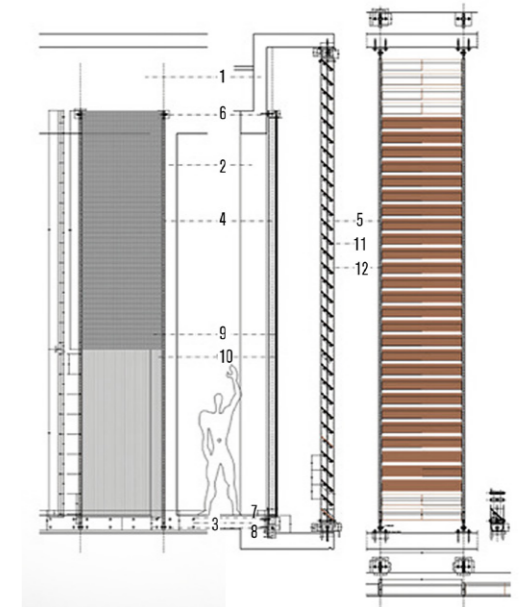


Figure 5.22: External screen detailing



## CASE STUDY: INDUSTRIAL FORM

TriBeCa Coffee Factory, Centurion, South Africa  
 GPS Location: 25°54'4.28"S 28° 9'34.08"E

Architect: Henk Bakker  
 Client: TriBeCa Coffee Company  
 Civil Engineer: Hanness Claassen Engineering &  
 EGC Consulting Engineers  
 Contractor: Fabucon Construction  
 Landscaping: Intu-it



Figure 5.23: Figure-ground plan of Highveld Business Park showing position of TriBeCa Coffee factory



Figure 5.24.1: East elevation



Figure 5.24.2: West elevation

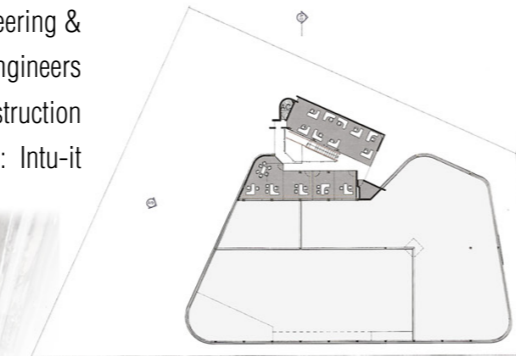


Figure 5.24.3: First floor plan

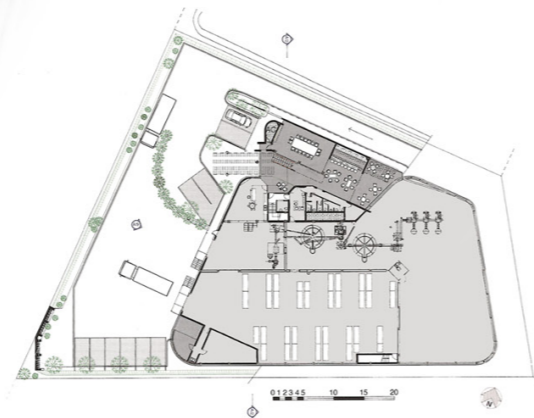


Figure 5.24.4: Ground floor plan



Figure 5.25: View looking southeast showing public entrance of the building

The TriBeCa Coffee Factory is located in the Highway Business Park, in the northern triangle formed by the crossing of the N1 and the Old Johannesburg Road. This context consists largely of industrial to semi-industrial buildings. The focus of this study is the mode in which the TriBeCa Coffee Factory reveals itself and connects to public and commercial functions while still retaining the restrictions, safety and privacy that industrial functions so often command.

From the outside the building appears as a solid form of steel sheeting that floats above either the ground or a red face-brick plinth. This continuum of steel sheeting then folds in on itself as though to form a backdrop and niche in which a sculptural concrete mass manifests. Architect, Henk Bakker, speaks of the merging of the steel surface with the concrete, and notes that these surfaces find their harmony when they are seen not to join. Concrete and steel come together in the inside corner; their seam is essentially one of void and shadow. (Bakker, 2011)





Figure 5.26: Image showing window between factory and laboratory



Figure 5.27: Steel sheeting adjacent to concrete wall with shadow gap



Figure 5.28: Delivery and collection area for factory



Figure 5.29: Steel sheeting forming shadow line above concrete

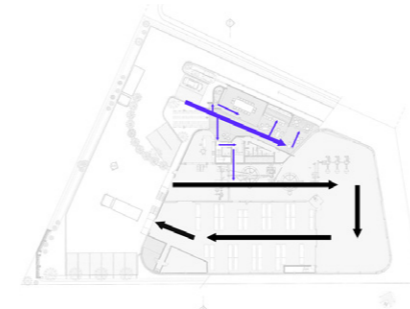


Figure 5.30.1: Circulation

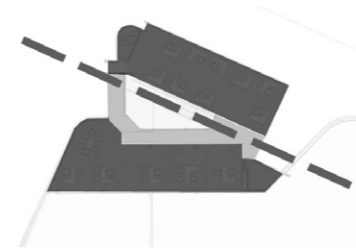


Figure 5.30.2: Additive to subtractive

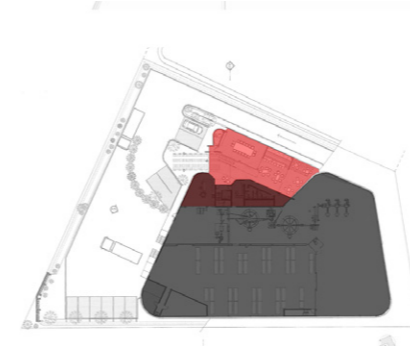


Figure 5.30.3: Unit to whole

The Design of the factory seeks to combine the industrial functions (roasting and testing of coffee beans) with those of human habitation (TriBeca head-office, boardroom and coffee bar) into the single facility. It is along this niche that this integration takes place. The space of public function (the concrete mass) undergoes a spatial subtractive process at its center (see additive to subtractive diagram) - the axis of this subtractive process is made up of the entrance, the double volume beyond the entrance, a portion of the coffee bar, and finally an outdoor seating area beyond the coffee bar

This axis intersects the two points at which steel finds concrete on the factory's exterior. This axis informs the experience of use in the building (see circulation to use diagram). Upon entry one is confronted with an expanse of seemingly continuous green glass spanning a double volume from ground to roof. It is with this glass entrance that steel is most obviously isolated from concrete via a most dramatic void. Upon entry into the double volume one notes public spaces to the front and left (boardroom, coffee bar and open plan offices) and fixed functions (offices, laboratory and ablutions) to the right. This primary axis, as a gesture towards the primary concept, then terminates with a view onto the steel envelope - and so celebrates the industrial of which it is a part.

In the interior, a brick wall and internal windows divide the offices and the factory. These two opposing function are staged onto each other via these internal glass windows - again the merging becomes void. The detail in figure 5.31.1 represents the design intention for this connection (although the detail as built differs). Here the pragmatic concerns of dirt in the factory are dealt with - the glazing is flush with the inside factory wall while a windowsill is placed on the office side of this wall.



Architect, Henk Bakker, speaks of the factory form as recollective of the coffee bean and considers the office portion is the figurative hilum of that bean: *...the scar at the in-curving side of the bean where the seed was attached to the pod.* (Bakker 2009: 58). The factory's form is simple; its shape is largely an offset of the shape of the site - this maximizing floor area. This form is then filleted to give the factory its look of continuum. Circulation is a simple linear U-formation; with delivery point at one end and distribution point at the other.

It is clear that the concept of the coffee bean (as highlighted by the architect) is one that abstracts itself in many ways and on many scales. Ultimately the success of this design lies in its ability to express this concept in the smallest of details as well as in its greater context. Despite its location (in an industrial office park) the building commands a strong orientation towards the Old Johannesburg Road. It proclaims its industrial function and communicates strongly its fold that reveal solid sculpture and the articulated void between.

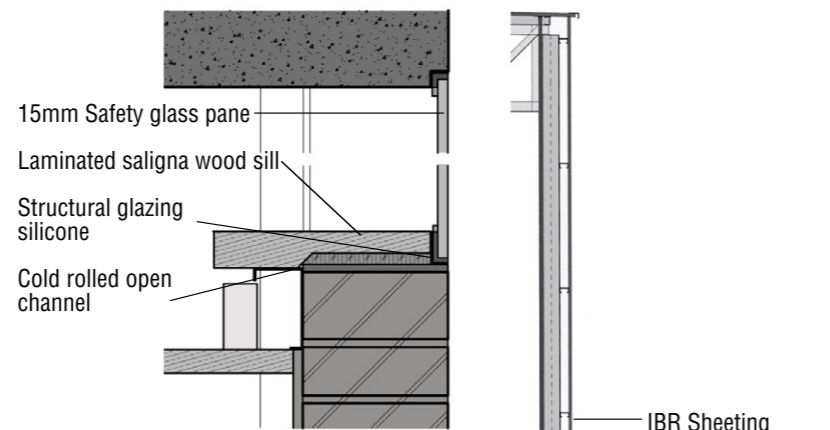


Figure 5.31.1: Detail of window between factory and offices

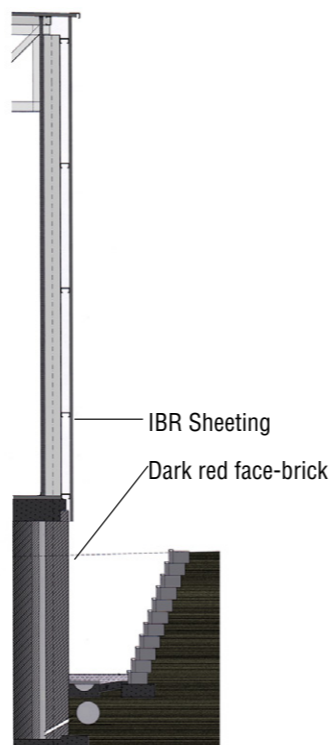


Figure 5.31.2: Detail of southern wall

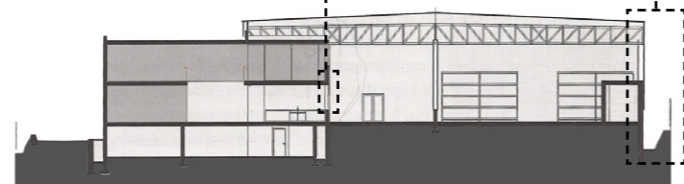


Figure 5.31.3: North - South Section through building

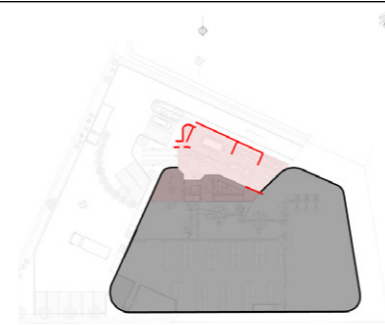


Figure 5.32.1: Repetitive to unique diagram



Figure 5.32.2: Geometry diagram



Figure 5.32.3: Symmetry and balance

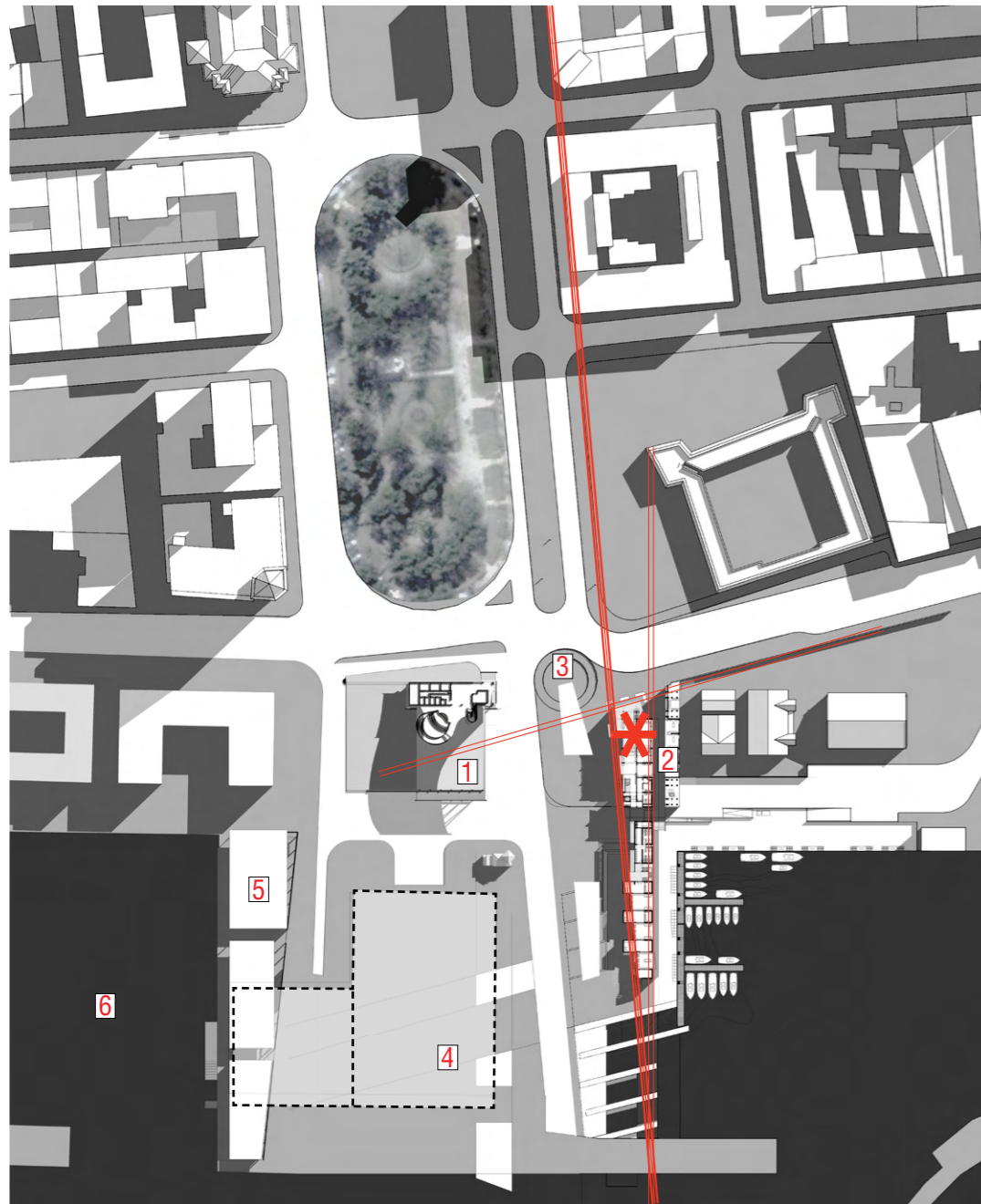
Figure 5.33: View of main entrance of TriBeCA Coffee Factory





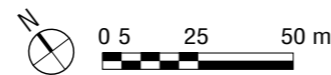
## CHAPTER 6: DESIGN DEVELOPMENT

P.	084	THE HARBOUR PRECINCT
	087	PORT AS THRESHOLD
	090	INFRASTRUCTURE IN RESPONSE TO THE TEMPORAL
	090	THE AXIS
	094	DESIGN SYNTHESIS AND DEVELOPMENT
	100	PLANS
	102	FORMAL PRINCIPLES ILLUSTRATED



- Legend
- Phase 1  
 1 Fishery museum  
 2 Fish processing and auction building  
 3 Harbour precinct entrance plaza
- Phase 2:  
 4 Commercial fisheries warehouse  
 5 Ferry terminal  
 6 Second harbour

Figure 6.1: Harbour precinct development plan and phasing

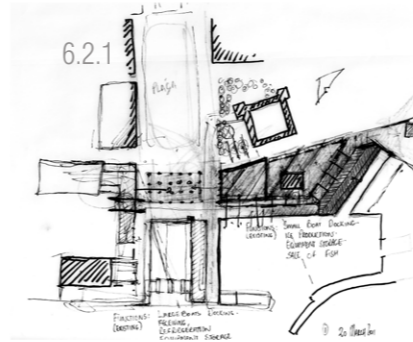


### The harbour precinct

The harbour precinct's development is phased in 2 stages.

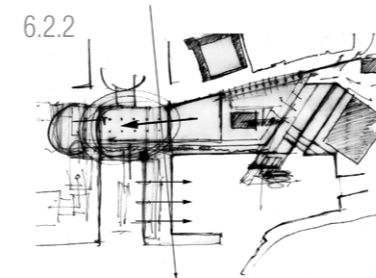
#### First Phase: Gateway to the harbour precinct from the city

The fisheries museum designed by Jose Forjaz together with the fish processing and auction building frame a gateway plaza to the harbour precinct. The establishment of this gateway plaza as well as the resolution of the fish processing and auction building forms the focus of the design investigation

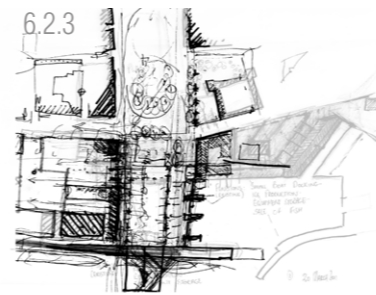


#### Second Phase: Ferry terminal as gateway to the city

In Chapter 5 of this dissertation the tendency for the relocation of global ports beyond the confines of the inner cities is discussed. The commercial fisheries warehouse currently handles international imports and exports. As the demand for inner city harbour land increases it is likely that this facility will also be relocated. In line with the Cultural forum 2004 development (discussed in chapter 5) the proposal is that this site be developed as a cultural events precinct and entry point to the city, framed and supported by a ferry terminal on its western edge. The design of this ferry terminal forms the basis of the design investigation of a colleague of mine, Catherine Deacon, and was completed in November 2011.



Owing to the proximity of the fish auction building as well as the proximity of the ferry terminal the precinct will accommodate on a daily basis a large amount of informal traders, recreational areas similar to those found at Catembe ferry terminal on the other side of Maputo Bay as well as viewing decks. It is, however, also suggested that such a plaza be designed to accommodate annual city events such as the Maputo/ Brazil Carnival and the annual swim across the bay .





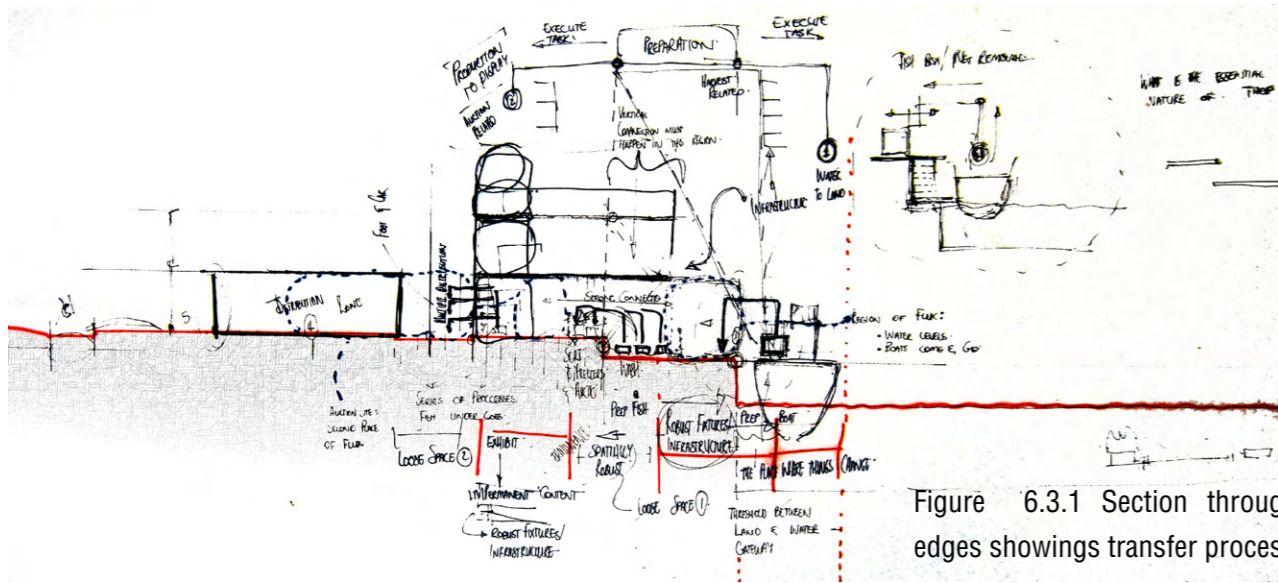


Figure 6.3.1 Section through harbour edges showings transfer process

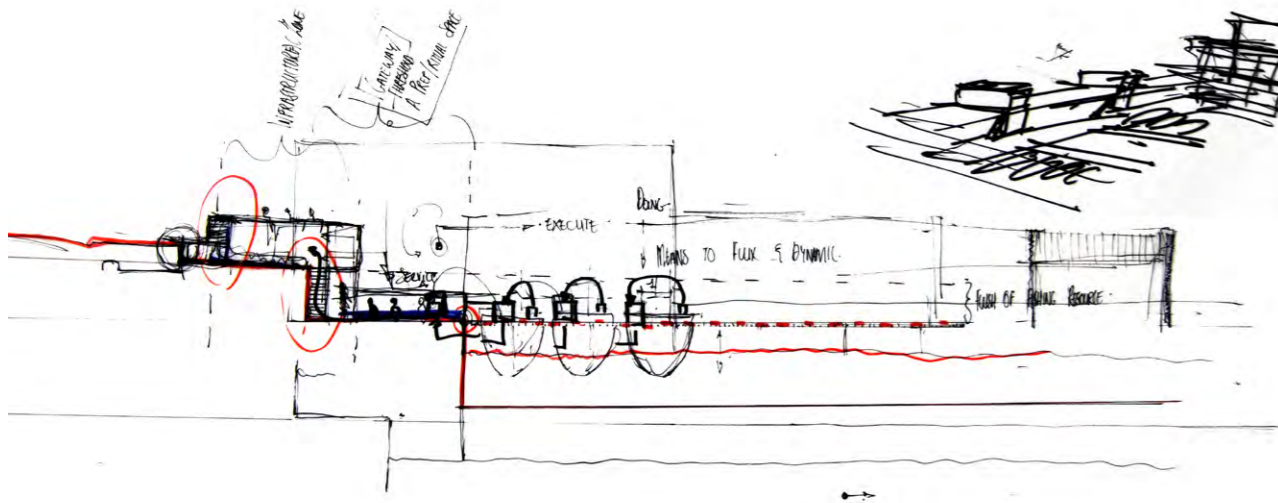
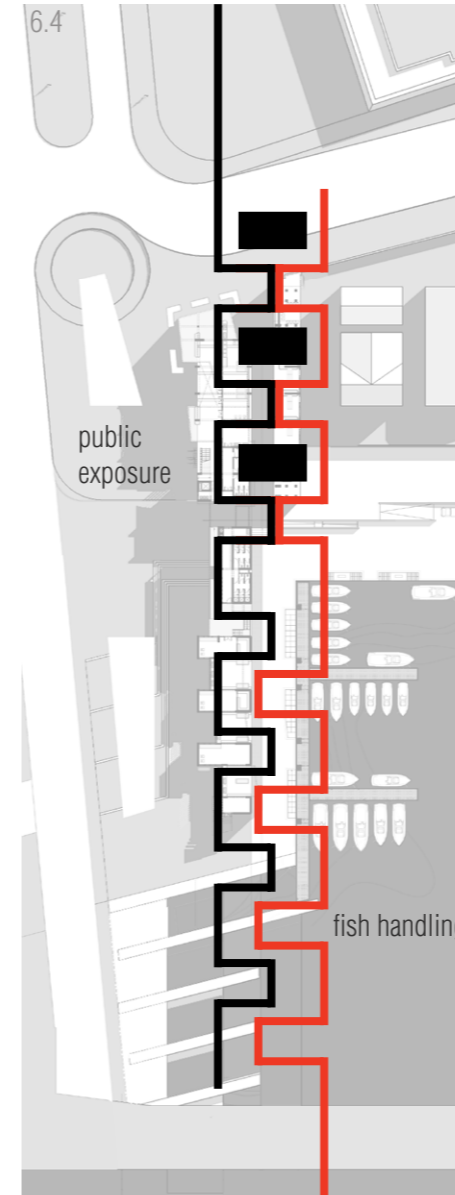


Figure 6.3.2 Section through harbour edges showings transfer process

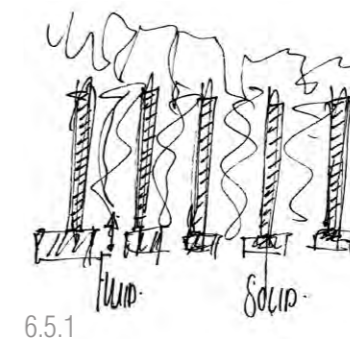


### Architectural Form

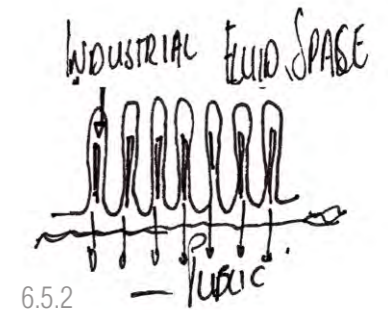
#### a. Port as threshold

In chapter 3 the port is identified as a site of migration and mediation of resources and people. The port therefore becomes a highly temporal site, which is required to absorb expanding and contracting volumes of people and products. Ports act as a threshold and gateway to the city. The transfer of goods across this threshold is analyzed in figures 6.3.1 and 6.3.2 in which containers of fish are transferred from boats to a landing site, this fish is then unpacked, cleaned, weighed and packaged for either direct sale or distribution.

In line with the intension of establishing the harbour as an accessible platform to the general public, the processing of fish comes into contact with the public in 2 ways. The first is a scenario where the handling of fish is made visible to the public but no interactive exchange takes place. The second is the act of sale or exchange. Figures 6.4 - 6.5.2 demonstrate the diagrammatic concepts that underlie these two scenarios.



6.5.1



6.5.2

6.6

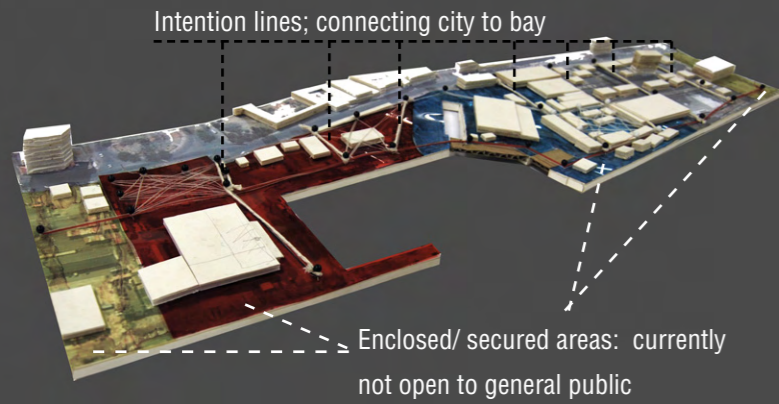
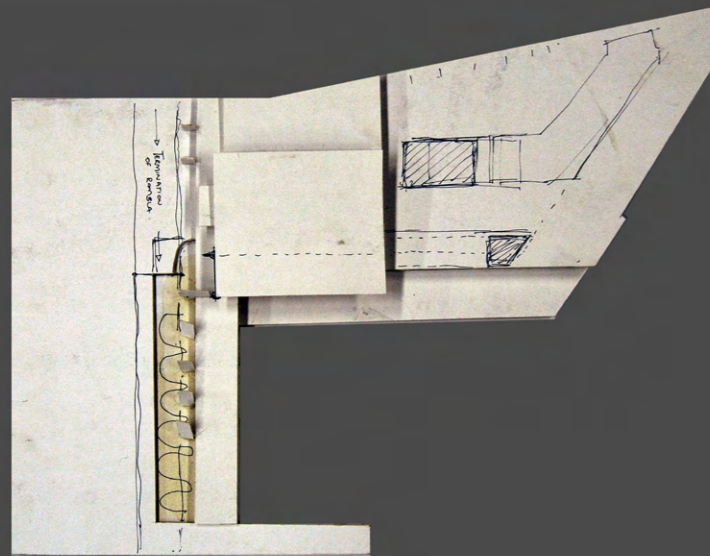


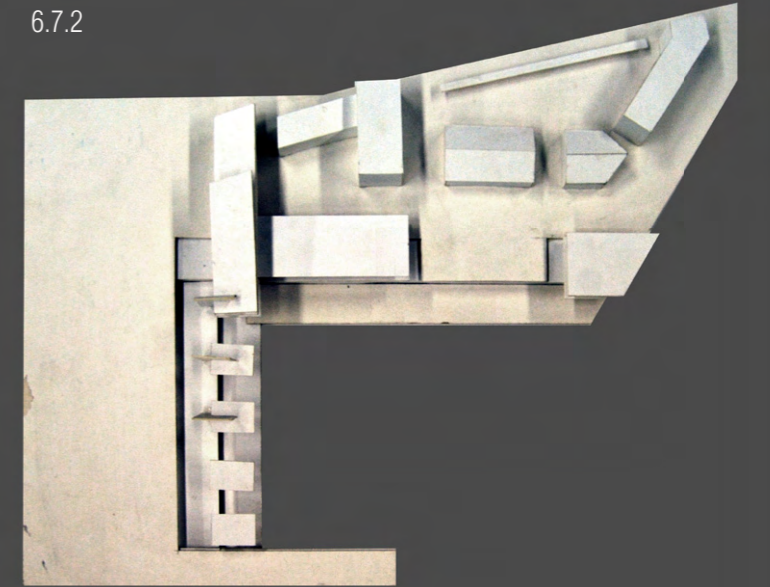
Figure 6.6: Design development series: A study of the harbour as barrier between the city and the bay as well as potential bridging areas

6.7.1

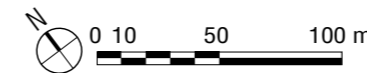
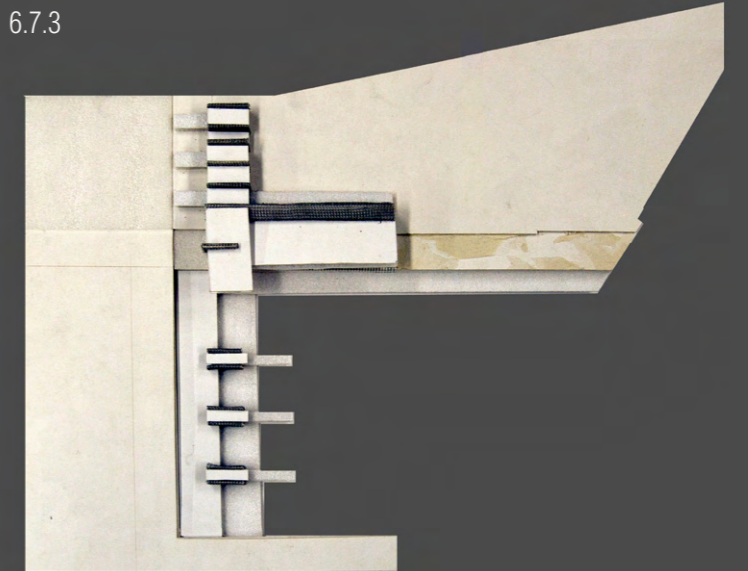


Figures 6.7.1 - 6.7.3: Design development series. A study of the harbour edge condition of permeability and its potential influence on form,

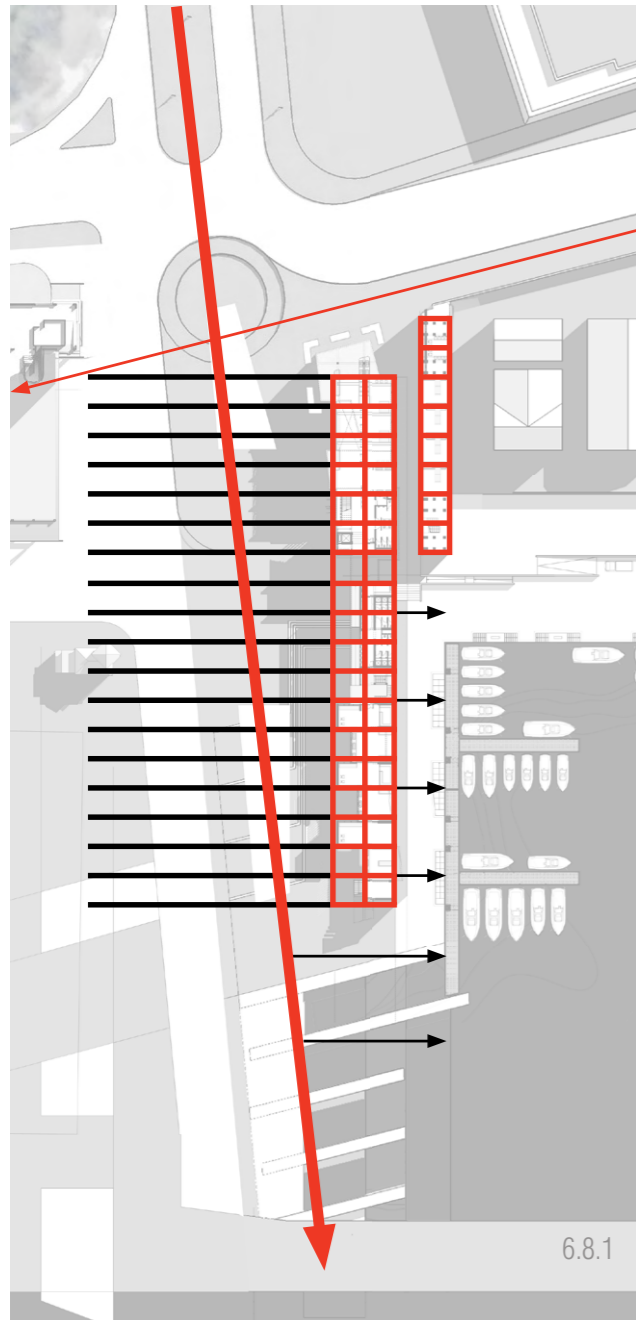
6.7.2



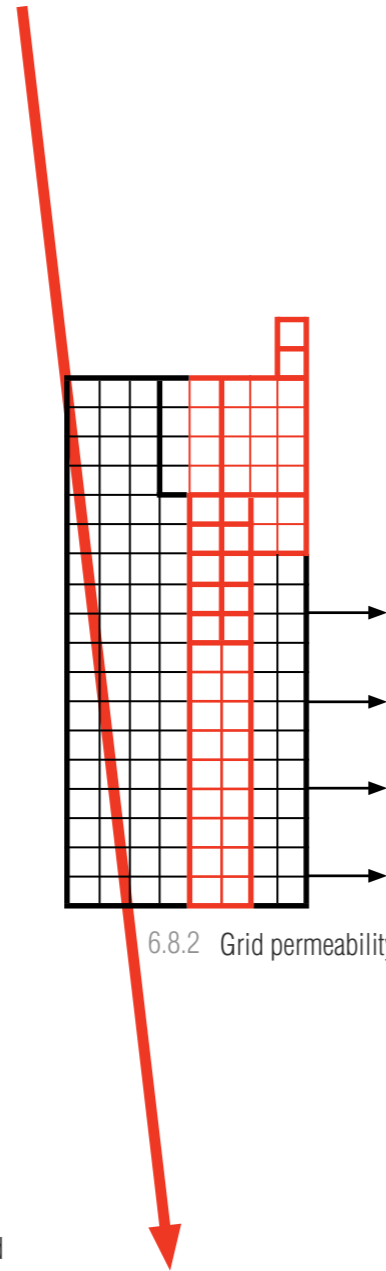
6.7.3



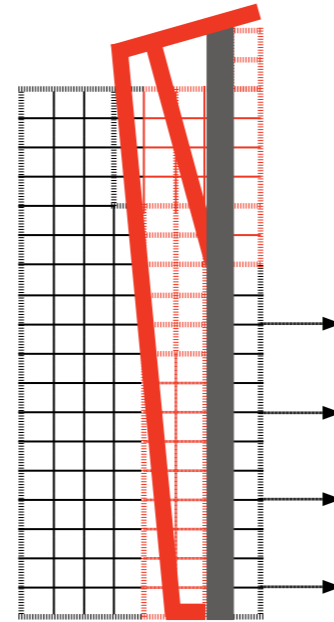




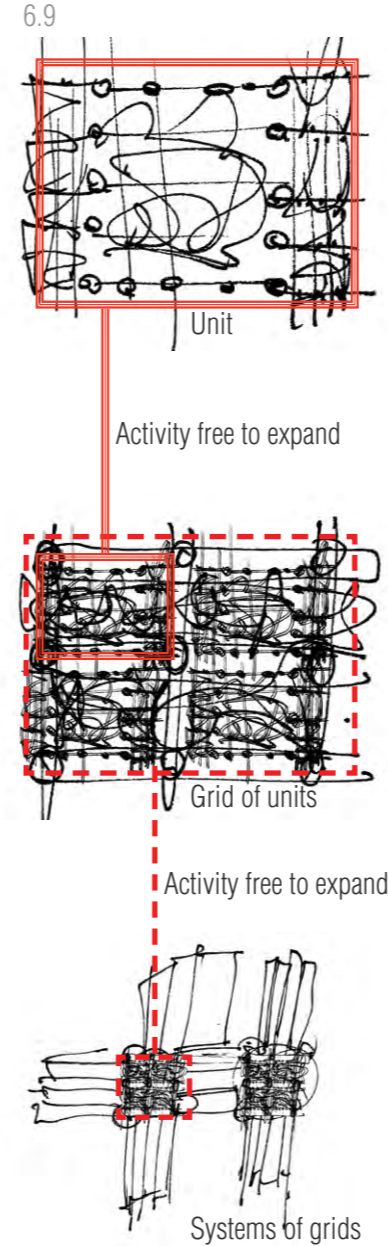
6.8.1 The grid



6.8.2 Grid permeability



6.8.3 Axial grid distortion



6.9

**b. Infrastructure in response to the temporal**

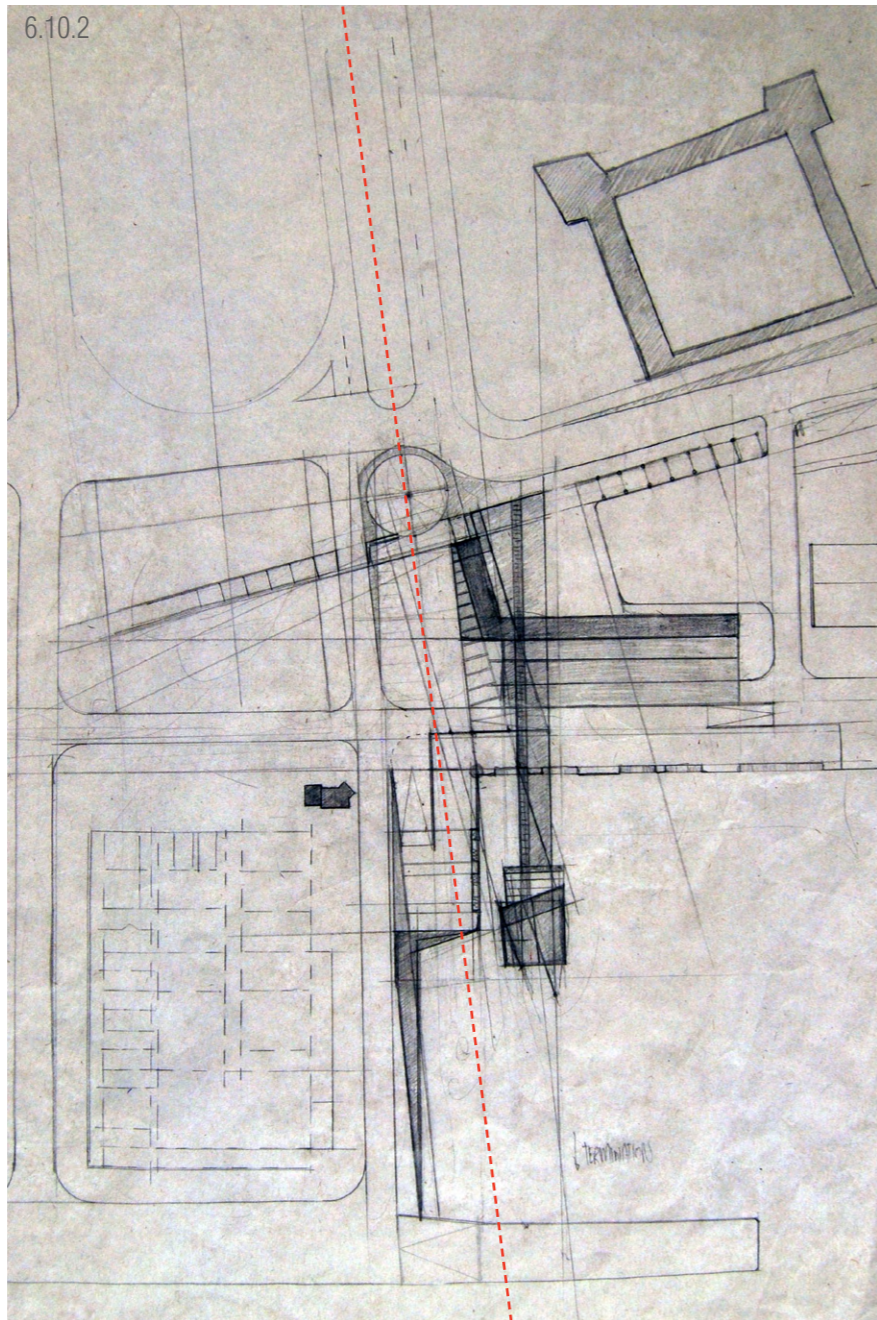
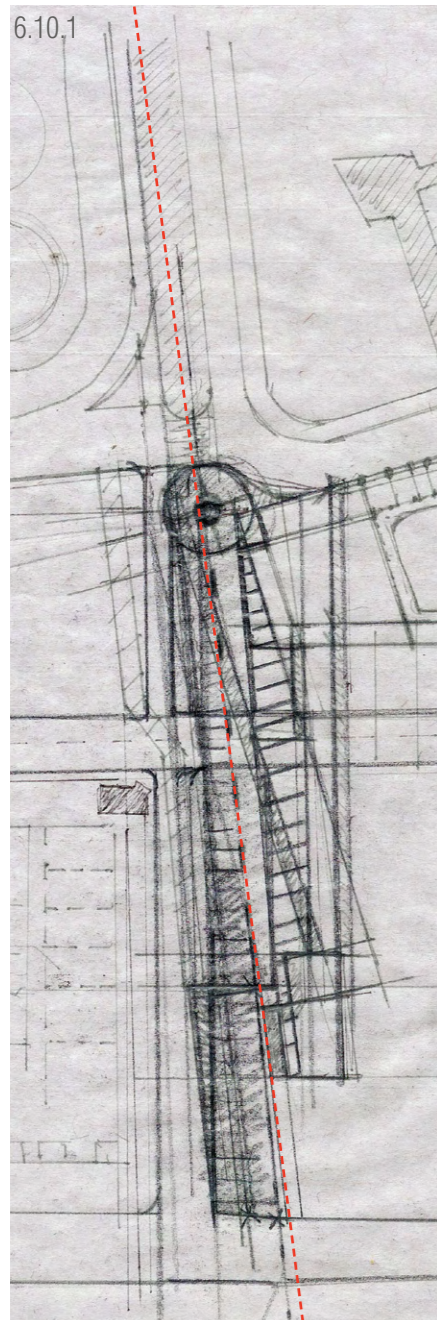
A requirement in port planning is the accommodation of fluctuations in traffic (Jonkhoff & Manshanden, 2011: 49). Spatial boundaries therefore continuously shift as transfer activities occupy less or more space.

In the design development process the acknowledgement of this requirement of spatial temporality takes the conceptual form of the grid. The bidirectional square grid is a non-hierarchical system that subdivides its surface into equal accessible units (Ching, 2007: 72). Where divisions are permeable the activities occurring in any given unit easily expand and fill into its adjacent units as demand requires. In other words the degree to which grid line divisions are articulated informs the degree to which activities within that region are free to spatially expand and contract (demonstrated in figures 6.8.2 and 6.9). The infrastructure referred to in the previous paragraph is understood as the services and utilities required for the operation of the fisheries harbour. These include access to and disposal of water, waste management, mooring areas in the harbour itself, areas geared to the handling, washing and packing of fish and access to electricity amongst others. The grid as described above serves as the organisational mechanism for the resolution of these and other infrastructure requirements in the harbour.

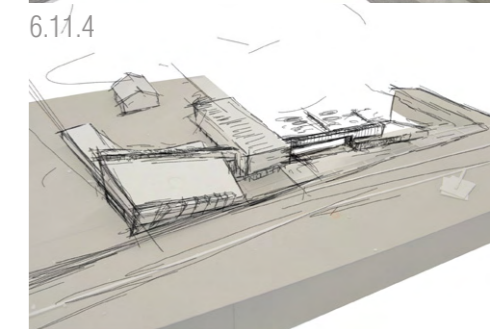
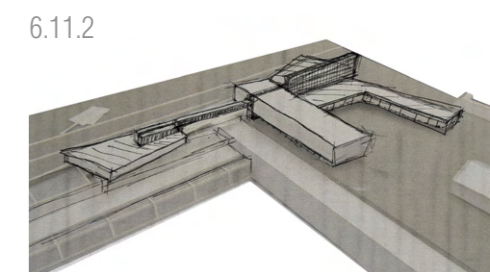
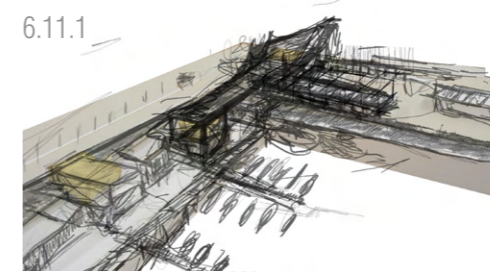
**c. The axis**

As demonstrated in figure 6.8.1 the geometry of this grid (which is aligned the harbour) is intersected at an angle of 7° by the axis of Avenida (Avenue) Samora Machel, discussed in detail in Chapter 5. In composition in art the diagonal is cited as a tool to introduce movement or tension to a painting:





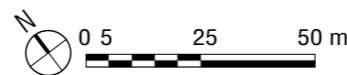
Figures 6.11.1 - 6.11.4:  
Design development: Contextual  
geometries explored in 3 dimension



**The axis (continued)**

*This [rectangular] shape provides consistent vertical and horizontal edges to which lines within the composition can be related. Vertical and horizontal lines, then, repeat a direction that is already present and reinforce a feeling of stability in the work. By contrast, diagonal lines violate this stability and create a sense of tension or movement. (Fichner-Rathus, 2007: 30)*

Figures 6.10.1 & 6.10.2:  
Design development: Contextual  
geometries explored on plan



When two grid systems converge the one becomes a reference point for the other, the perception of which creates the sense of a dynamic tension. In the design process the direction of the urban axis is brought into dialog with the grid and orientation of the harbour. This grid is referential, the axial distortion of this grid communicates and celebrates the force, movement or thrust with which this axis meets the vista of the ocean. Figures 6.10.1- 6.20 demonstrate explorations in the design process in the resolution of this distortion.



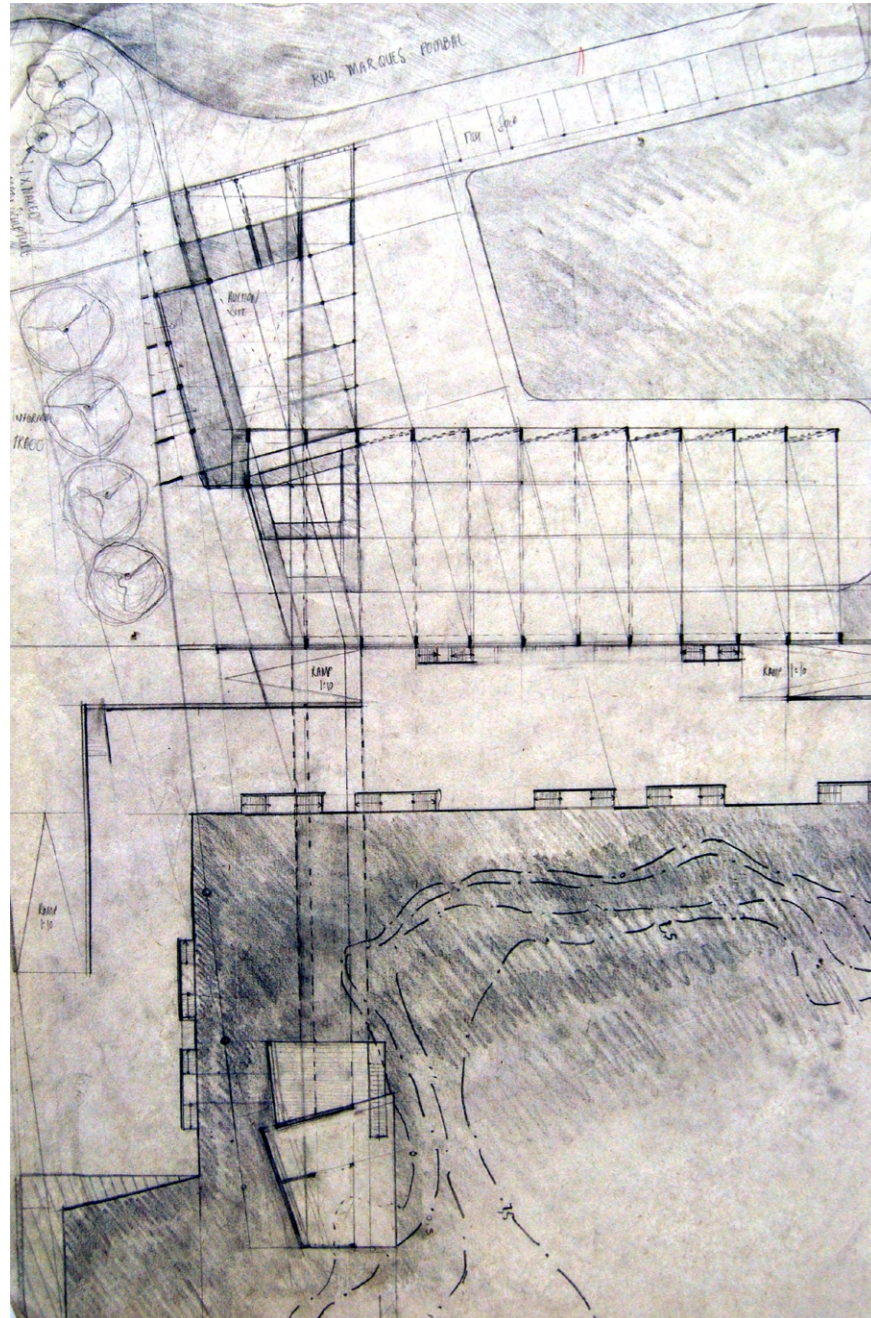
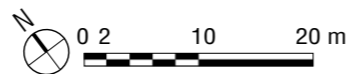
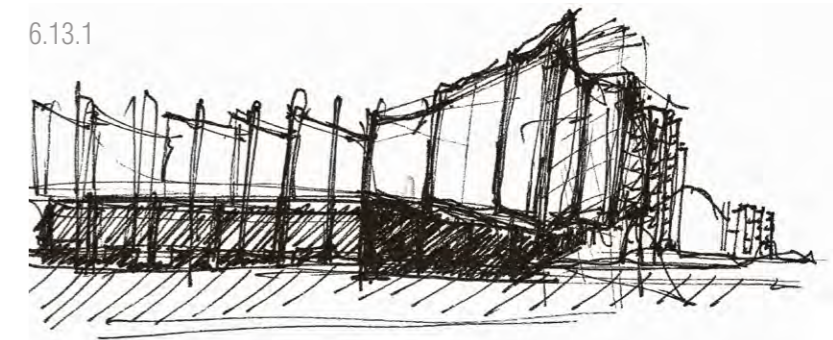


Figure 6.12: Design development: Contextual geometries explored on plan



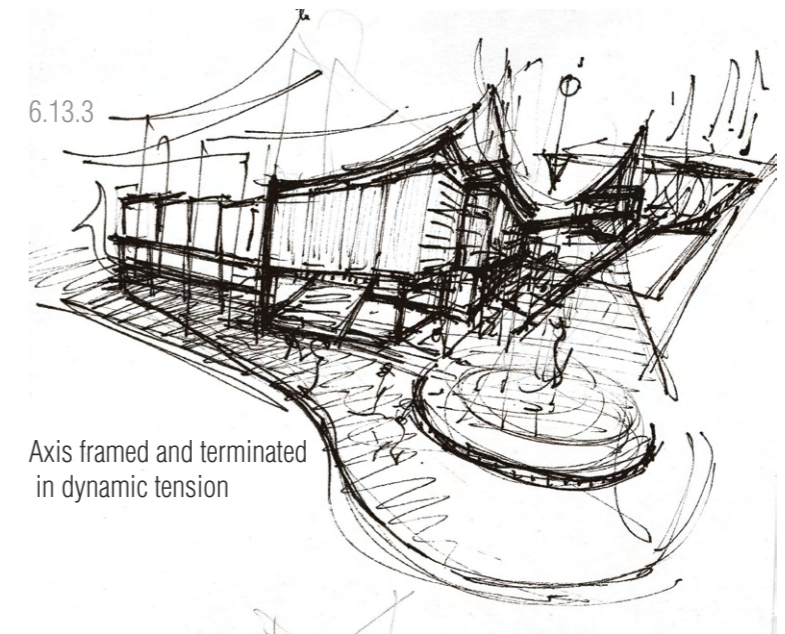
Figures 6.13.1 - 6.13.3:  
Design development: Contextual geometries explored in 3 dimension



6.13.1  
Rhythmic modifications

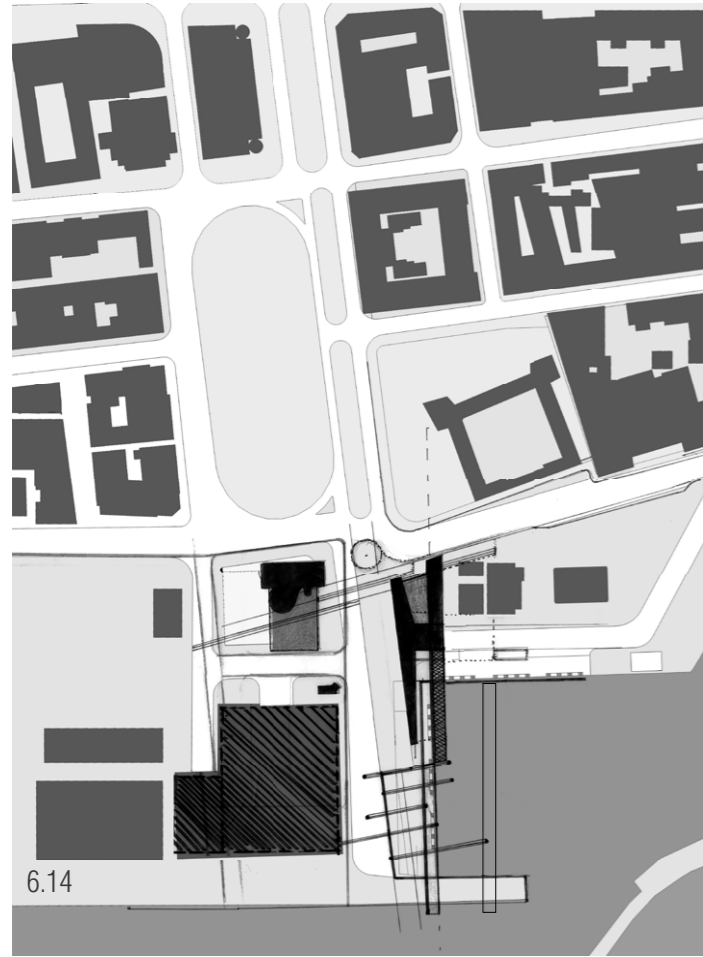


6.13.2  
Screen detached from main structure



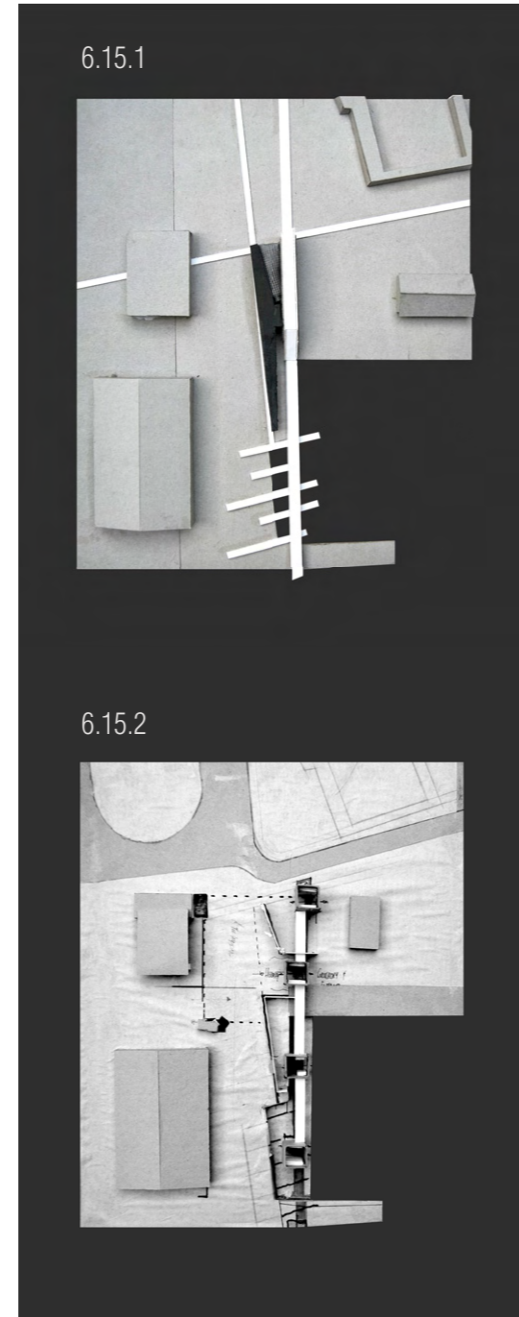
6.13.3  
Axis framed and terminated  
in dynamic tension





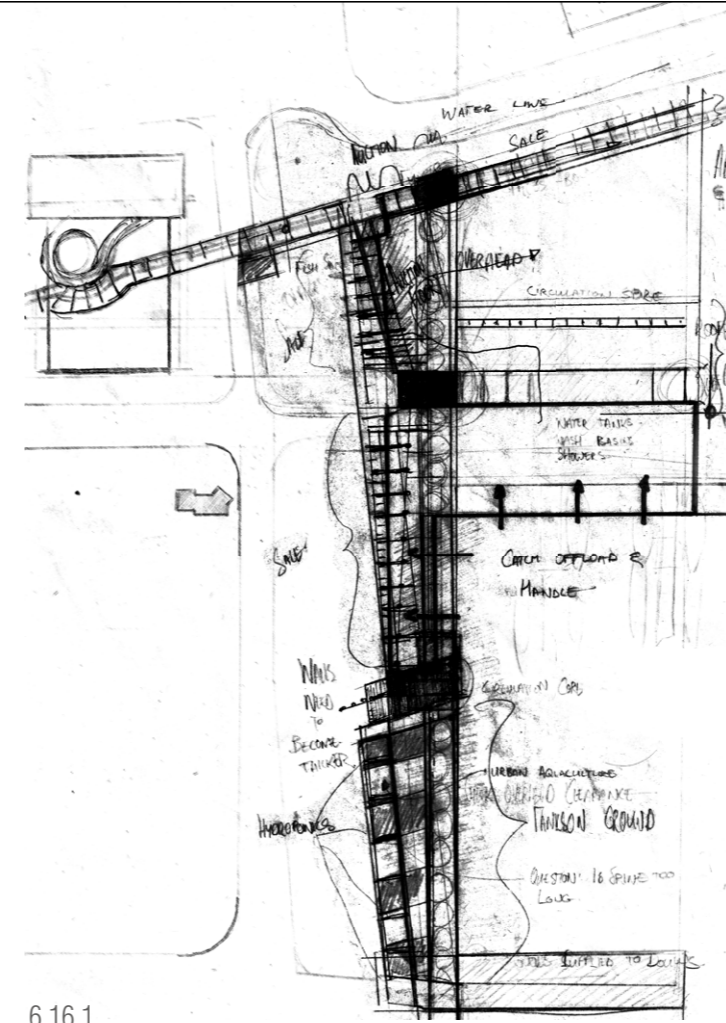
6.14

Figure 6.14: Design development: Form in context plan  
 Figure 6.15.1: Design development: Form in context model  
 Figure 6.15.2: Design development: Form in context; rectilinear structure framed by a series of diagonal aprons.



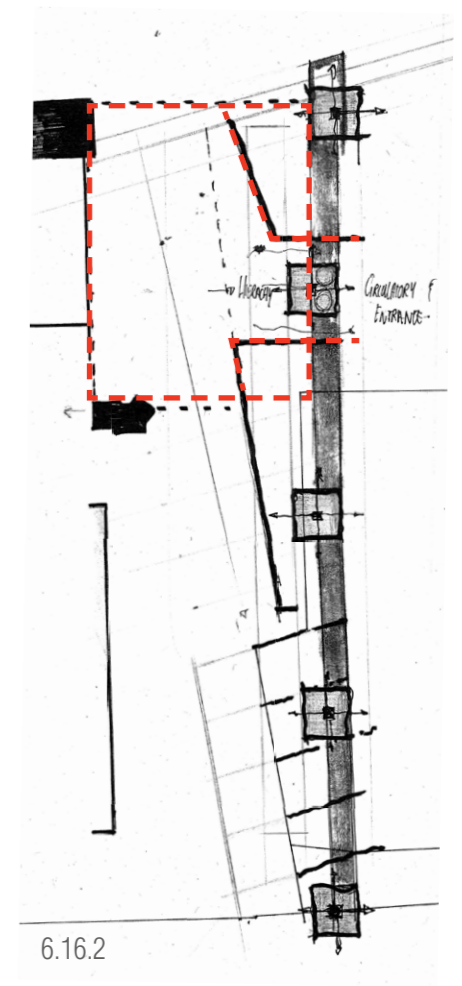
6.15.1

6.15.2



6.16.1

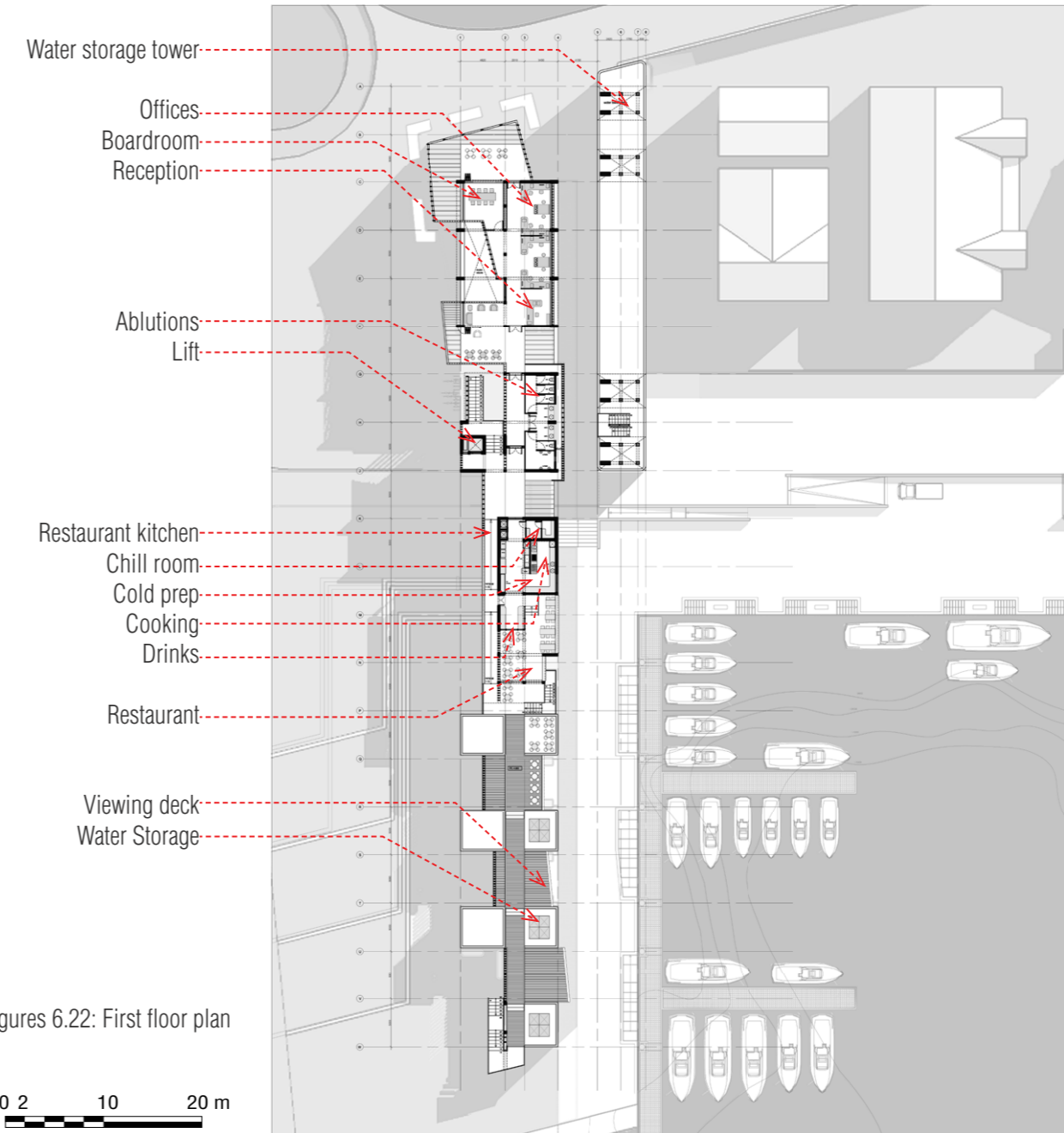
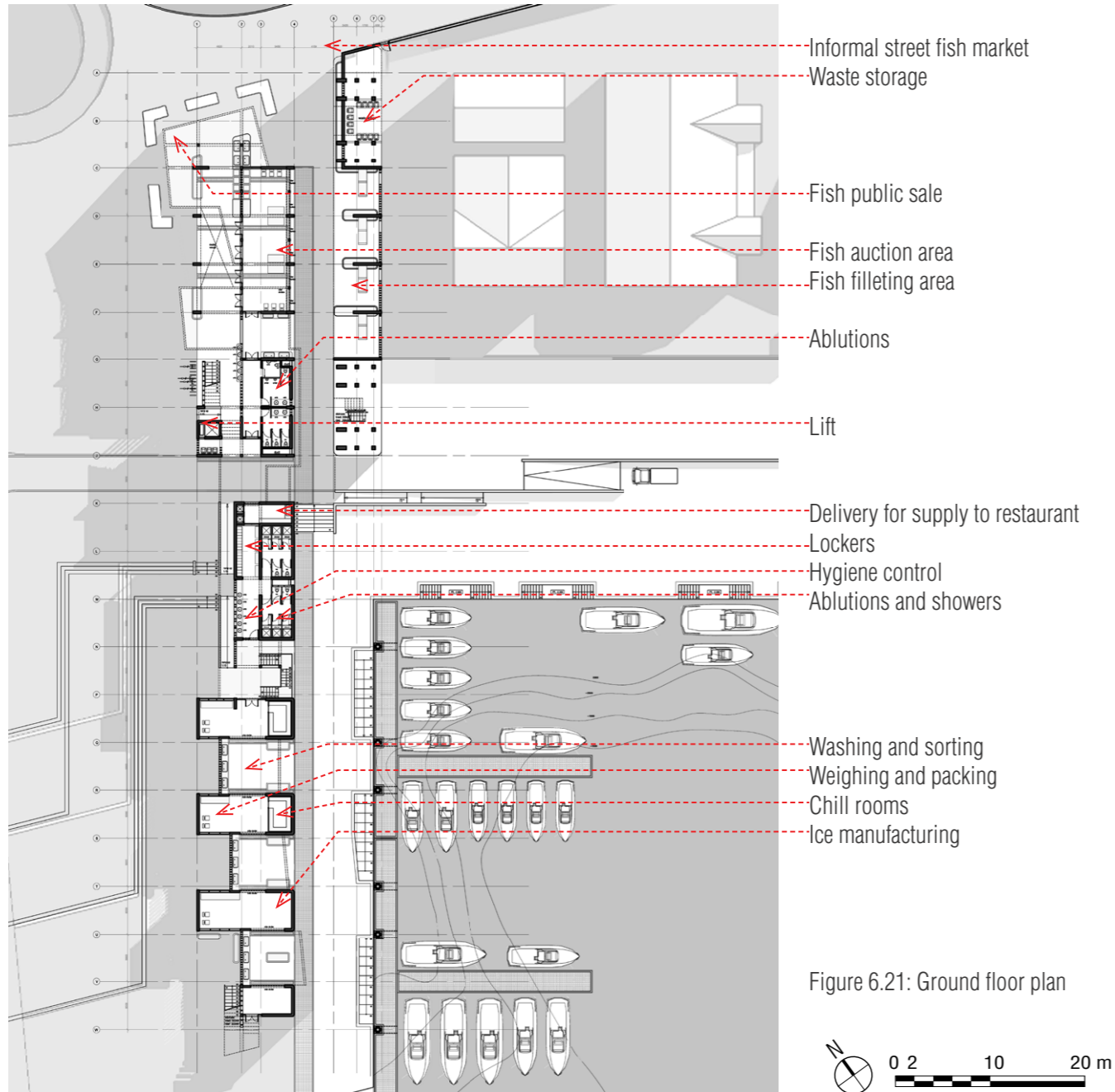
Figure 6.16.1 - 6.16.2: Design development: Contextual geometries explored on plan to establish the nature of the relationship between the experiential diagonal axis and the utility based rectilinear form.



6.16.2









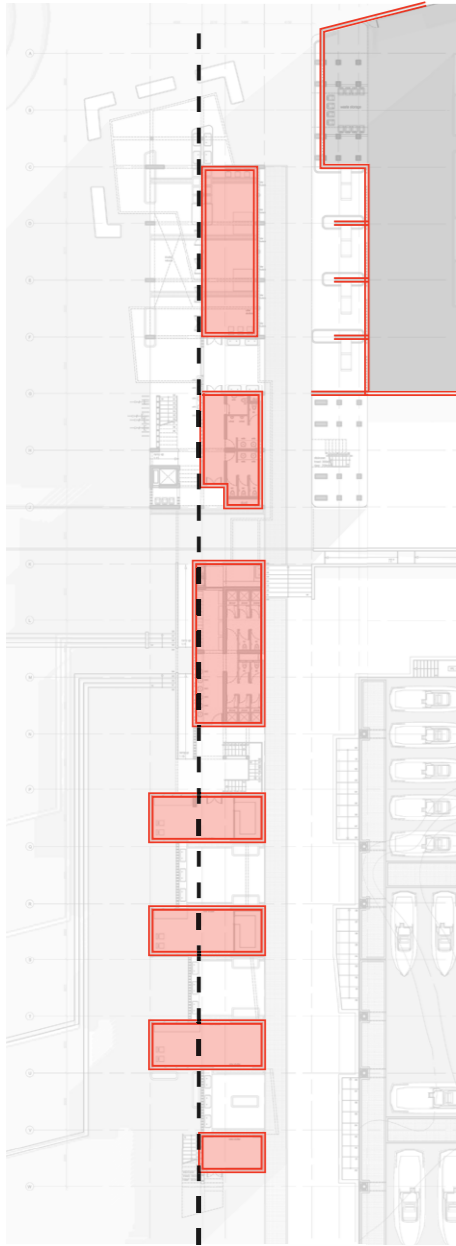


Figure 6.23.1: Inside/outside: Lockable zones

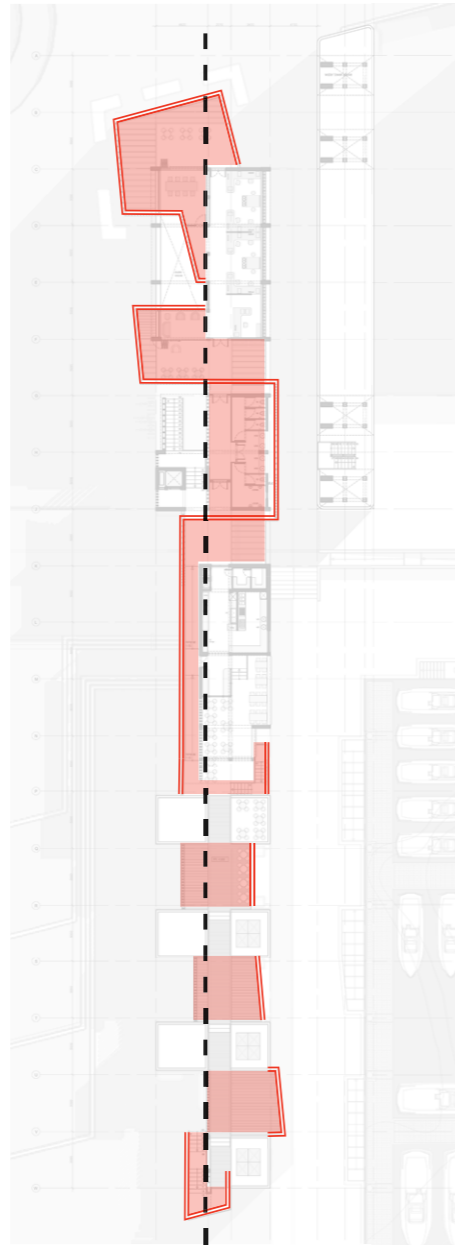


Figure 6.23.2: Main building as datum line to screen

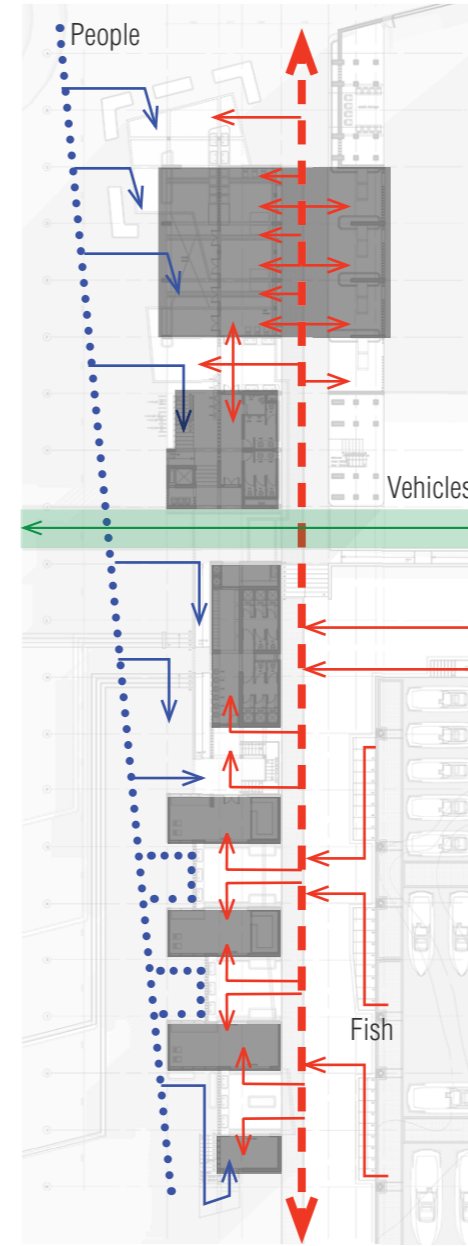


Figure 6.23.3: Circulation to use

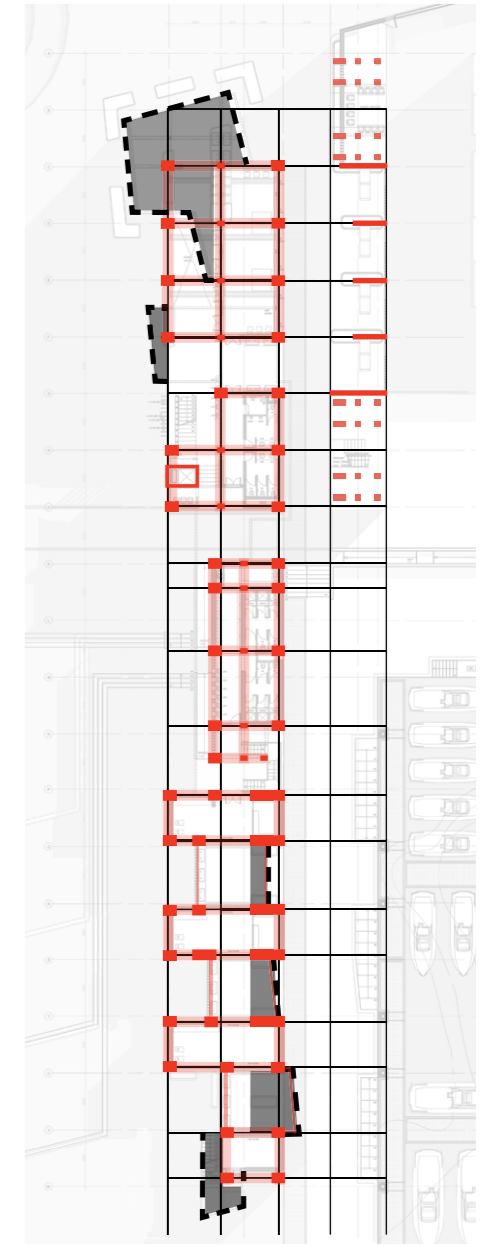


Figure 6.23.4: Rhythm: Repetitive to unique

## CHAPTER 7: TECHNICAL DEVELOPMENT

P.	106	PRINCIPLES
	108	FISH HANDLING AND DISTRIBUTION PROCESSES
	112	URBAN TERRACE
	114	UPPER LEVEL ACCOMMODATION
	115	PRIMARY STRUCTURE
	118	SECONDARY STRUCTURE
	122	WATER TREATMENT





Figure 7.1: Floor being sprayed



Figure 7.2: Fish handling

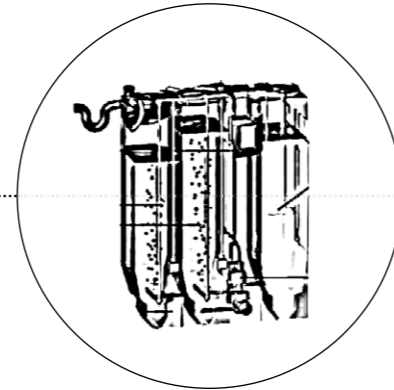


Figure 7.3: Water filtration

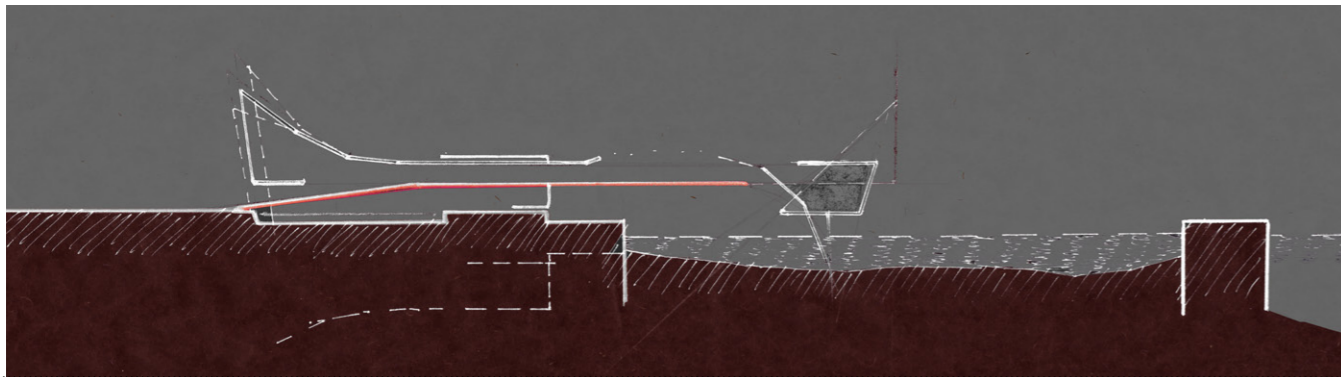


Figure 7.4: Early design sketch exploring tectonic concept

## Principles

The utility and functional requirements in the technical resolution of a fish handling and distribution facility generally include the corrosion resistance of surfaces and components as well as their ability to be easily cleaned. While robustness and durability of materials and details is therefore central to the technical resolution of the design, it is in the dialog between the **tectonic** and the **stereotomic** that the building becomes a work of architecture.

In his essay, *Towards a Critical Regionalism*, Kenneth Frampton places emphasis on the idea that the technical must not be confused with the tectonic. Where the 'technical' suggests the resolution of a structure or a piece of infrastructure the 'tectonic' suggests a relational delineation of the materials and other technical components in a design (Frampton, 1983: 27).

In the first part of this chapter the fish handling process, its utilities and resolution on plan are discussed. The second part of this chapter discusses the tectonic resolution of the design. Finally, due to the high water demand of the facility, in the third part the supply and treatment of water is discussed.

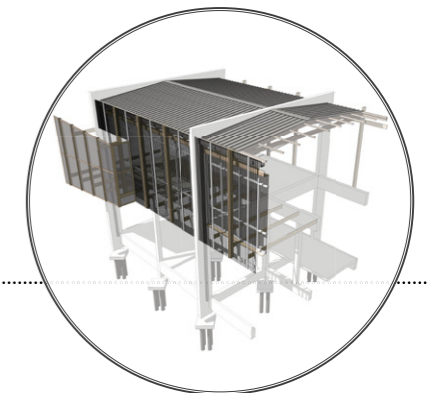


Figure 7.5: Tectonic language

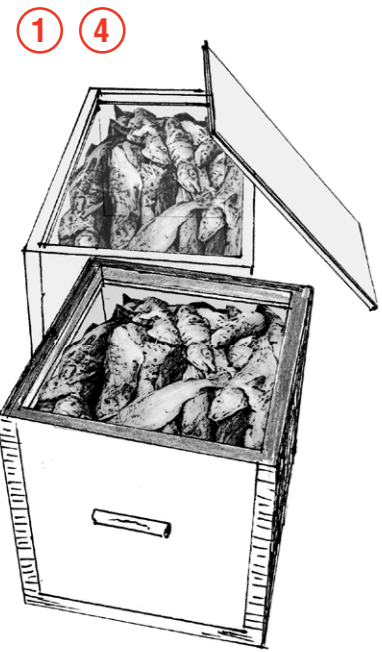


Figure 7.6.1: Typical fish boxes used to transport and temporarily store fish harvest

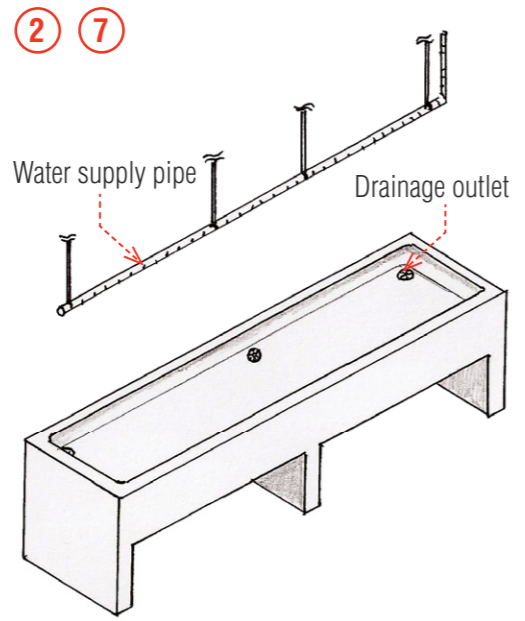


Figure 7.6.2: Typical fish washing concrete table

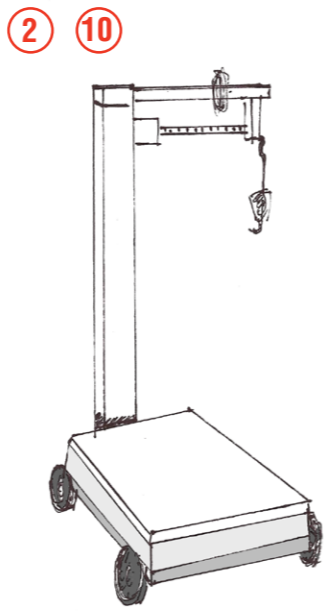


Figure 7.6.3: Typical fish weighing scale

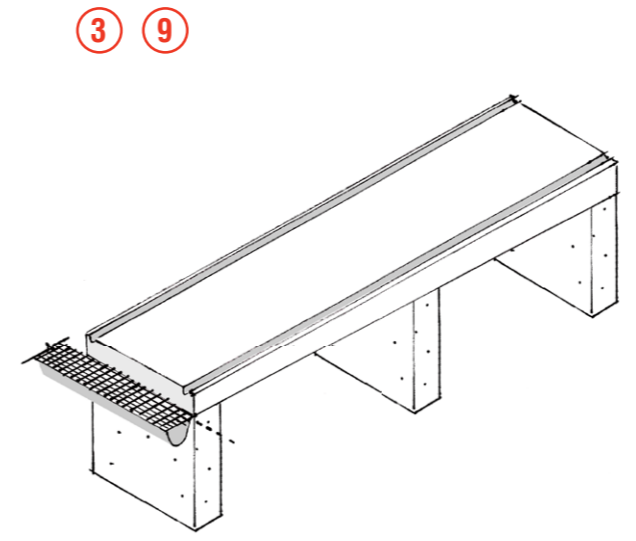


Figure 7.6.4: Typical fish filleting concrete table with drainage gutters and catchment grill

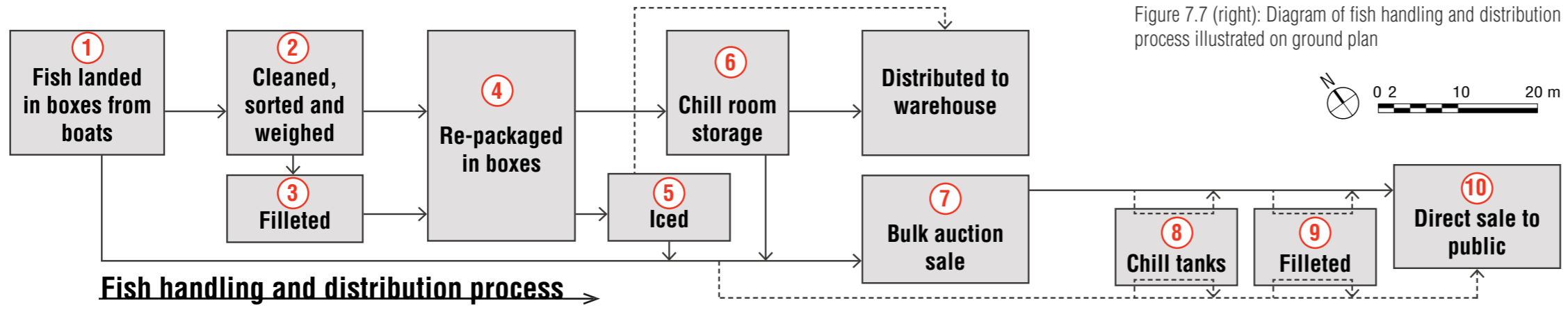
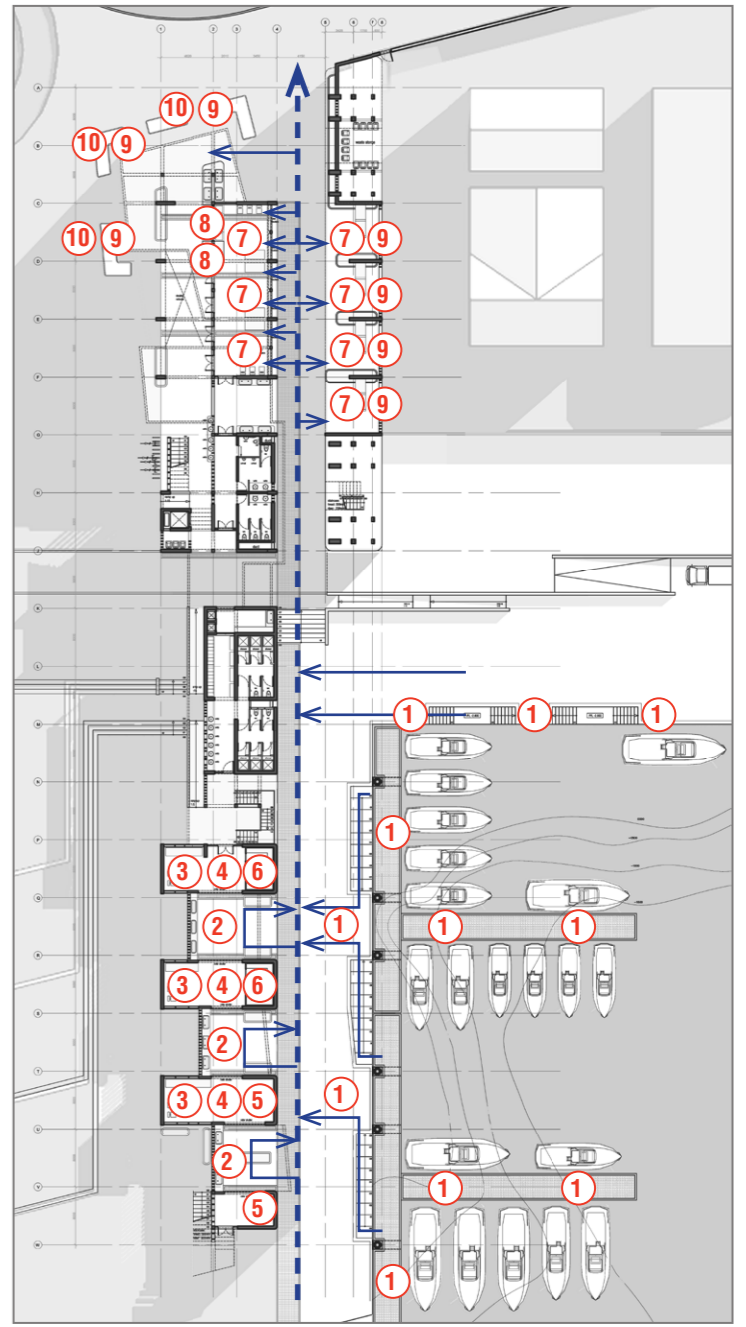


Figure 7.7 (right): Diagram of fish handling and distribution process illustrated on ground plan





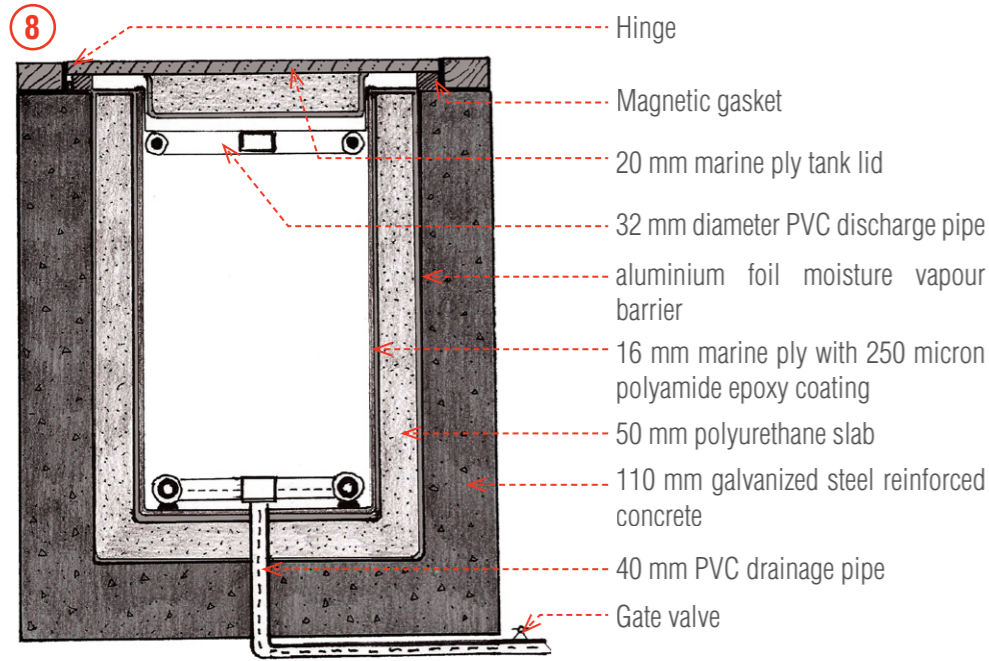


Figure 7.8.1: Typical insulated fish and ice concrete storage tank

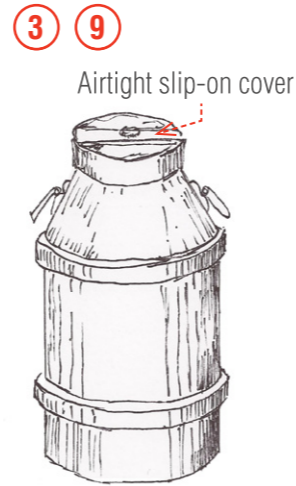


Figure 7.8.2: Typical poly-ethylene airtight fish offal storage container

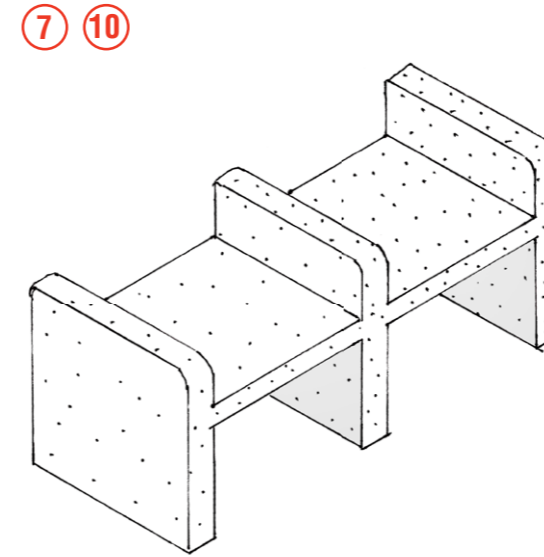
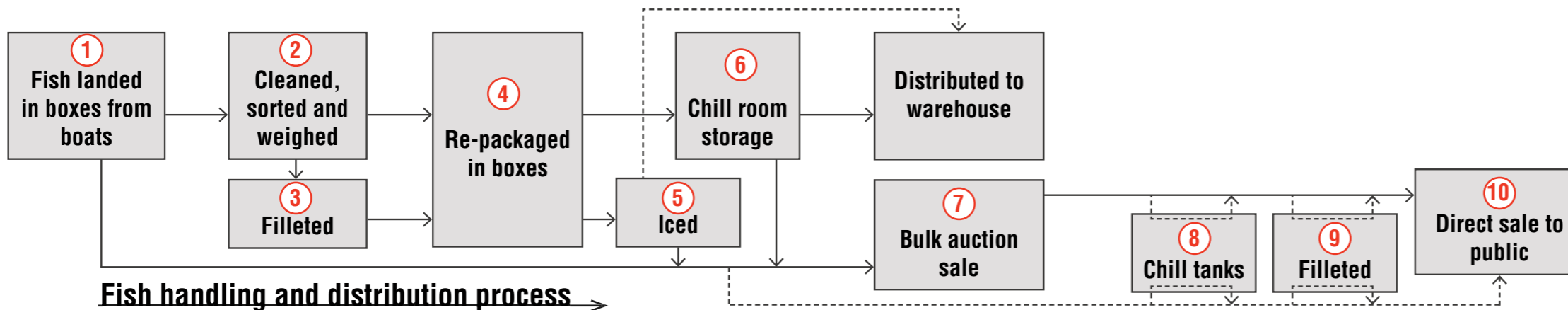


Figure 7.8.3: Typical fish auction and sale concrete table



**Fish handling and distribution process**

Table 7.1: Fish Handling areas: Accommodation requirements  
Floor area design guidelines based on Constantine Memos' *Port Planning* (2004: 60 - 64) and based on an annual catchment of 1500 tons

Fish Sale areas	
Projected uses	Exhibition, temporary storage, auction/ bulk sale, small scale sale
Filleting and bulk sale	250 m <sup>2</sup> (7 9)
Public sale	150 m <sup>2</sup> (in addition to sale on street pavement) (8 9 10)
Total designed area	400 m <sup>2</sup> (200 -400m <sup>2</sup> req.)
Occupation classification	F1 large sale/ F3 wholesale areas
Population (sellers):	30
Required lighting levels	400 lux
Ventilation requirements	Natural ventilation: Majority of spaces are open covered spaces. Closeable section: 75 m <sup>2</sup> 55 m <sup>2</sup> open sections (73% floor area)
Fish Processing	
Projected uses	Washing, sorting, weighing, packaging, temporary storage
Areas:	350m <sup>2</sup>
- Washing and sorting	115 m <sup>2</sup> (50-150 m <sup>2</sup> req.) (1 2 3)
- Weighing, arrangements and packaging	200 m <sup>2</sup> (150-300 m <sup>2</sup> req.) (2 4 5)
- Cold storage	30 m <sup>2</sup> (20-40 m <sup>2</sup> req.) (6)
- Total	345 m <sup>2</sup> (220-460 m <sup>2</sup> req.)
Occupation classification	D3 (Low risk industrial)
Personnel population	40
Required lighting levels	500 lux
Ventilation requirements	Natural ventilation: 90 m <sup>2</sup> open sections (25% of total floor area)
Significant considerations (In addition to the fixtures required to process fish)	
Floors and walls: Non-porous, easy to wash, easy to drain, light colour to show dirt easily	

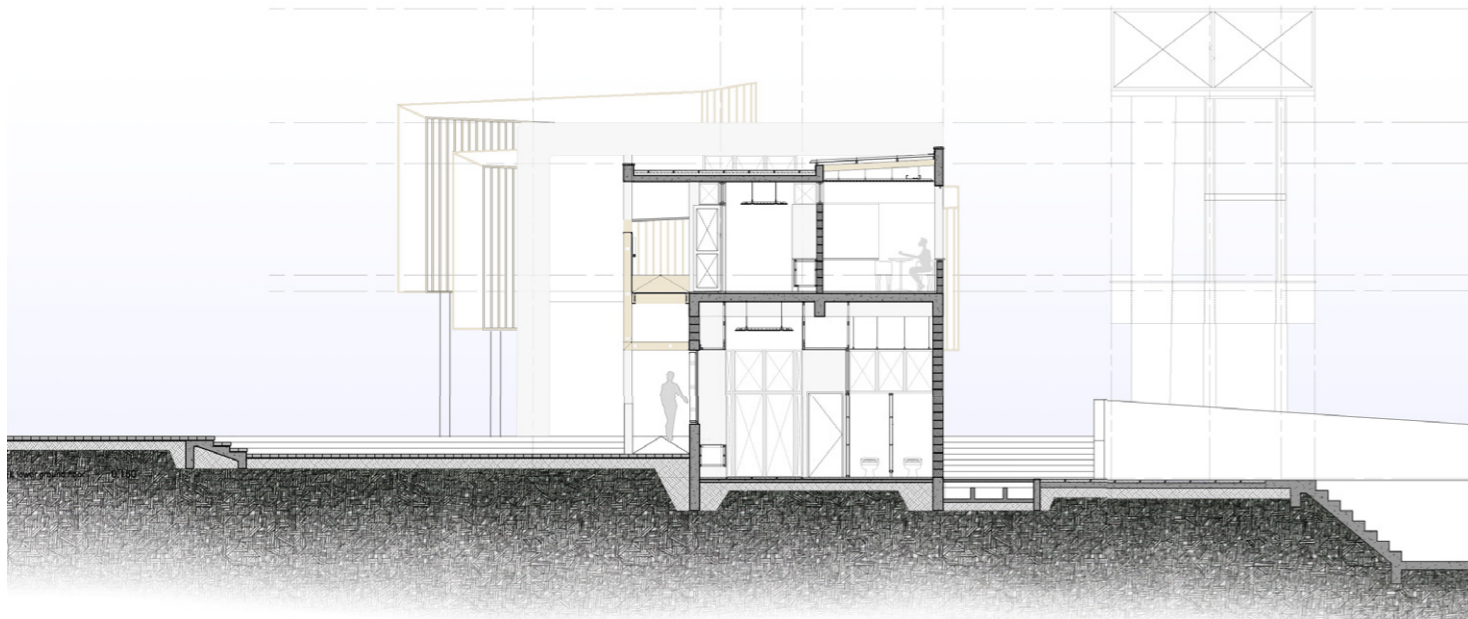


Figure 7.9: Cross section through restaurant and ablutions



### Urban terrace informing tectonic terrace

It is important to note that the grid, as outlined in Chapter 6 is not preconceived as a boundless infinite. In the design process it gives way to distortions, inflections and hierarchies of permeability with urban geometries and security requirements.

In the same way this grid meshes with the topography of the horizontal urban plane on which it lies. The ground plane undergoes a series of decrements in altitude as it approaches the ocean. In section the building form adapts to this principle in its tectonics through a series of segmented reiterative terraces. In this process the building's triangulation on plan is brought into alignment with its section

This terracing as well as its translation into the primary concrete structure is demonstrated in figure 7.11. In the next section the primary and secondary structural systems are demonstrated. It is in the dialogue of form established between these systems that the tectonic language is uncovered.

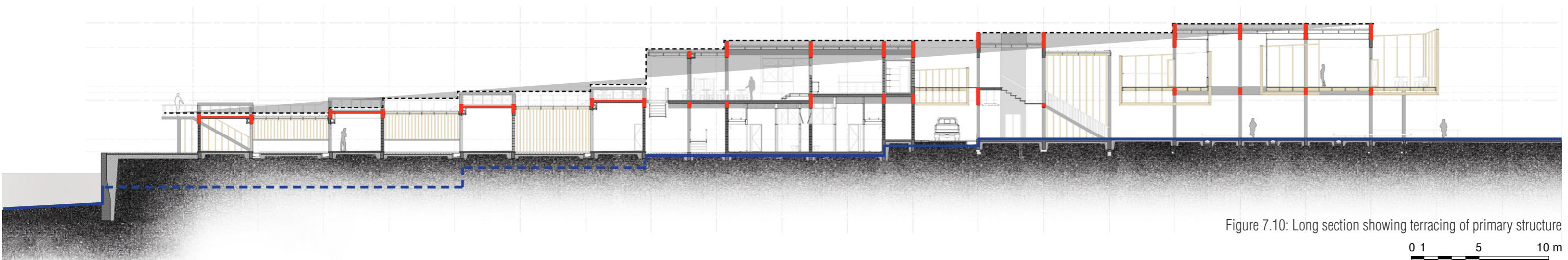
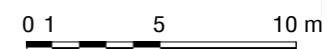


Figure 7.10: Long section showing terracing of primary structure





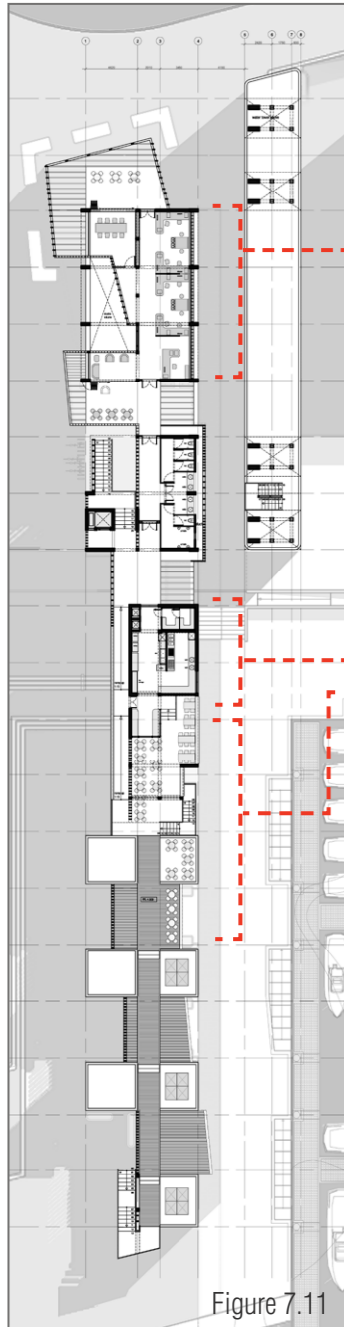
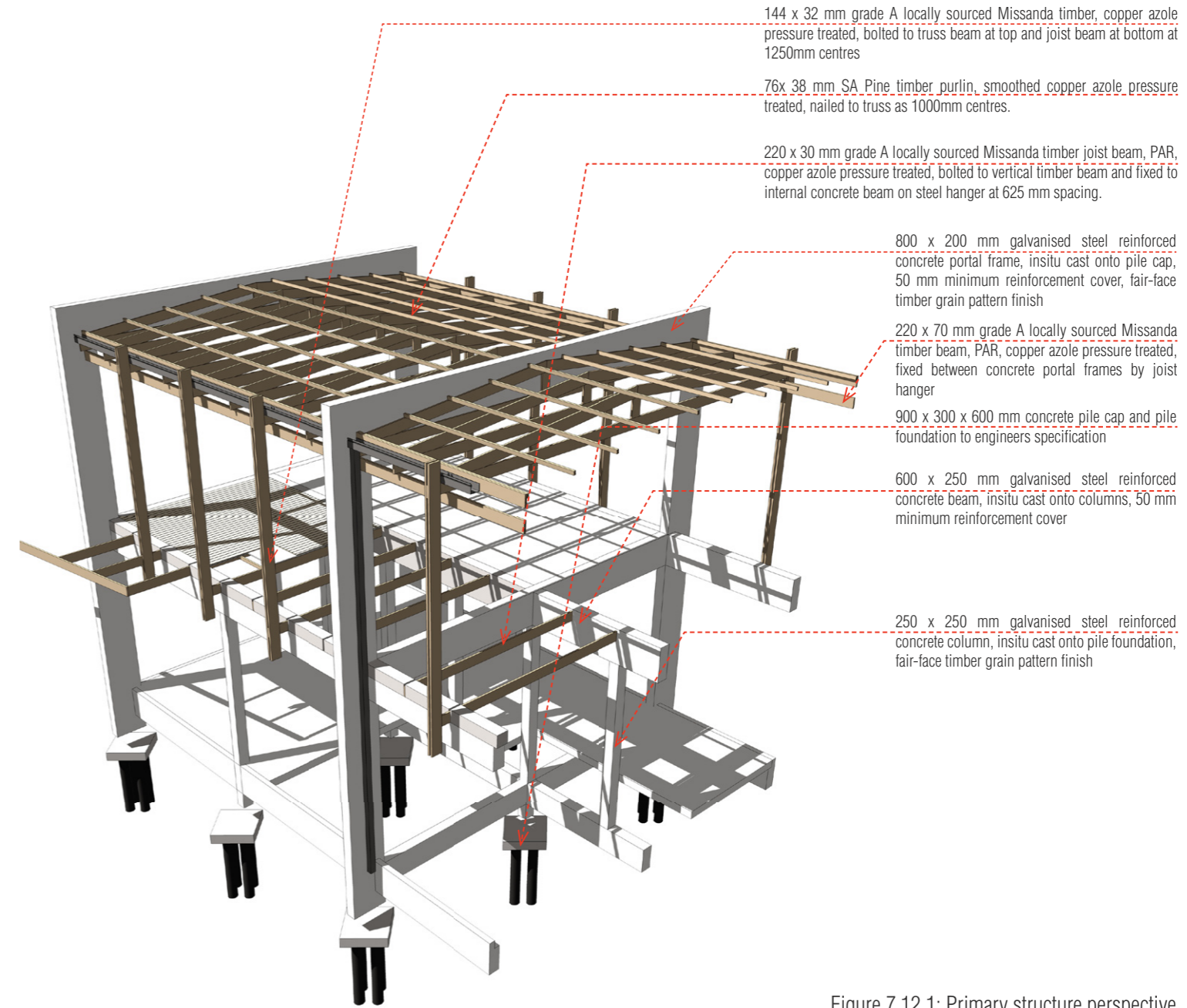


Figure 7.11

<b>Harbour Management Offices</b>	
Projected uses	Administration of auction and handling facilities, regulation of harbour water quality as well as quality and treatment of water used in the facility.
Area	150 m <sup>2</sup>
Occupation classification	G1
Population	14
Required lighting levels	400 lux with 700 lux at testing stations
Ventilation requirements	7.5 //s required 32 m <sup>2</sup> openable sections (20% of floor area) Assisted with mechanical ventilation when required: filtration to get rid of potential smells

<b>Fish Restaurant</b>	
Kitchen area	60 m <sup>2</sup>
Restaurant patron area	100 m <sup>2</sup>
Occupation classification	A1
Population:	20
Personnel	20
Patrons	90 (Max)
Required lighting levels	
- Kitchen	700 lux
- Restaurant floor	200 lux
Ventilation requirements	
- Kitchen	17.5 //s required Majority natural ventilation. 10 m <sup>2</sup> openable sections (16% of floor area) Additional extractor fans located in cooking area
- Restaurant floor	Natural ventilation provided by folding stacking windows and doors: 22m <sup>2</sup> openable sections for 45m <sup>2</sup> indoor zone (50% of floor area)

<b>Sanitary fixtures on both levels</b>	
Total population of personnel:	80 (designed for up to 90)
Additional wash hand basins (WHB) due to additional hygiene requirements	
Table 6 of SANS 10400 is referred to for ablution requirements for buildings of classifications F1, D3, B3, G1	
WC and WHB for disabled persons: 1	
Shared WHB: 15 (8 Required)	
Males:	
WC pans: 4 (3 required)	
Urinals: 6 (5 required)	
Females:	
WC pans: 8 (7 required)	
Showers: catering for 60 persons	
Required: 1 shower per 10-15 persons (moderately dirty industrial environments): 4-6	
Males: 3	
Females: 3	
<b>Ventilation Requirements</b>	
25 //s required	
Northern ground floor ablution block	4 m <sup>2</sup> (15% of floor area)
Southern ground floor ablution block	5 m <sup>2</sup> (15% of floor area)
Upper level ablutions	4 m <sup>2</sup> (15% of floor area)



- 144 x 32 mm grade A locally sourced Missanda timber, copper azole pressure treated, bolted to truss beam at top and joist beam at bottom at 1250mm centres
- 76x 38 mm SA Pine timber purlin, smoothed copper azole pressure treated, nailed to truss as 1000mm centres.
- 220 x 30 mm grade A locally sourced Missanda timber joist beam, PAR, copper azole pressure treated, bolted to vertical timber beam and fixed to internal concrete beam on steel hanger at 625 mm spacing.
- 800 x 200 mm galvanised steel reinforced concrete portal frame, insitu cast onto pile cap, 50 mm minimum reinforcement cover, fair-face timber grain pattern finish
- 220 x 70 mm grade A locally sourced Missanda timber beam, PAR, copper azole pressure treated, fixed between concrete portal frames by joist hanger
- 900 x 300 x 600 mm concrete pile cap and pile foundation to engineers specification
- 600 x 250 mm galvanised steel reinforced concrete beam, insitu cast onto columns, 50 mm minimum reinforcement cover
- 250 x 250 mm galvanised steel reinforced concrete column, insitu cast onto pile foundation, fair-face timber grain pattern finish

Figure 7.12.1: Primary structure perspective

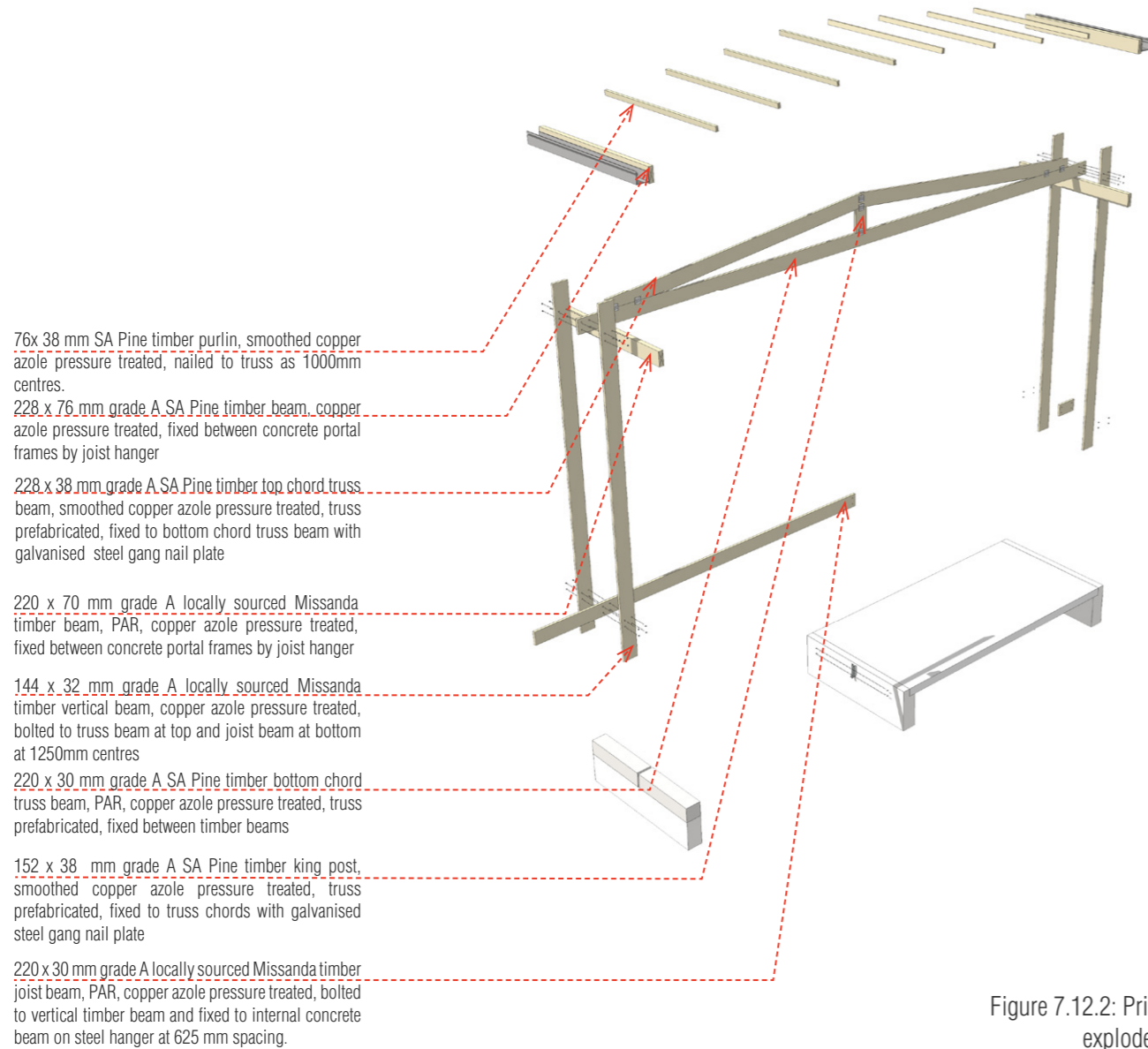


Figure 7.12.2: Primary structure exploded perspective

### Concrete columns and beams

**Columns:** The columns span a height of 4m, the typical minimum dimension of concrete columns of this height range from 200x200mm - 260 x 260mm (Orton, 2007: 30). The columns are spaced at 5m intervals

**Beams:** The beams span a distance of 5m, the typical minimum depth is 250 - 360mm. For beams spanning a distance of 9m the typical minimum depth is 450 - 650 mm (Orton, 2007: 35)

The reinforcement cover is 35mm due to the highly corrosive marine environment. The fair-faced finish as seen in figure 7.12.3 below is achieved by using rough sawn timber sheeting as shuttering

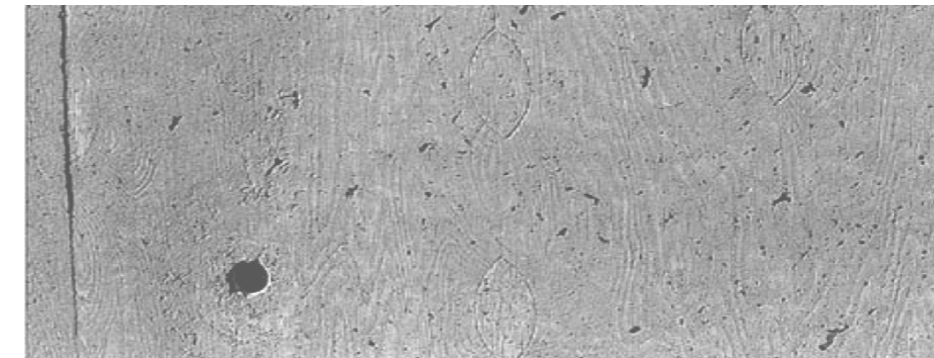


Figure 7.12.3: Concrete finish, rough sawn timber sheeting used for formwork

### Timber Joinery

Missanda and pine timber framework makes up the space between the dominating concrete portal frames. This timber is as per the specification in figure 7.12.1 and 7.12.2.

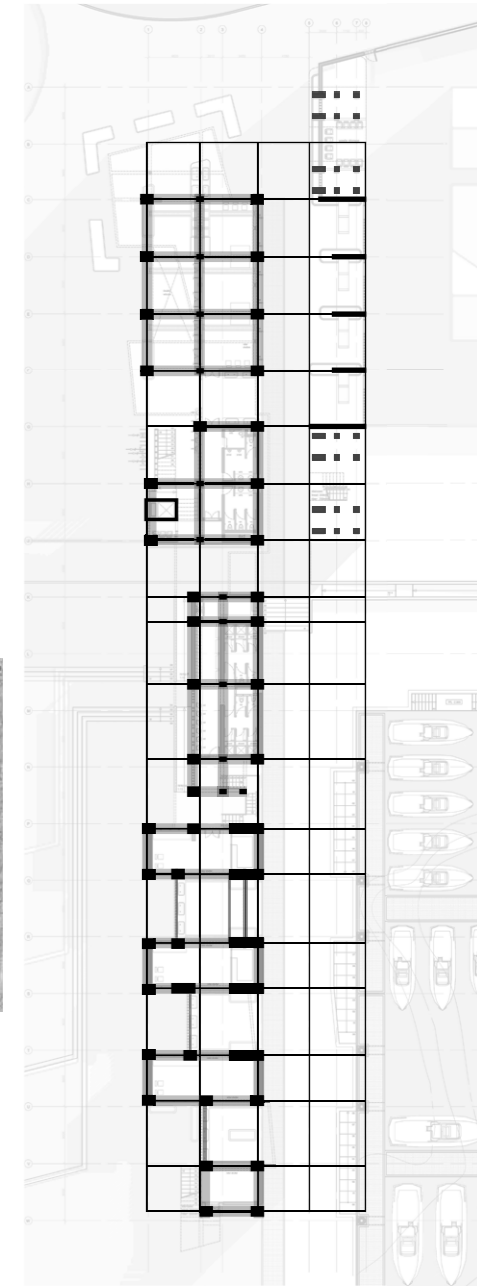


Figure 7.13: Diagram of structure



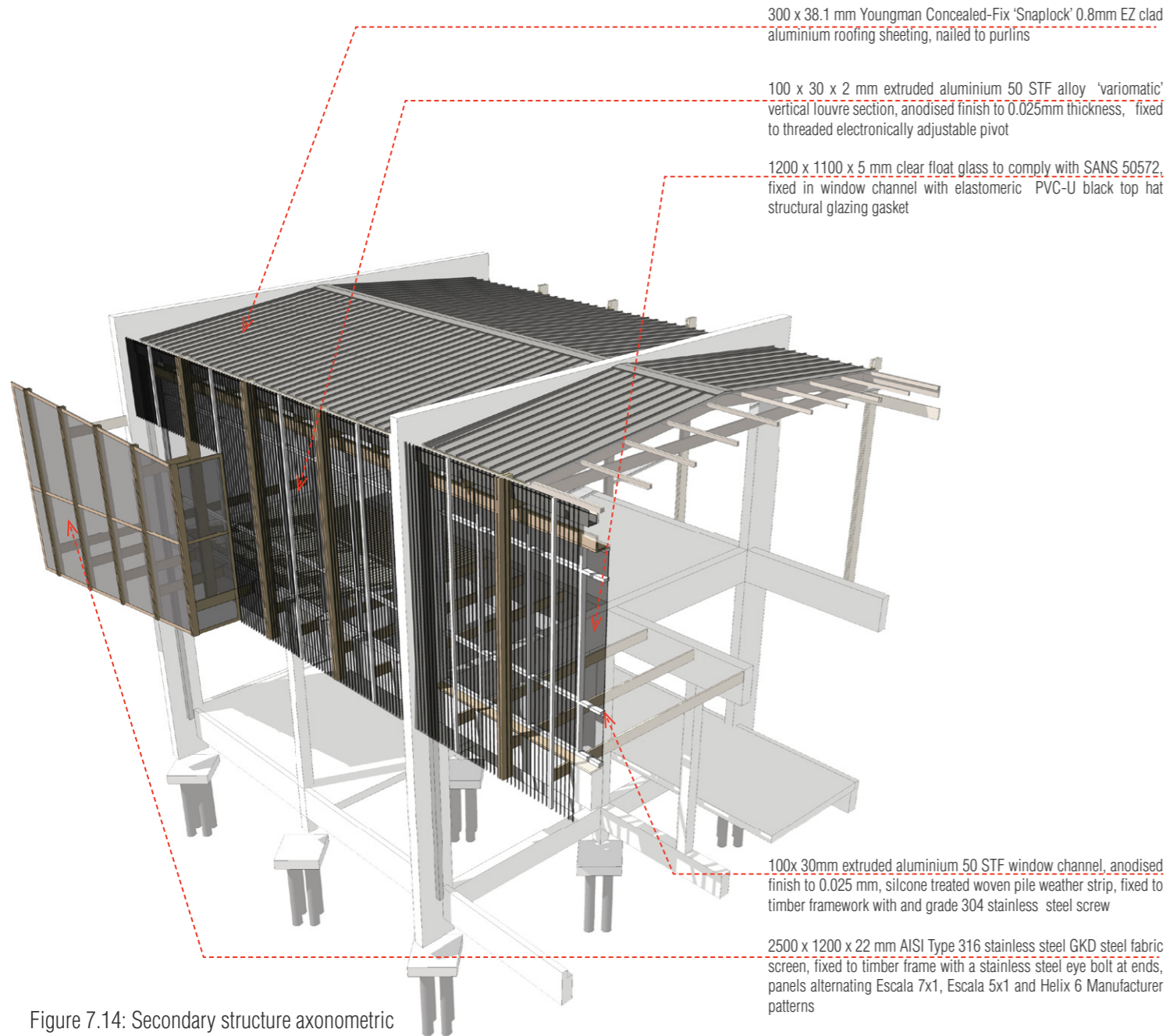


Figure 7.14: Secondary structure axonometric

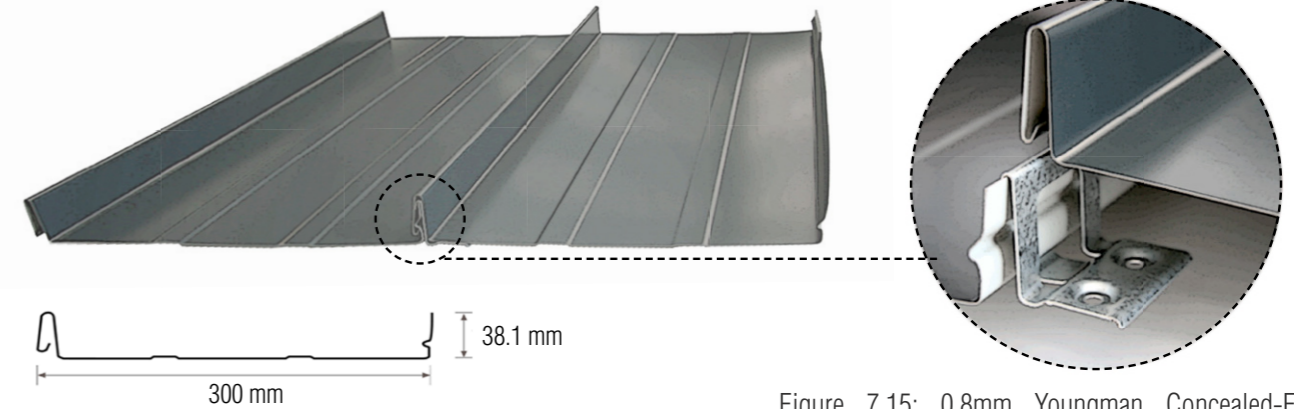


Figure 7.15: 0.8mm Youngman Concealed-Fix Snaplock 38.1mm EZ clad aluminium roof sheeting

**Roofing:**

An aluminium roof sheeting is selected due to the highly corrosive marine environment. Youngman Concealed-Fix Snaplock sheeting is available in aluminium as per the specification in figures 7.14 and 7.15: The fall of the roof is 6°, which is well above the minimum 1° that the Snaplock system can manage. The sheeting is fixed to purlins which lie at intervals of 1100mm. The roofing and adjoining gutter (see figure 7.17) are concealed behind the louvered screen as demonstrated in the next section.

**Facade:**

The buildings facade is made up of three essential elements.

1. Curtain wall: An aluminium framed curtain wall. Again aluminium is selected for its high resistance to corrosion. This curtain wall comprises openable sections to provide some control over the passive ventilation of the building and is shown in more detail in figures 7.16.1, 7.16.2 and 7.17
2. Louvres: Adjustable vertical aluminium louvres on the northwest and southeast facades allow for thermal sun control. These louvres sit on the exterior side of the facade therefore represent a minimal heat gain.
3. GKD Screening: The metal fabric screens wrap around portions of the building in an expression and revelation of contained event. The material is stainless steel which is, again, selected for minimal corrosion. Three pattern varieties are selected which in combination show portions of the screen to be either more or less revealing beyond its edge.



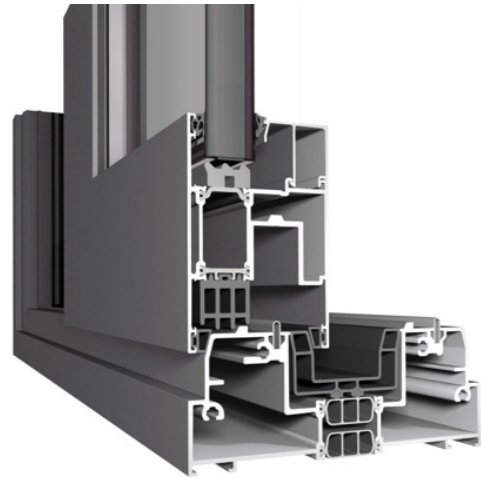


Figure 7.16.1: Diagram showing axonometric view of aluminium window system

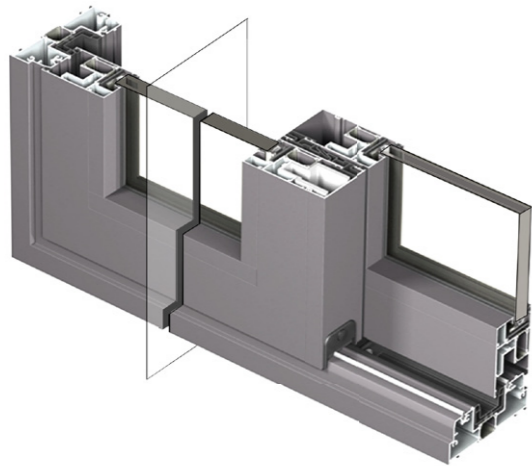


Figure 7.16.2: Diagram showing axonometric view of aluminium window system

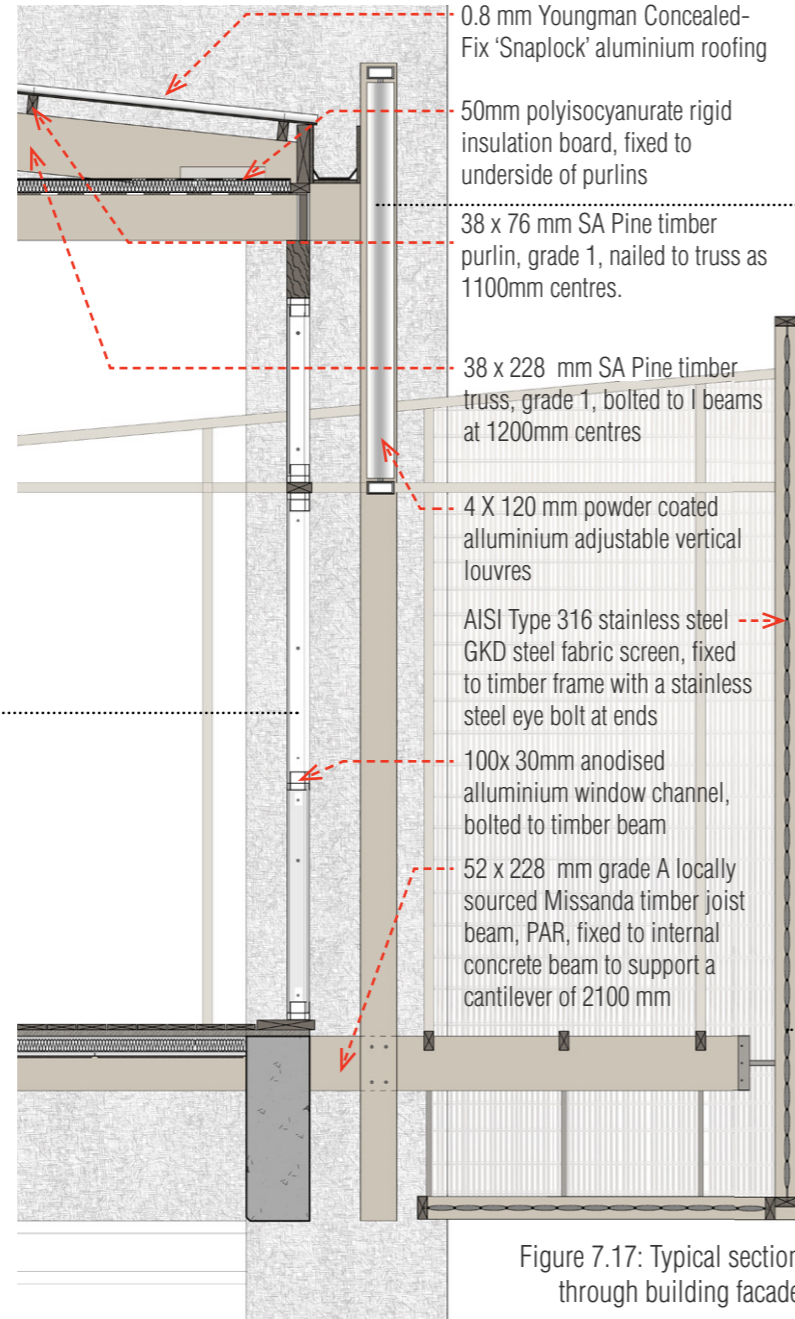


Figure 7.17: Typical section through building facade

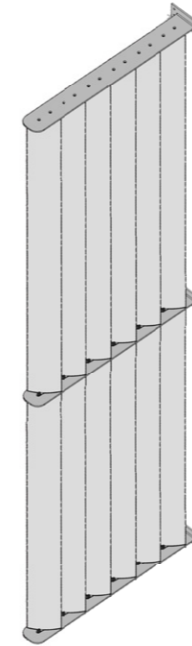


Figure 7.18.1: Diagram showing axonometric view of aluminium louvres

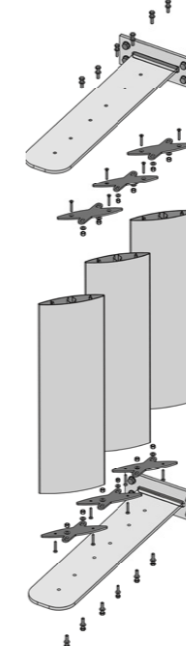


Figure 7.18.2: Diagram showing exploded axonometric view of aluminium louvres



Figure 7.18.3: Photo showing the application of aluminium louvred facade

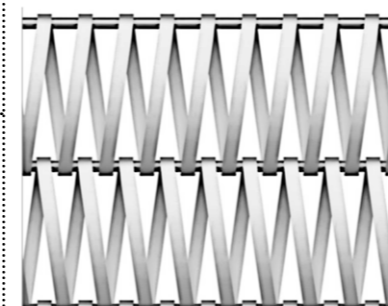


Figure 7.19.1: GKD metal fabric: Escale 5 x 1

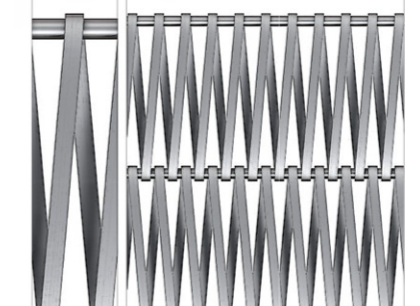


Figure 7.19.2: GKD metal fabric: Escale 7 x 1

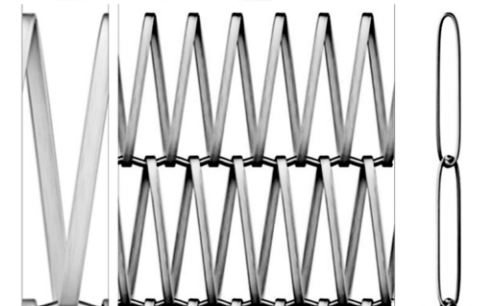


Figure 7.19.3: GKD metal fabric: Helix 6



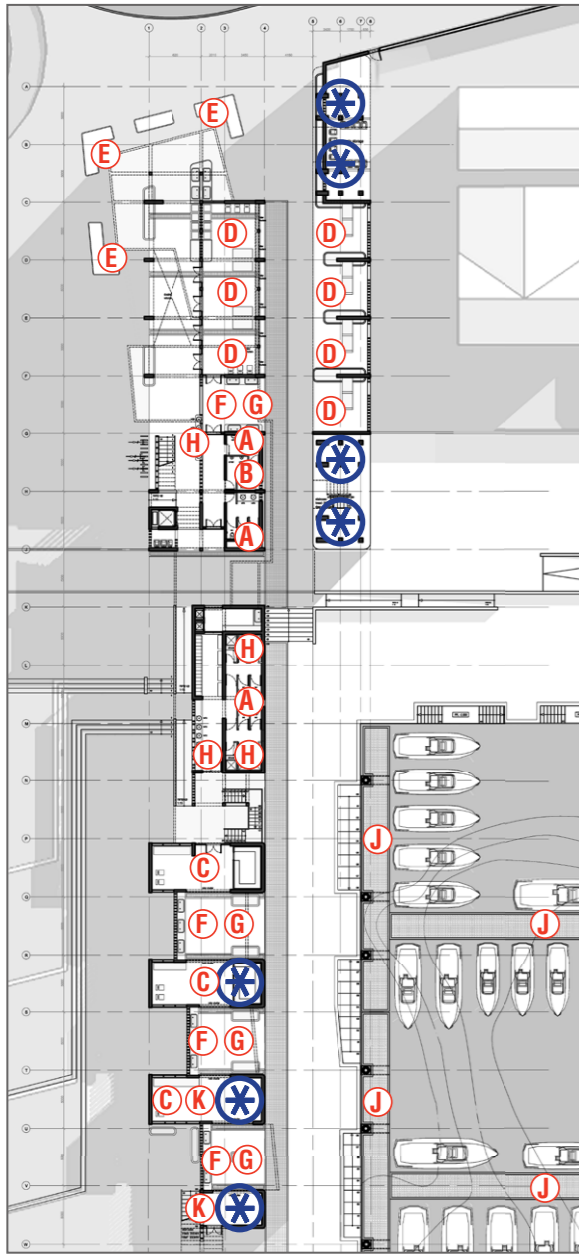


Figure 7.20: Ground floor plan showing position of water treatment and use processes

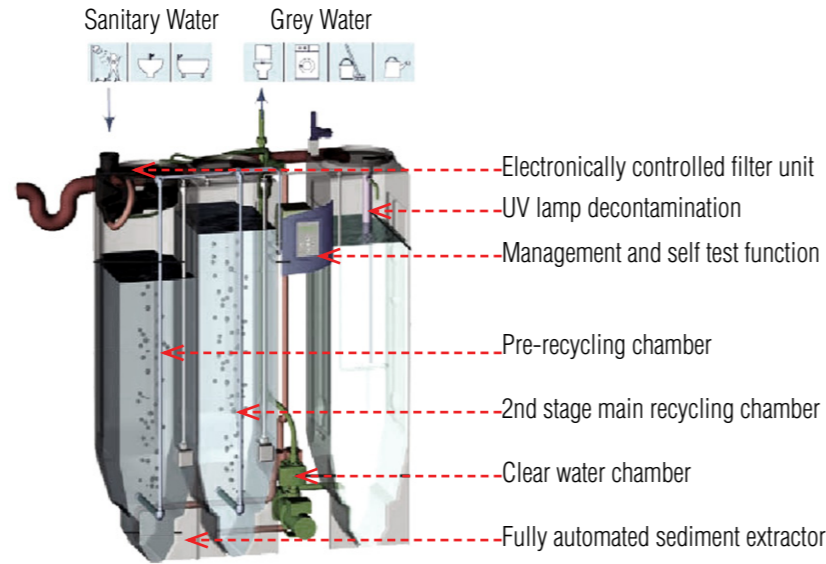
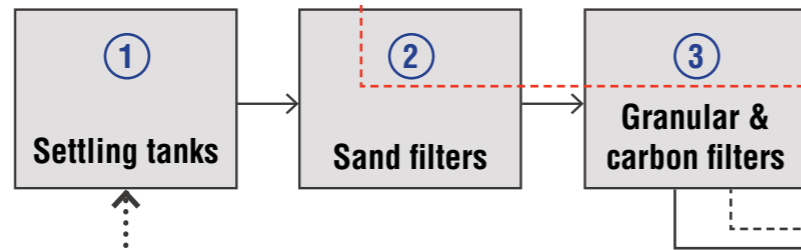


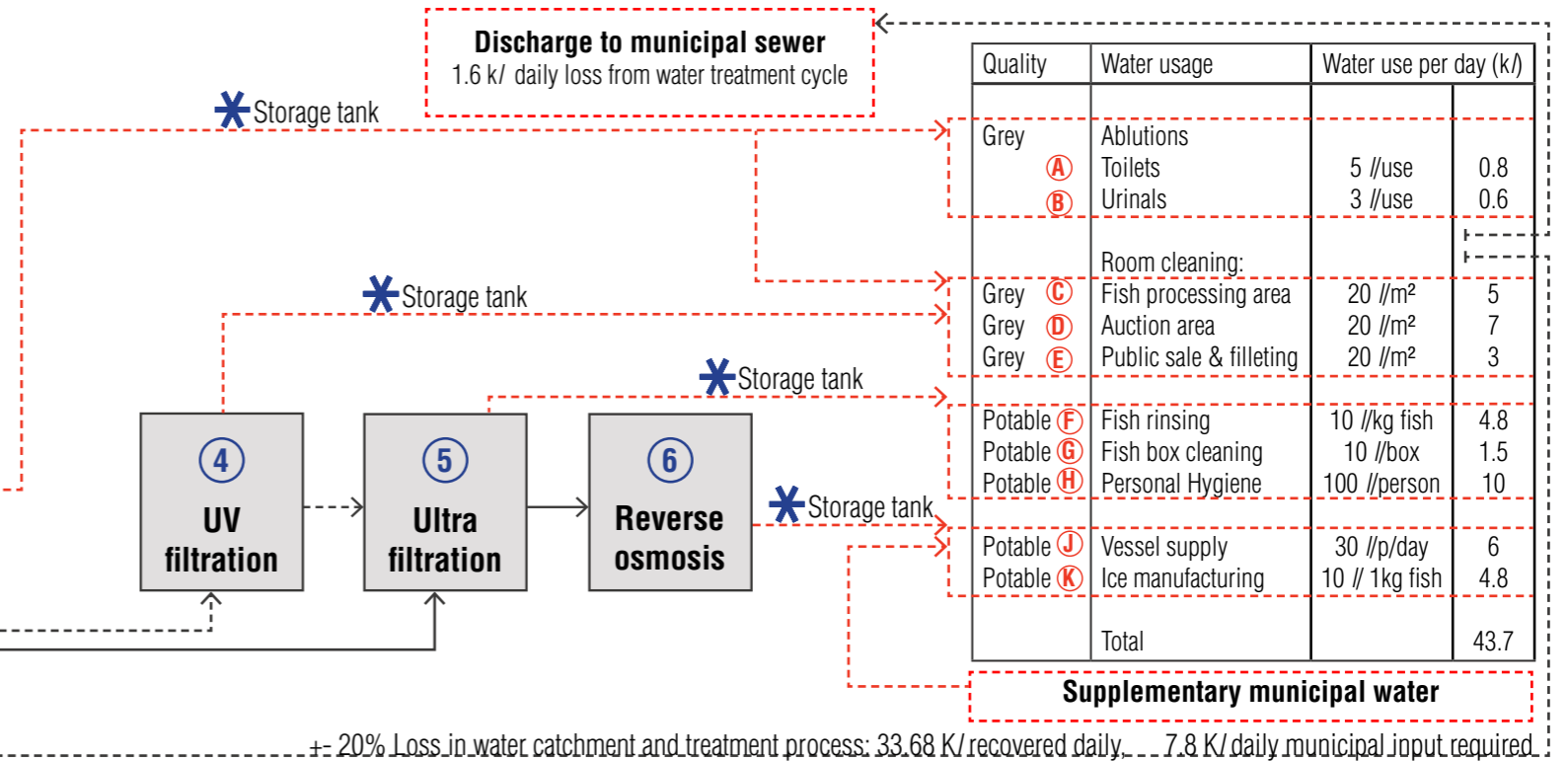
Figure 7.21: Diagram of simple grey water filtration system

Month	J	F	M	A	M	J	J	A	S	O	N	D	Total	Daily Average
Rainfall (mm)	130	124	97	64	28	27	12	12	38	46	86	130	794	
Catchment (k/l)	80	75	58	38	17	16	7	7	23	28	52	78	479	2



**Water treatment process**

**Water treatment:** Based on an annual harvest of 1500 tons of fish, the facility uses an average of 43 700 litres of water per day (seen in the table below). For this reason there is an investigation into potential water supplies other than the standard municipal one currently used in the harbour. Two main water strategies were considered; the first is the treatment of sea water to use in some of the processes in the facility including the washing of the harvest, the auction areas, etc. Due to a likelihood of industrial chemical contamination in the the seawater surrounding the harbour, however, it is speculated that the monetary and energy costs involved in its cleaning would exceed the value gained in water saving. Bigham suggested a second option in which waters used in processes in the auction facility itself would undergo a treatment (Bigham, 2012). A critical factor in this regard is the concept of 'total dissolved solids' where the contamination of waters with heavy metal solubles renders its reclamation a highly expensive exercise. Bigham indicates that while one would be inclined to regard water used for the washing of filleted fish as 'highly contaminated', in reality this water contains a relatively low dissolved metal content and is therefore relatively easy to clean via several filtration processes and the exposure to UV light. The diagram below demonstrates this reclamation process.



## CHAPTER 8: DRAWINGS

P.	126	PERSPECTIVES
	131	SITE PLAN
	132	PLANS
	134	SECTIONS
	138	DETAIL SECTION
	140	DETAILS
	142	MODEL





Figure 8.1: Perspective rendering: view along Avenida Samora Machel looking south





Figure 8.2: Perspective rendering: view along Avenida Samora Machel looking north



Figure 8.3: Perspective rendering: view from harbour

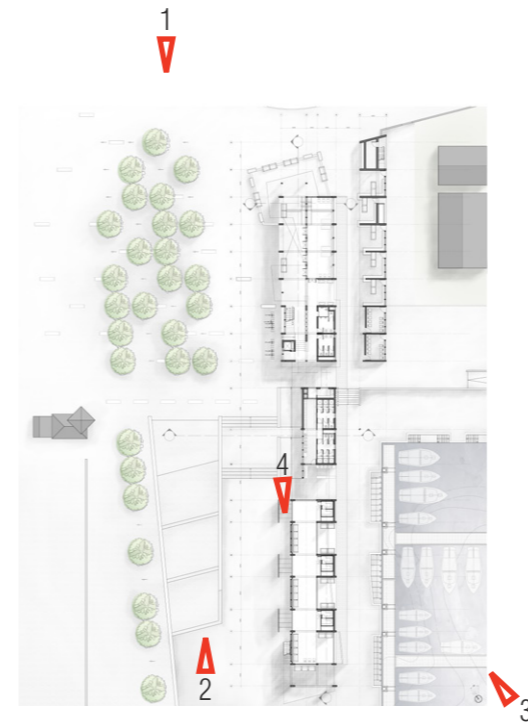


Figure 8.4: Perspective rendering: view along western edge of fishing processing area







Figure 8.5: Perspective rendering: view through auction area looking south toward harbour



Figure 8.6: Perspective rendering: view looking toward fish public sale area

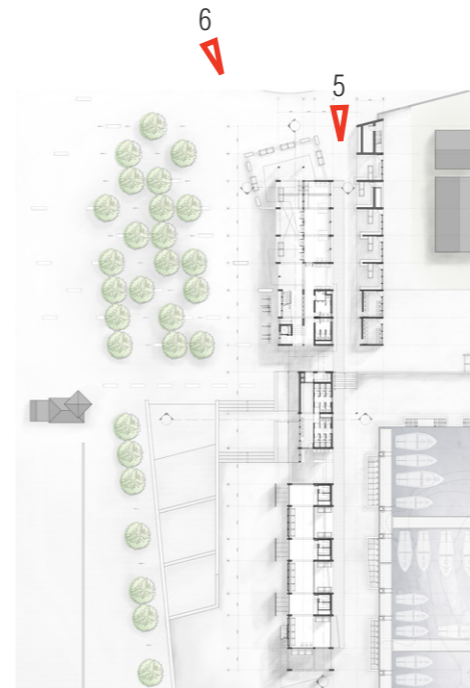


Figure 8.7: Site plan

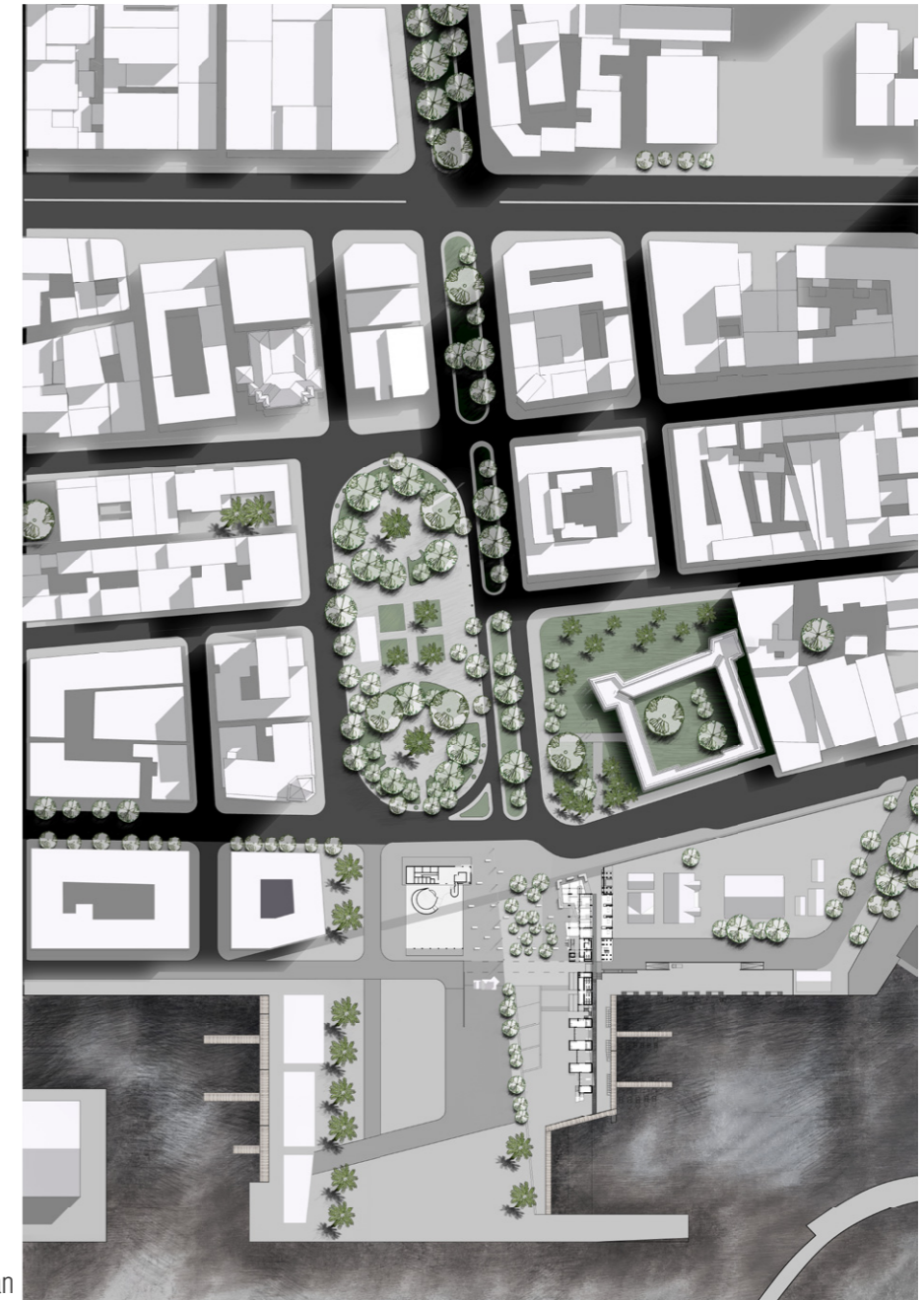






Figure 8.8: Ground Floor Plan

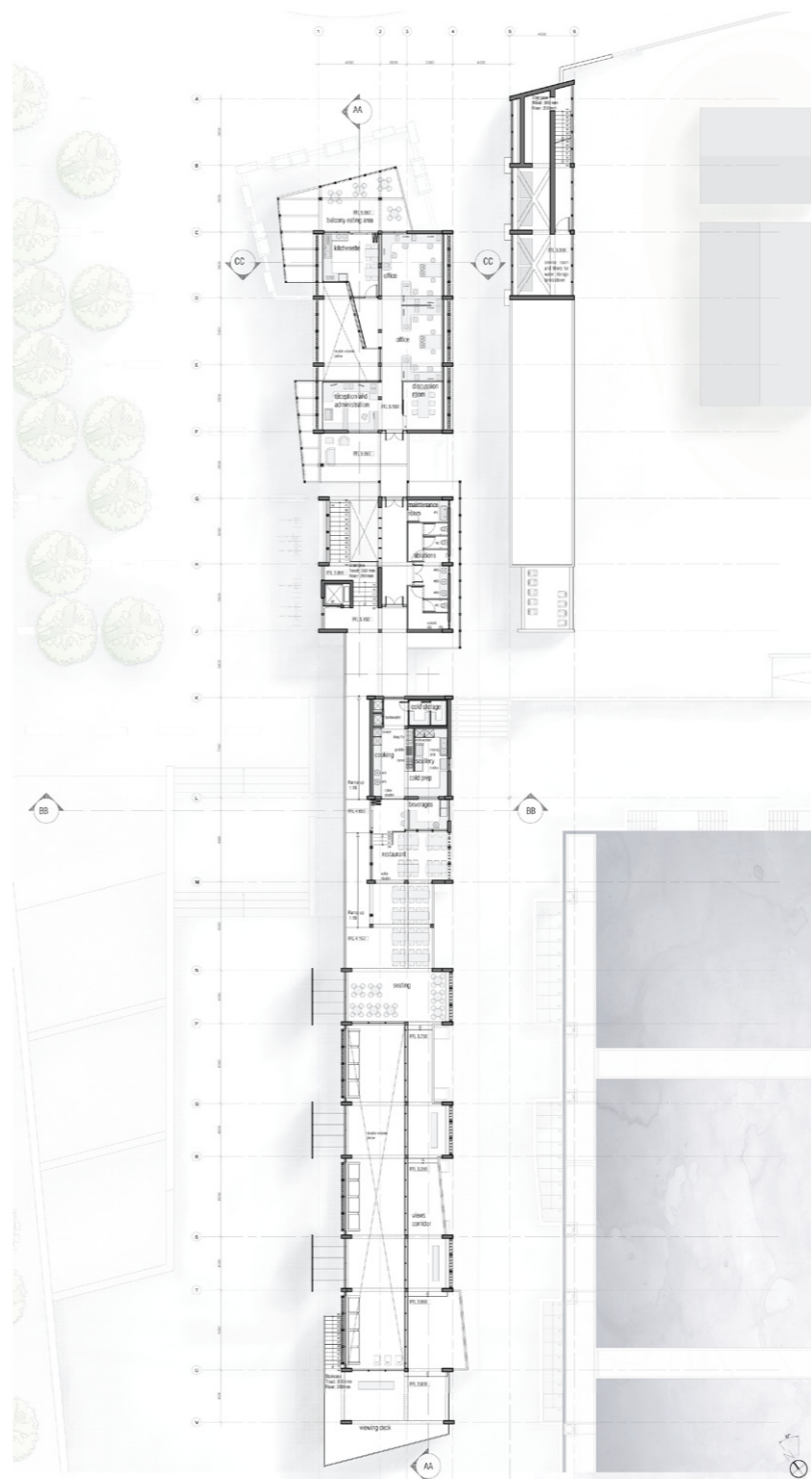


Figure 8.9: 1st Floor Plan



300 mm concrete pile foundation to engineer's specification

100 mm closed cell fire retardant expanded polystyrene cold room wall, enclosed in painted galvanised steel

50 mm concrete screed, layed on concrete slab, cement:sand ration of 1:3, steel floated to hard smooth finish

200 x 200 x 300 mm U-profile concrete blocks, fixed together with class II mortar joint with cement:sand ratio of 1:5, class II plaster finish with cement:sand ratio of 1:5

250 x 600 steel reinforced concrete ground beam, institu cast on concrete column

100 x 20 mm grade A locally sourced Jambire timber floor mini planks, to comply with SANS 281, laid by specialist contractor, fixed to marine plywood with manufacturer patent adhesive, sanded and coated once with clear wax polish

250 x 250 steel reinforced precast concrete SW channel

250 x 400 mm steel reinforced concrete down stand beam

150mm steel reinforced concrete floor slab, insitu cast on concrete beams

60 mm concrete structural wearing slab to engineers specifications

150mm concrete ground slab, insitu cast on ground beams, 50 mm sand blinding layer below to protect DPC

200 mm gravel drainage layer

220 x 30 mm grade A SA Pine timber truss beam, as specified in section CC

300 x 38.1 mm aluminium roofing sheeting, as specified in section CC

800 x 200 mm galvanised steel reinforced concrete portal frame, as specified in section CC

600 x 1200 insulated axiom canopy exterior grade ceiling panel, suspended from aluminium angles attached to truss bottom chord

100 mm diameter geotextile wrapped discharge pipe as specified in detail 4

2500 x 1200 x 22 mm AISI Type 316 stainless steel GKD steel fabric screen, as specified in section CC

220 x 30 mm grade A locally sourced Missanda timber joist beam as specified in section CC

220 x 32 mm grade A locally sourced Missanda timber, copper azole pressure treated column, bolted to vertical floor plate and timber joist

800 x 250 mm galvanised steel reinforced concrete beam, insitu cast onto columns, fair-face timber grain pattern finish

400 x 400 mm concrete sump chamber, 100 mm diameter water discharge chamber and pipe, with floor drains at 2500 mm centres

9.100 top of upper concrete beam

6.700 top of lower concrete beam

5.150 FFL upper first floor

4.650 FFL upper restaurant

4.150 FFL lower restaurant

2.800 FFL lower 1st floor

1.150 FFL upper ground floor

0.100 FFL lower ground floor

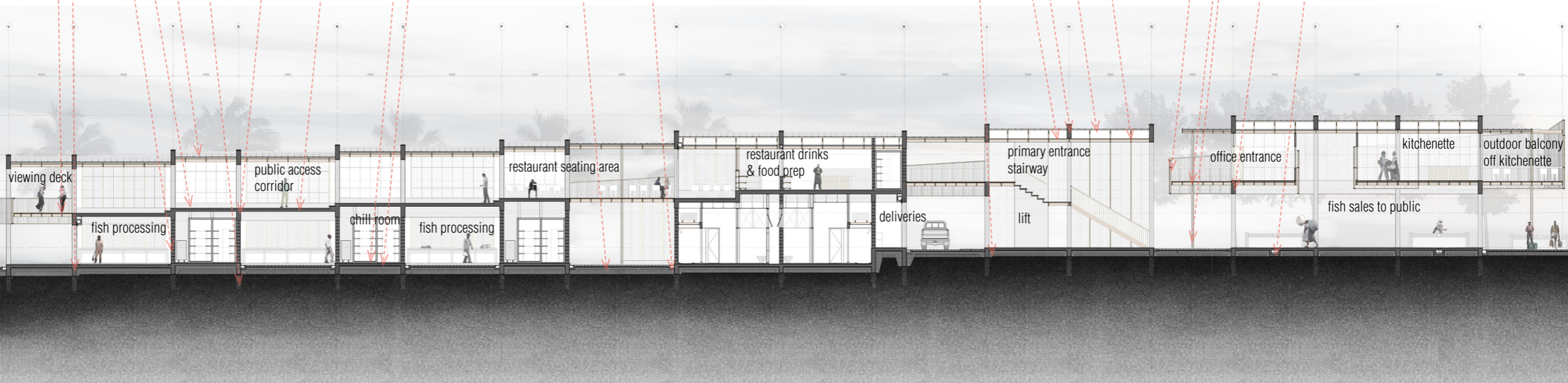


Figure 8.10: Section AA





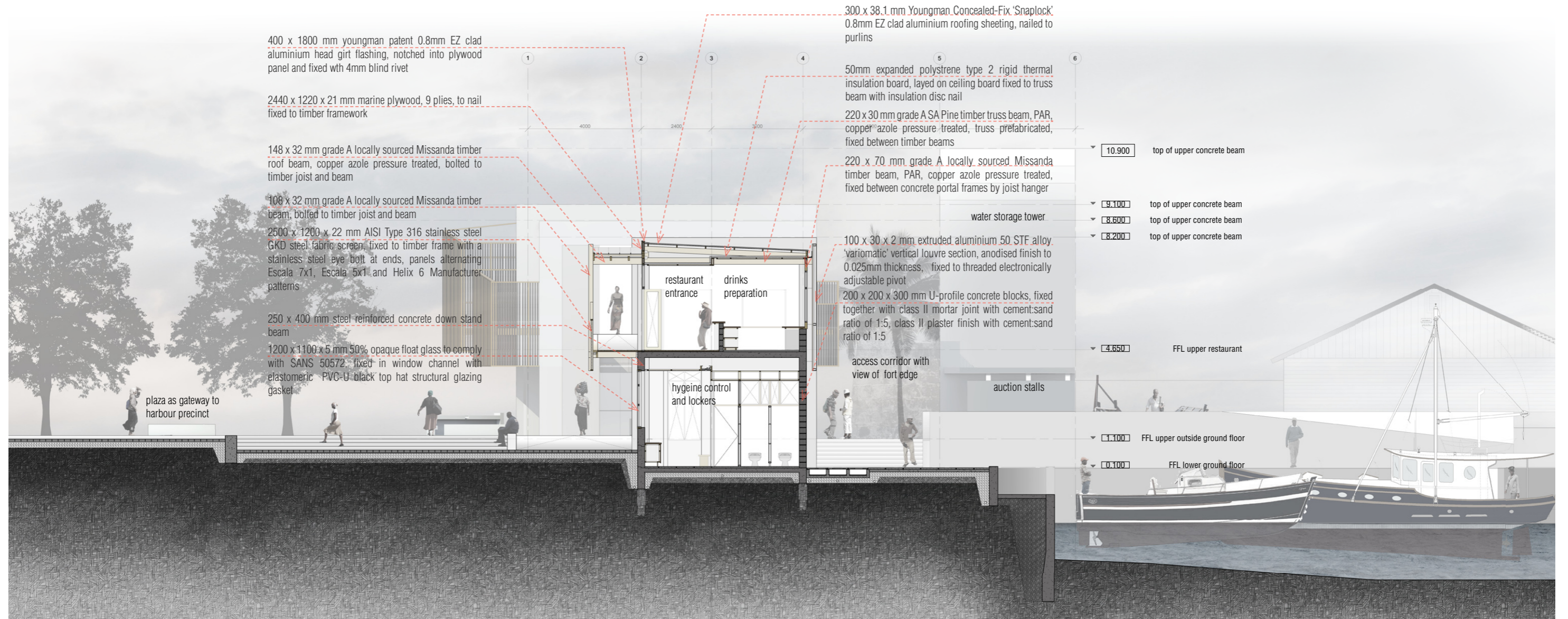


Figure 8.11: Section BB  
 0 1 5 m



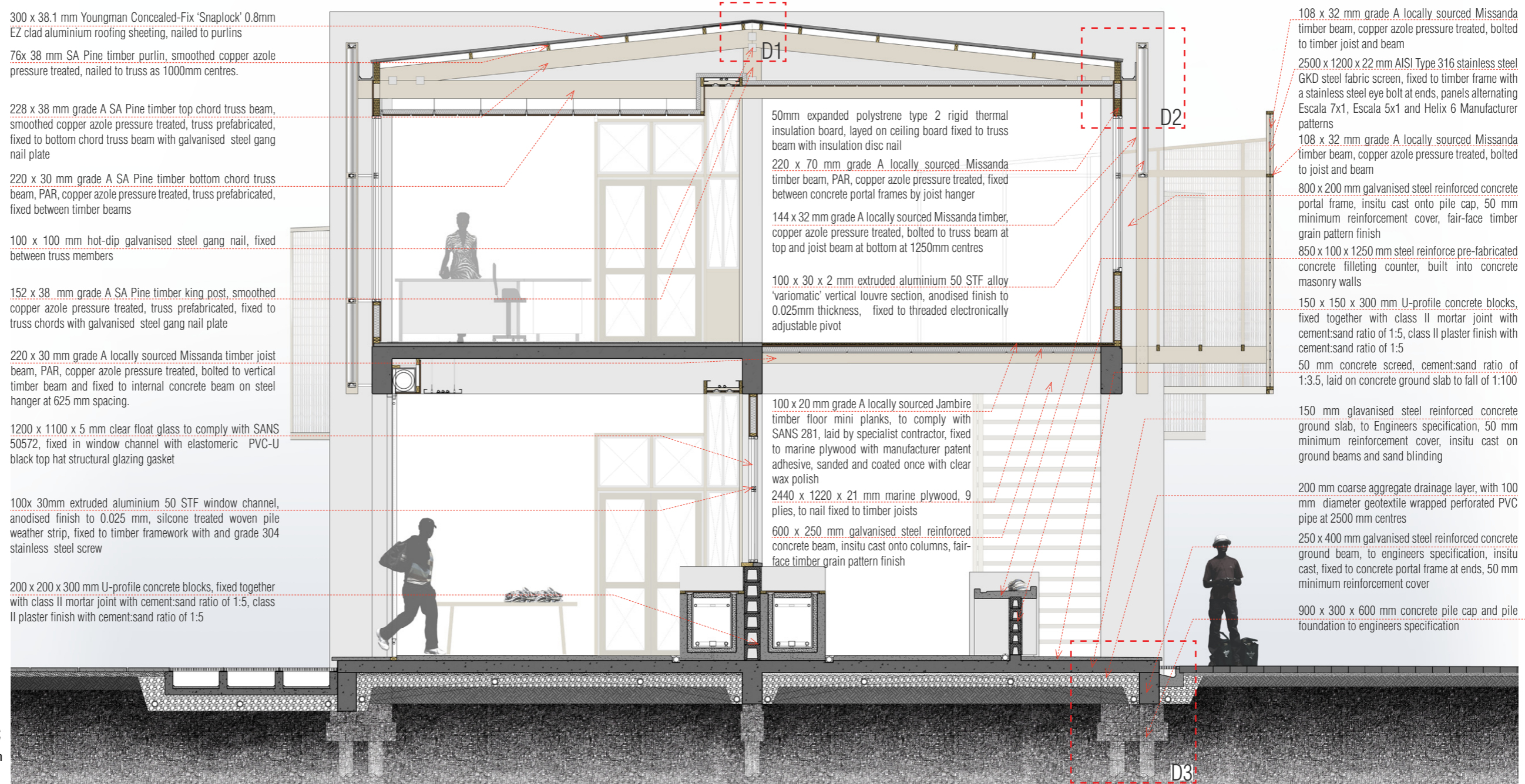
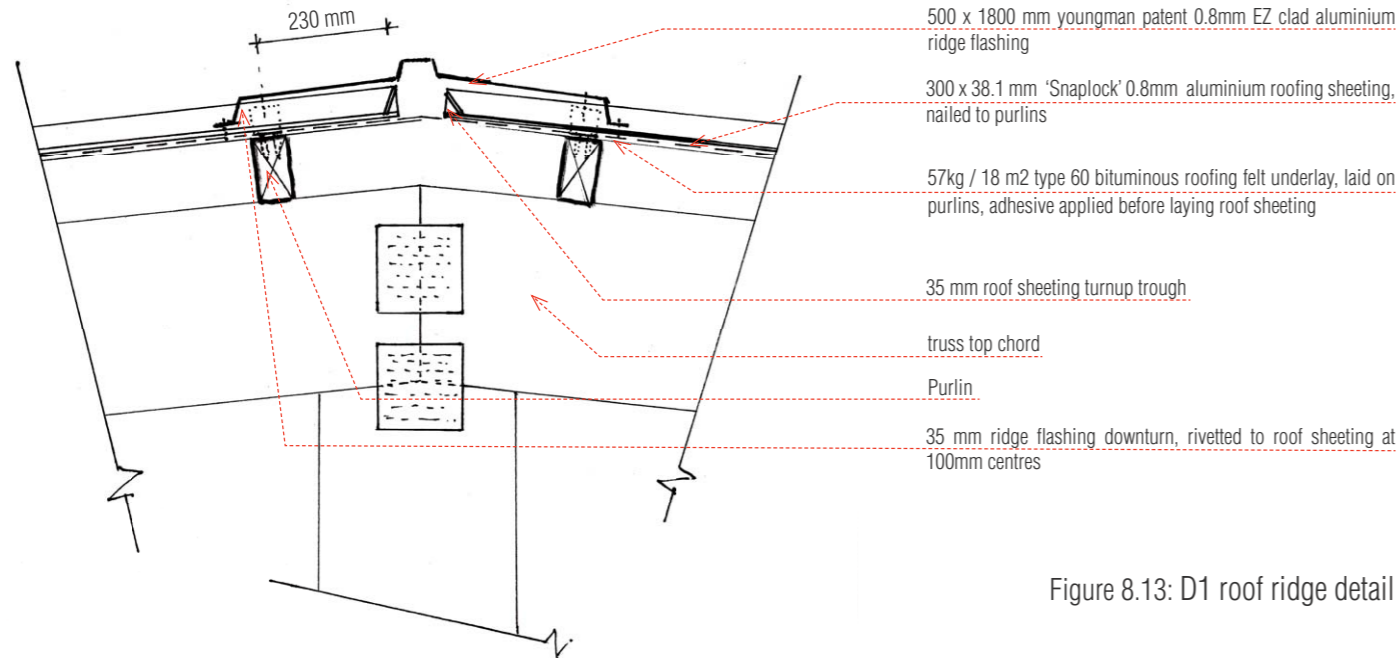


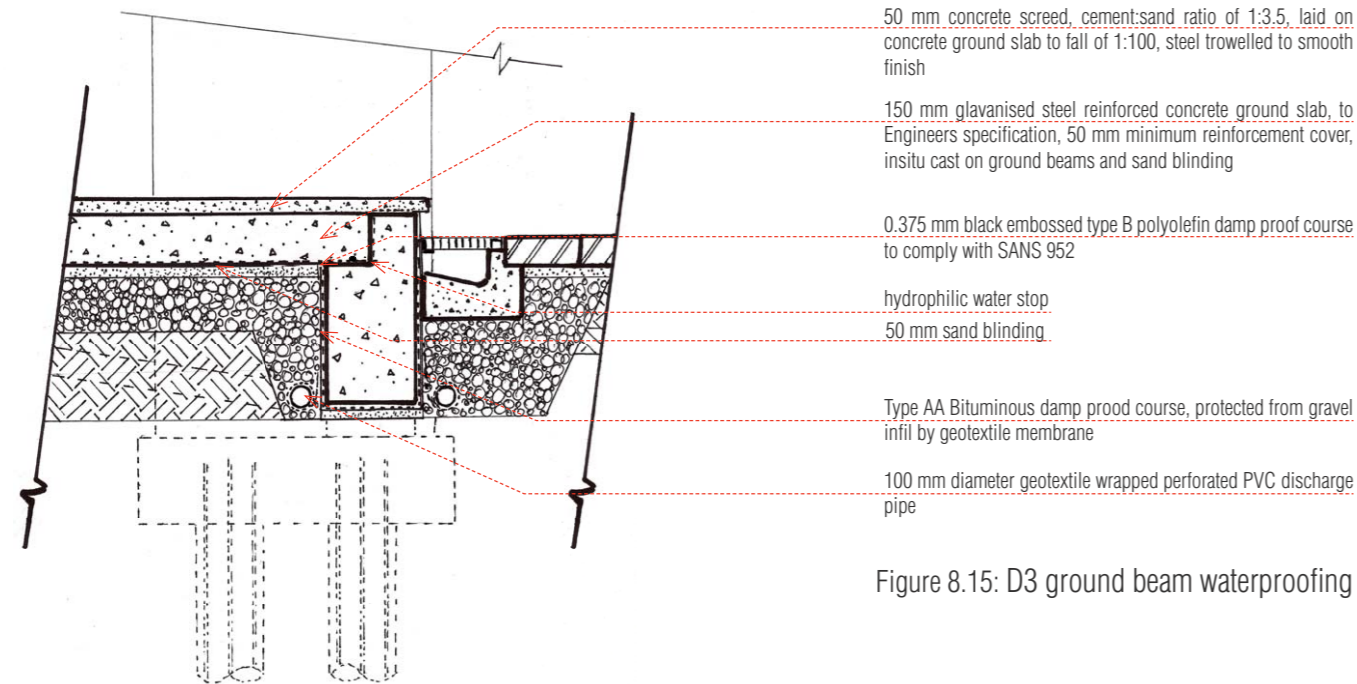
Figure 8.12: Section CC





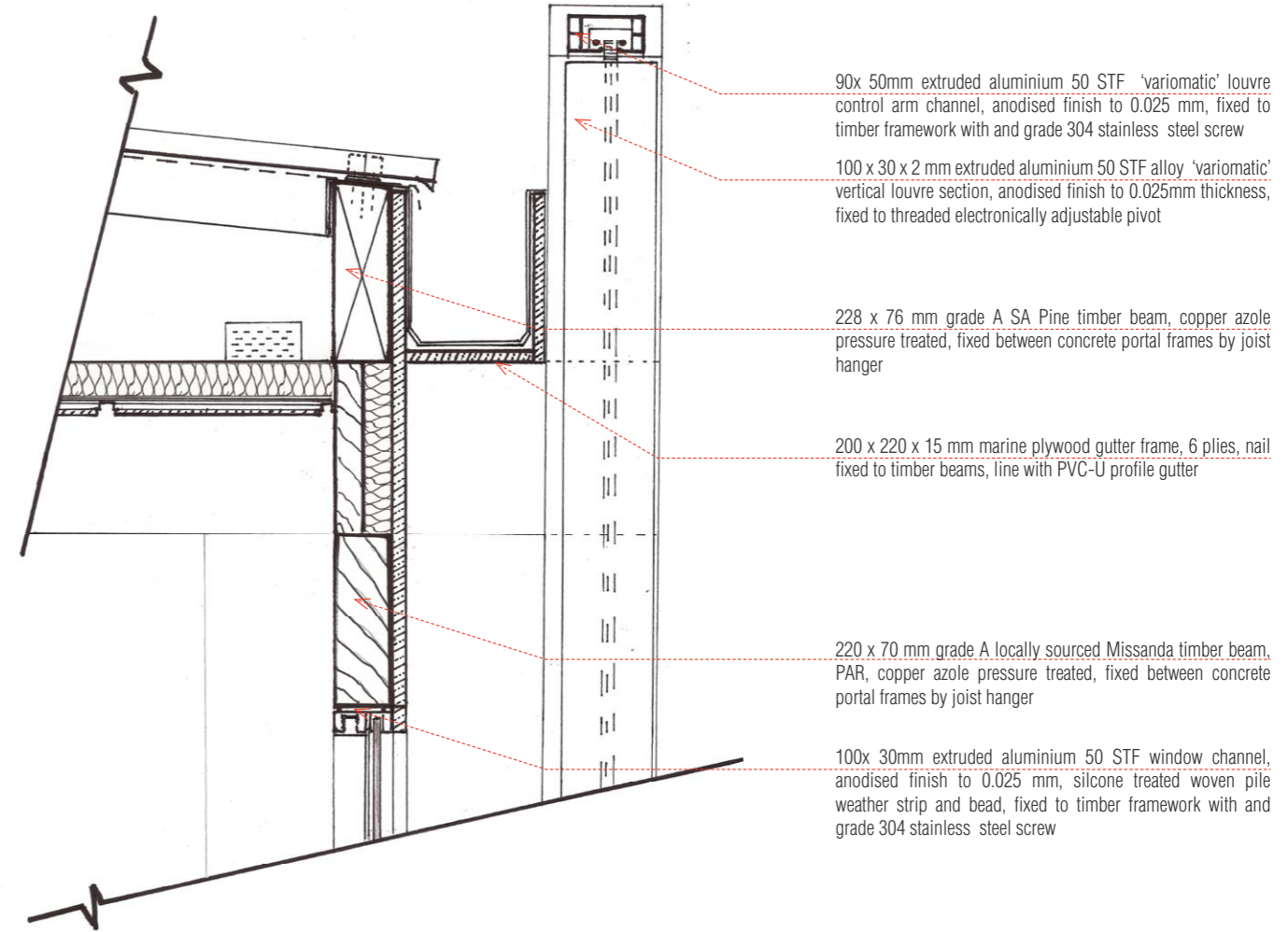
- 500 x 1800 mm youngman patent 0.8mm EZ clad aluminium ridge flashing
- 300 x 38.1 mm 'Snaplock' 0.8mm aluminium roofing sheeting, nailed to purlins
- 57kg / 18 m<sup>2</sup> type 60 bituminous roofing felt underlay, laid on purlins, adhesive applied before laying roof sheeting
- 35 mm roof sheeting turnup trough
- truss top chord
- Purlin
- 35 mm ridge flashing downturn, rivetted to roof sheeting at 100mm centres

Figure 8.13: D1 roof ridge detail



- 50 mm concrete screed, cement:sand ratio of 1:3.5, laid on concrete ground slab to fall of 1:100, steel trowelled to smooth finish
- 150 mm galvanised steel reinforced concrete ground slab, to Engineers specification, 50 mm minimum reinforcement cover, insitu cast on ground beams and sand blinding
- 0.375 mm black embossed type B polyolefin damp proof course to comply with SANS 952
- hydrophilic water stop
- 50 mm sand blinding
- Type AA Bituminous damp proof course, protected from gravel infil by geotextile membrane
- 100 mm diameter geotextile wrapped perforated PVC discharge pipe

Figure 8.15: D3 ground beam waterproofing



- 90x 50mm extruded aluminium 50 STF 'variomatic' louvre control arm channel, anodised finish to 0.025 mm, fixed to timber framework with and grade 304 stainless steel screw
- 100 x 30 x 2 mm extruded aluminium 50 STF alloy 'variomatic' vertical louvre section, anodised finish to 0.025mm thickness, fixed to threaded electronically adjustable pivot
- 228 x 76 mm grade A SA Pine timber beam, copper azole pressure treated, fixed between concrete portal frames by joist hanger
- 200 x 220 x 15 mm marine plywood gutter frame, 6 plies, nail fixed to timber beams, line with PVC-U profile gutter
- 220 x 70 mm grade A locally sourced Missanda timber beam, PAR, copper azole pressure treated, fixed between concrete portal frames by joist hanger
- 100x 30mm extruded aluminium 50 STF window channel, anodised finish to 0.025 mm, silicone treated woven pile weather strip and bead, fixed to timber framework with and grade 304 stainless steel screw

Figure 8.14: D2 truss end gutter and louvre detail





Figure 8.16: Model view 1

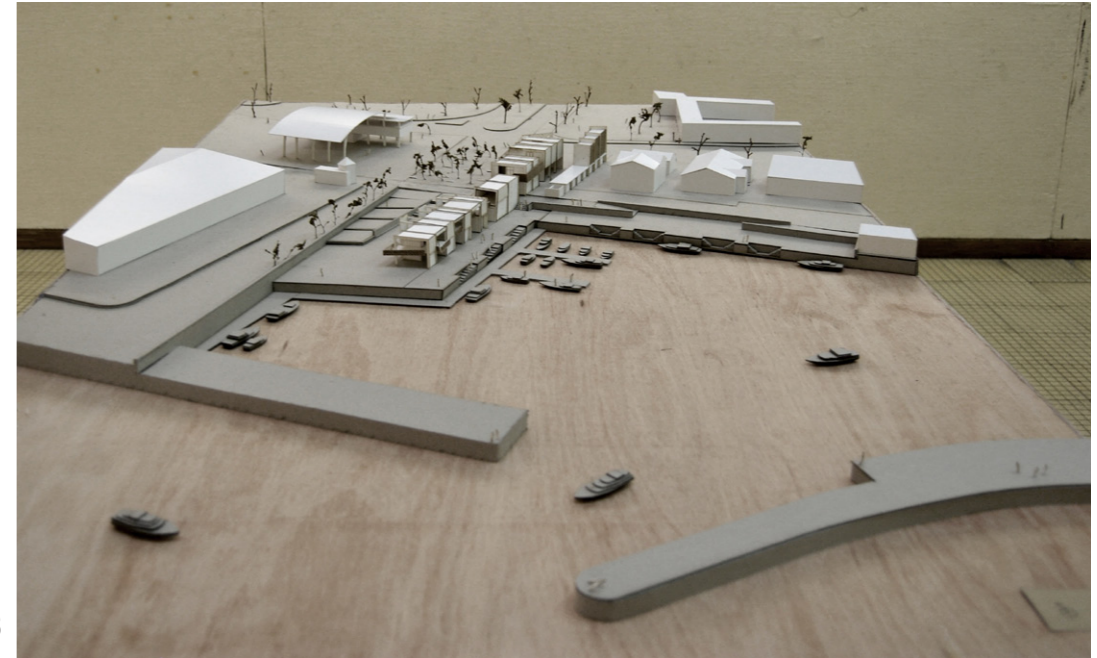


Figure 8.18: Model view 3



Figure 8.17: Model view 2



Figure 8.19: Model view 4



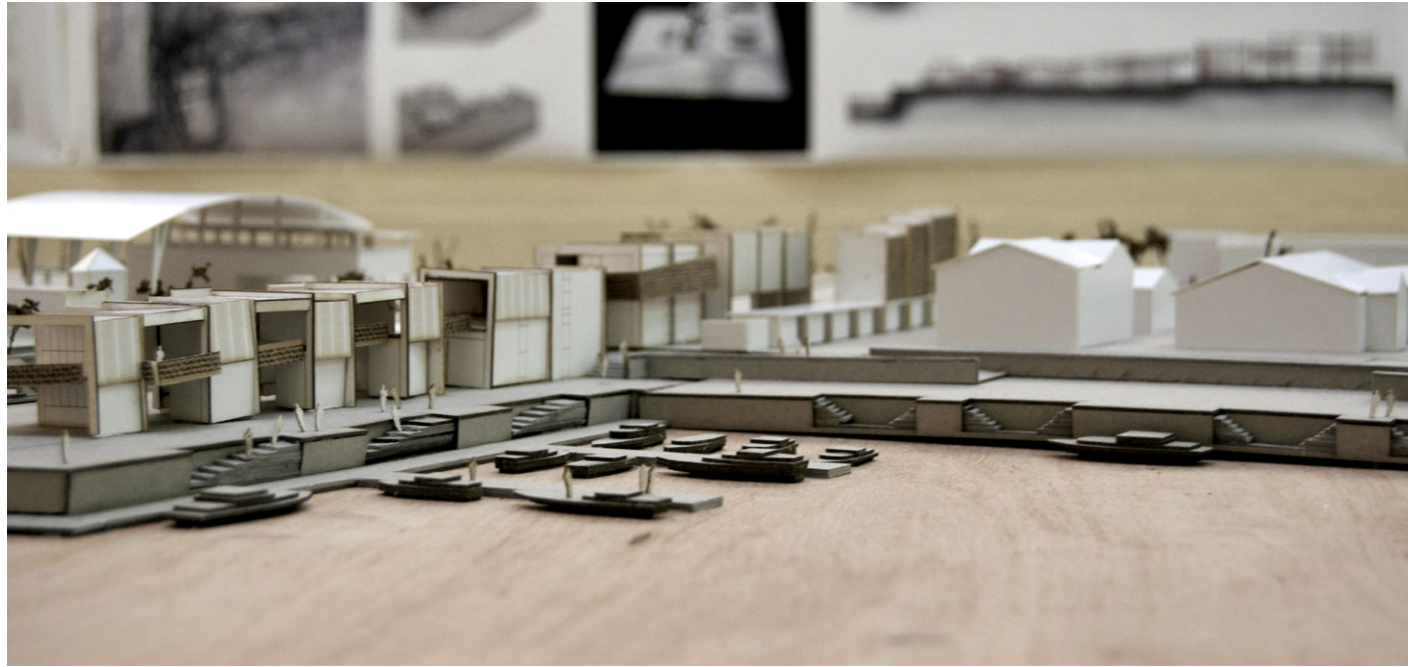


Figure 8.20: Model view 5



Figure 8.21: Model view 6



## CHAPTER 9: CONCLUSION



Figure 9.1: Abstract Painting:  
Abstraktes BILD, Gerhard Richter,  
 1990

*...[C]amcorders have built-in features that encourage generic usage: a warning light flashes whenever there is a risk of 'spoiling' a picture, as if to remind the user that they are about to become creative and should immediately return to the norm. (Dunne, 1999: 30)*

There is a restraint on creativity when people are forced to use production tools in a particular fashion. When a building specifies to its inhabitant a singularity of use this restraint on creativity becomes evident in architecture. Figure 9.1 represents the blurring of an image and figures 9.2 and 9.3 represent the abstraction of an image of an architectural space through light exposure. All three figures provide an alternative way of looking at established/normative ideas.

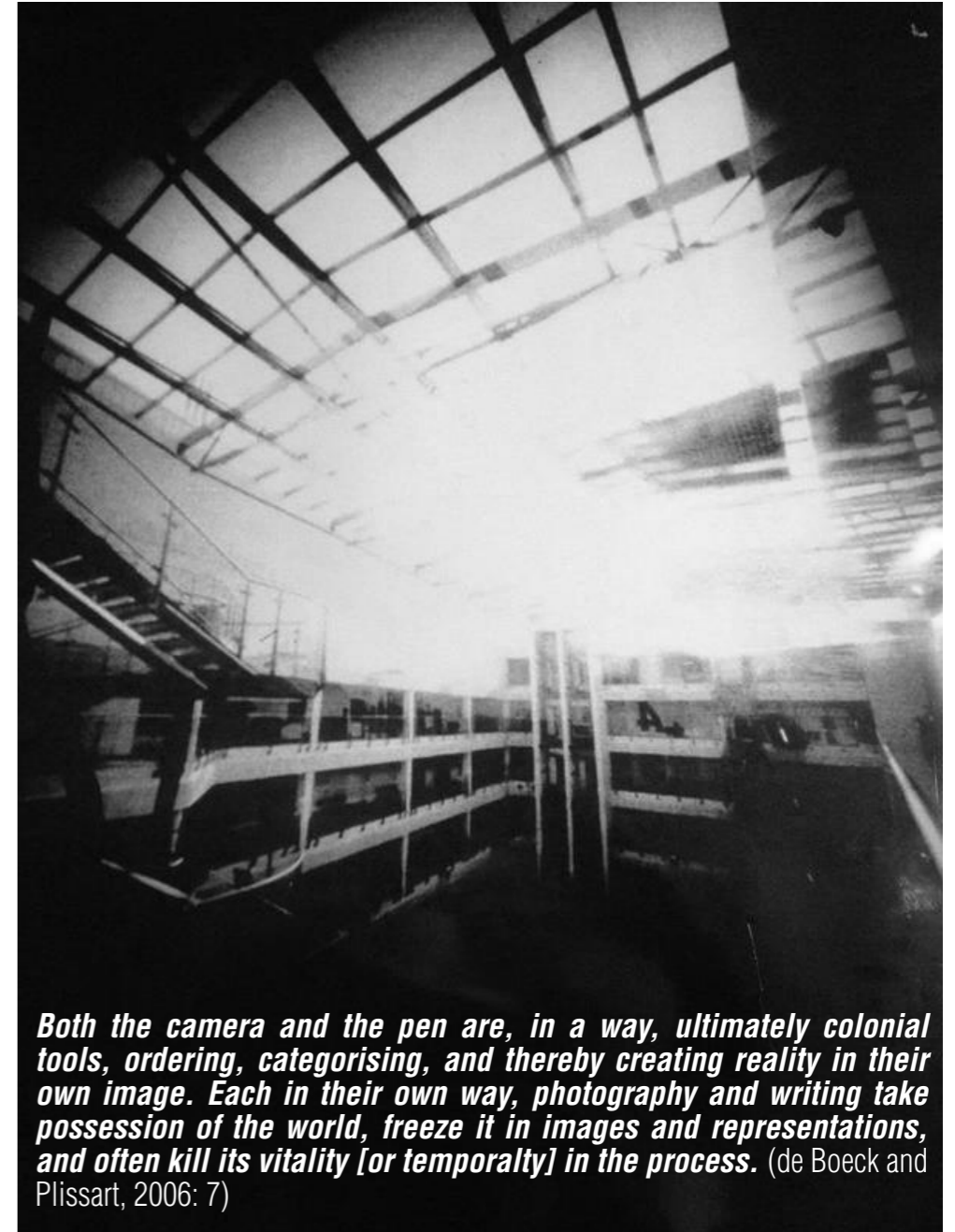
As buildings are experienced spatially there is a sequencing of experience in time. The concept of 'blurring' in painting or photography becomes evident in architecture when the sequencing of spatial experience undergoes an abstraction so that the relationship between one spatial event and another is not wholly fixed. What this translates to in real and simplified terms is degrees of concealment and revealment: or the curtain and the veil.

It is impossible to wholly capture the events - the experiences, smells, sounds, energies and the possibilities - in the *Baixa*; either in text or in imagery. These events and their temporality form a basis for our spatial experiences and are often more striking than the built forms themselves. The selective concealment and revealment of the temporal nature of these events by buildings demonstrates the plurality of use. In this way actions find liberation.





Figure 9.2: Architectural Pinhole photograph 1



*Both the camera and the pen are, in a way, ultimately colonial tools, ordering, categorising, and thereby creating reality in their own image. Each in their own way, photography and writing take possession of the world, freeze it in images and representations, and often kill its vitality [or temporality] in the process.* (de Boeck and Plissart, 2006: 7)

Figure 9.3: Architectural Pinhole photograph 2

## APPENDIX A: URBAN HISTORY

P.	154	TIMELINE
	158	BACKGROUND TO HISTORICAL DEVELOPMENT OF MAPUTO
	159	TRADING POST ON THE ISLAND: EARLY 19TH CENTURY
	161	THE BEGINNINGS OF A TOWN: LATE 19TH CENTURY
	163	EARLY 20TH CENTURY DEVELOPMENTS
	165	THE OFTEN OVERLOOKED “REED CITY” DEVELOPMENT
	165	ADDRESSING THE WIDER METROPOLITAN ZONE



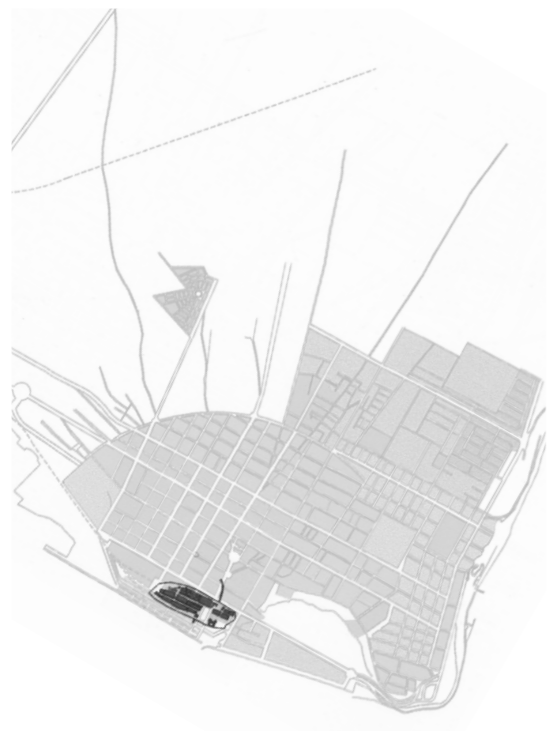


Figure 10.1: Fort & trading settlement on an island swamp - 1876

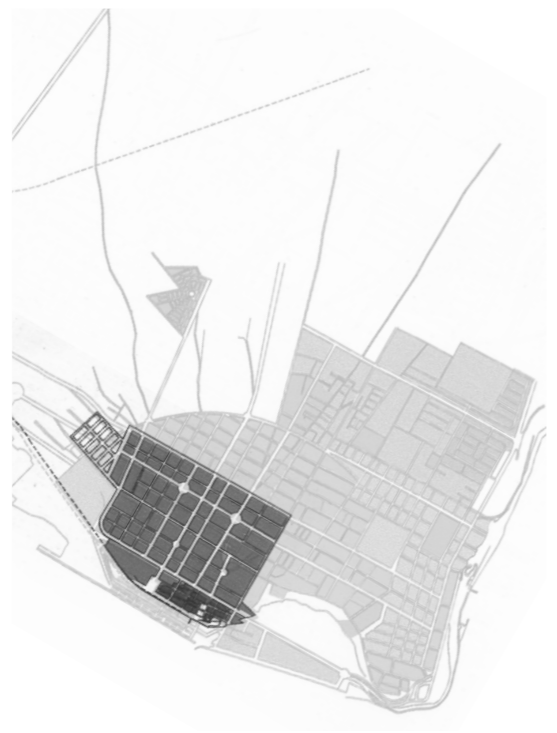


Figure 10.2: First phase of swamp reclamation & layout of formal street grid -1887

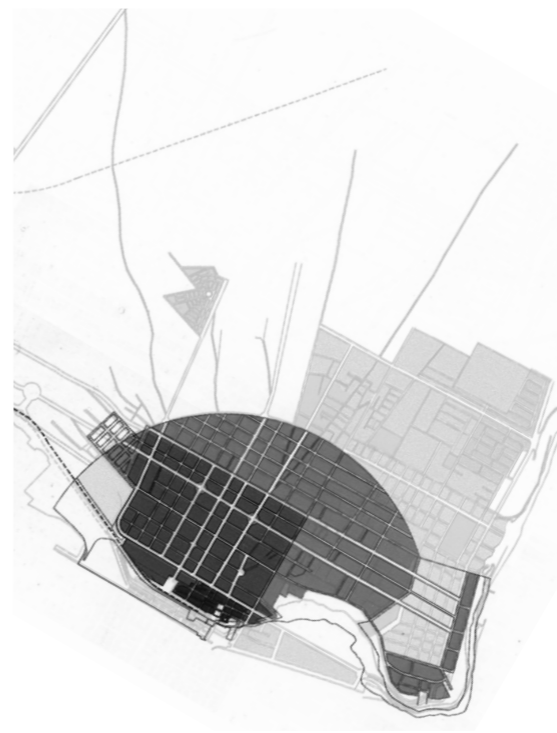


Figure 10.3: Circular demarcation of city limits & extension of street grid -1900

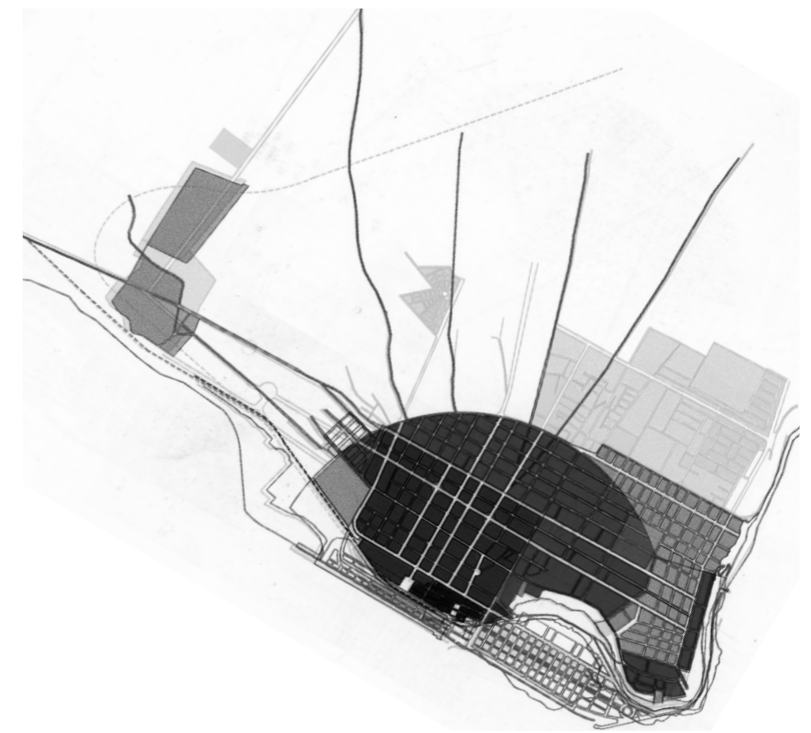


Figure 10.4: Second phase of swamp reclamation & extension - 1915

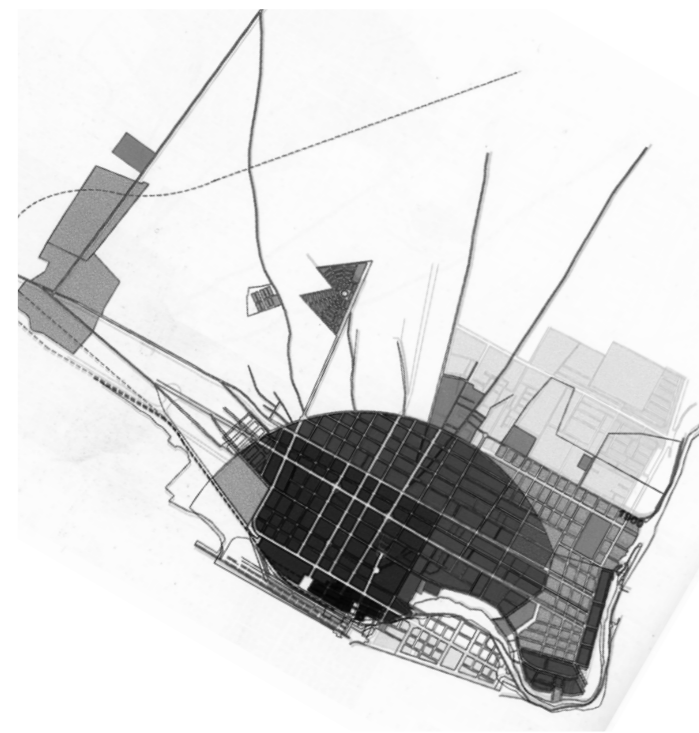


Figure 10.5: Organic extension. consolidation of erf plots in second phase swamp reclamation - 1940

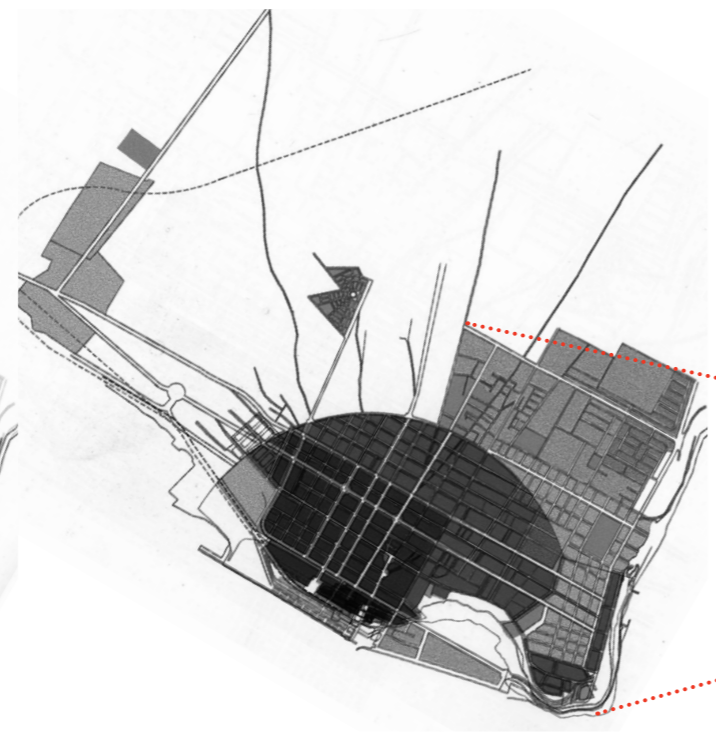


Figure 10.6: Extension of the city to the north - 1955



Figure 10.7: 1969 Map

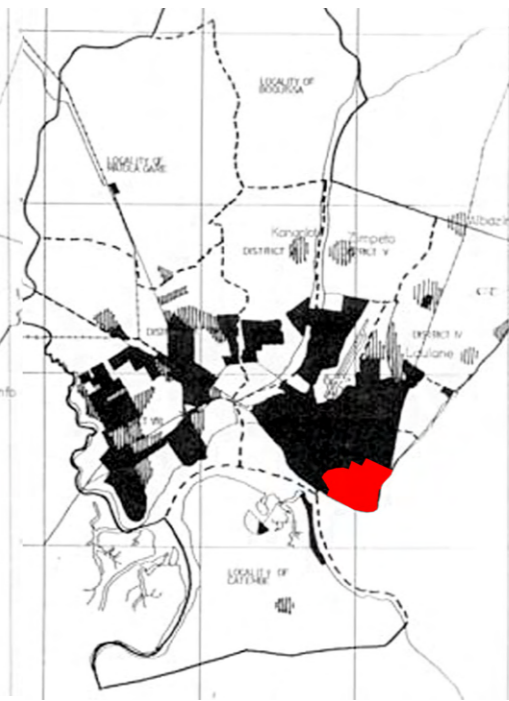


Figure 10.8: 1979 Map

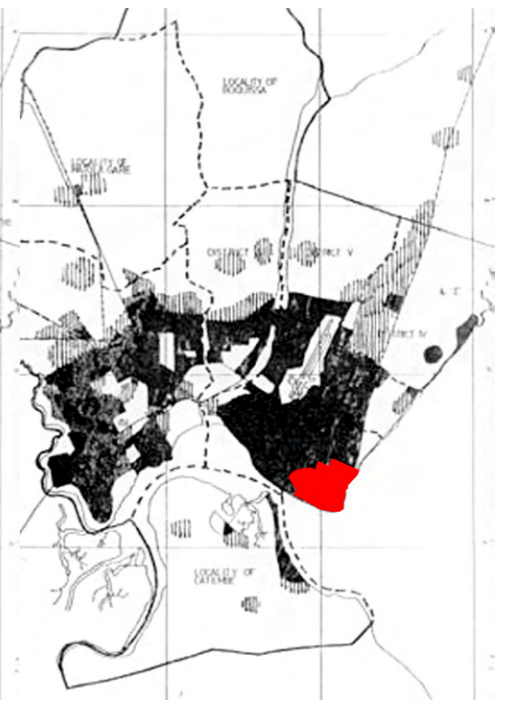


Figure 10.9: 1989 Map

Post independence there is an influx of people from rural areas and resultantly an expansion of the informal peripheral areas of greater Maputo.



### Background to Historical Development of Maputo

The city was previously known by two names; Lorenzo Marques, under the era of colonialism and mercantile trade of the Portuguese; and Xilunguine – the place of strangers - by local indigenous Ronga people of the same era (Jenkins, 2009: 1). The region has a long history of oceanic trade. Sofala, dating back to 700AD, laid some 600km north of present day Maputo and formed a main trade link between Southern Africa and the Arabian region for most of the period prior to the colonization of East Africa by Europe in the 16th century (Newitt, 1995: 4). Smaller scale intercontinental trade activities in present day Maputo can, however, be traced back as far as the 9th century (Jenkins, 2009: 1). From the 16th century till the 19th century the Portuguese and the Dutch sought to inhabit the region along the Espírito Santo Estuary of Delagoa Bay (present day Maputo Bay) as a means to control maritime trade and subsequently to establish connections to the mainland to allow trade and influence with local inhabitants of the region (Lage and Mabana, 2009: 1).

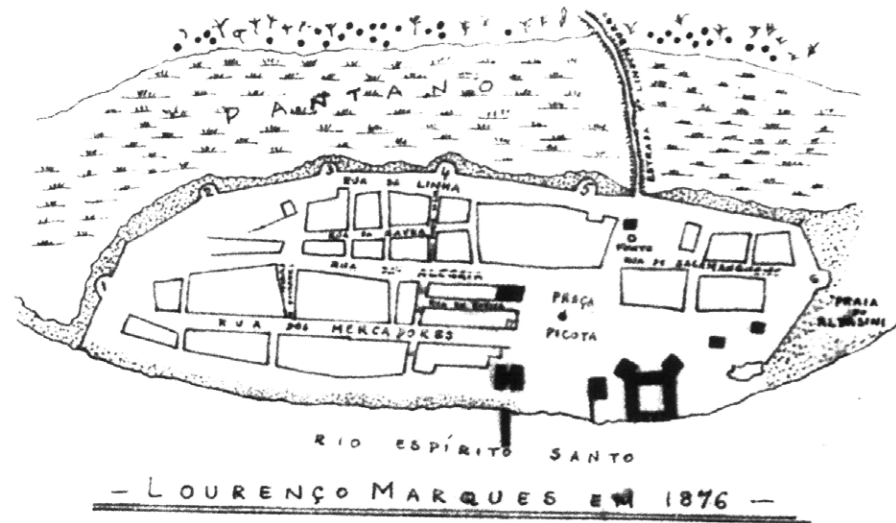


Figure 10.11: 1876 Plan of the early settlement of Lourenço Marques showing island separated from the mainland by marshland.

### 1) Trading post on the Island (early 19th Century)

The Portuguese established the permanent settlement in Lorenzo Marques in the 19th century initially on a small island north of the Espírito Santo Estuary (Lage and Mabana, 2009: 1). This island, seen in Figure 10.11, together with areas of reclaimed land between the island and the mainland form the historic heart of present day Maputo. Space was informally arranged around a central open square adjacent to the main fort; the square provided lines of sight from the fort to the ocean (Jenkins, 2009: 2).



Figure 10.10: View of early settlement across the marshland from the mainland



Figure 10.12.1: Position of coastline and island 1876

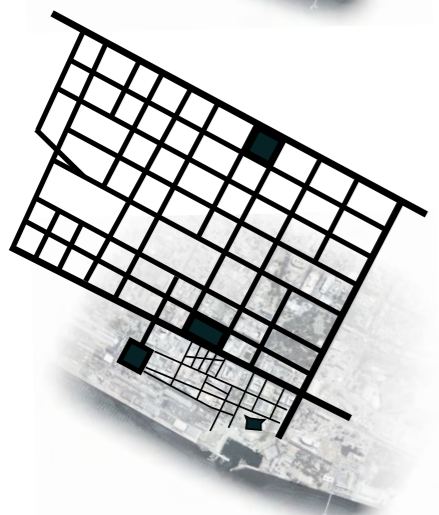


Figure 10.12.2: Diagrammatic grid layered over the 1887 Plan for the expansion of Lourenço Marques onto the mainland

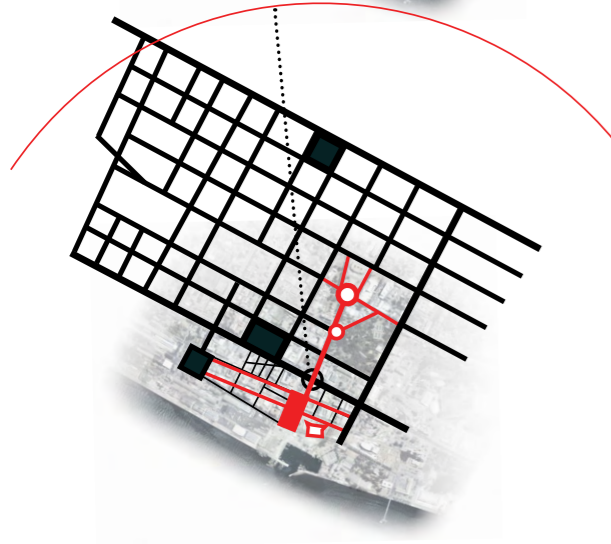


Figure 10.12.3: Diagram showing the introduction of the city hall axis, known today as Avenida Samora Machel

## 2) The beginnings of a town (Late 19th Century)

Following the discovery of Gold in Lydenburg, and later in Johannesburg, a rail link between Lourenço Marques and the Transvaal was initiated in 1877; the line to Johannesburg was completed in 1894 (Zezeza, 1997: 403).

Towards the end of the 19th Century there was increasing pressure on Portugal to demonstrate their control over their African colonies. Furthermore the 1890 financial crisis in Portugal made urgent the need to secure a profit in these colonies (Newitt, 1995: 362). In addition to colonial tariffs such as land tax and labour agreements with South Africa, the establishment of a reliable rail service secured the economic viability of Lourenço Marques. In this time 3 Major urban expansions/developments led by the Portuguese Ministry of public works stand out:

- Land Reclamations to incorporate the island into the mainland
- The development of the 1887 plan (Figure 10.12.2) in which a formal orthogonal road grid is drawn over the mainland. Wide avenues are seen to intersect from the north and terminate in a hierarchy of open plazas within the fine (once informal) grain. The orientation of the axis of this grid is aligned with the railway station and expanded industrial section of the port and not with the central square at the fort.
- A 2km wide semi-circular radius was established as the city's boundary. This final phase was completed in 1900.





Figure 10.13: Figure-Ground map of Lourenço Marques - 1903



Figure 10.14: Figure-Ground map of Lourenço Marques - 1940

### Early 20th Century Developments

In a paper on the history of the urban form of Maputo, Paul Jenkins (2009: 8) describes three characteristics pertaining to the formal urban spatial plan of the city in the beginning of the 20th century:

- 1) The plan does not respond or adapt to the topography of the region;
  - i. Roads retain their strict orthogonal geometry despite steep gradients and varied landform.
  - ii. The coastline is displaced with progressive land-reclamations.
  
- 2) The social and cultural values established in the informal arrangement of space around central public – event – space is overshadowed and dominated by a rational orthogonal grid, described by Jenkins as the ‘Realpolitik and subservient state-oriented economy of the colony’.
  
- 3) The plan is described as visionary and not wholly realistic: *...there is little evidence for any analysis of the actual situation or trends of urban development as the basis for future planning.* (Jenkins, 2009: 8)

Furthermore, Jenkins (2009: 8) demonstrates, with a comparison between the city plans of 1903 and 1940 (Figures 10.13 & 10.14), that formal urban development was largely confined to infrastructural development and densification within the framework and 2km radius boundary discussed. With the exception of the land to the north east of the city (near the present day Polana) as well as industrial developments to the west, little formal expansion outside of this boundary occurred.

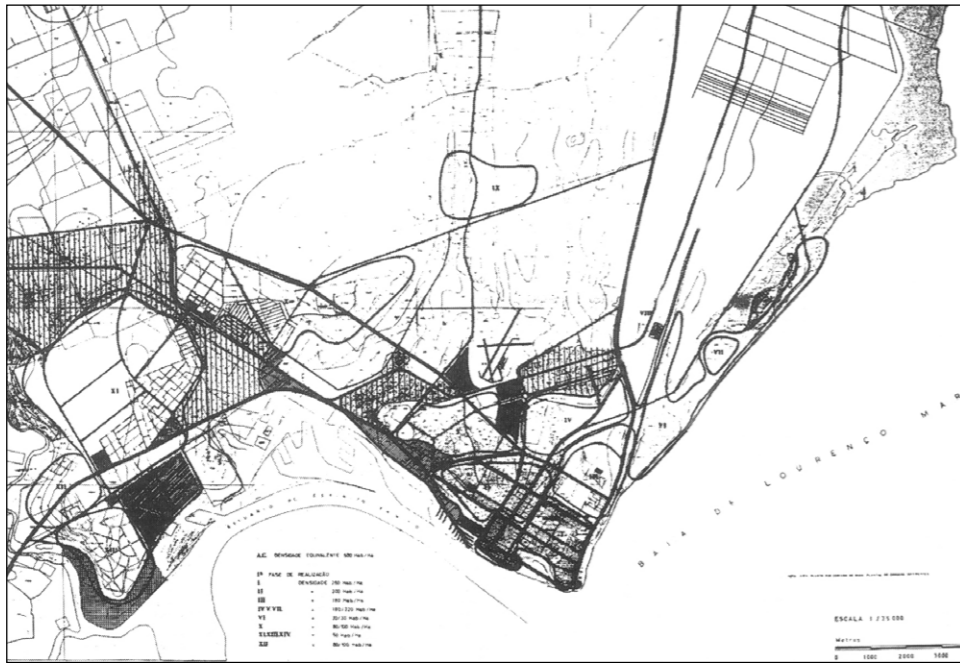


Figure 10.15: Municipal map: Zoning and network plan -1953



Figure 10.16: Municipal map: Actual network and land occupation -1953

### The Often overlooked “Reed City” development

The above historical description of the early development of Lorenzo Marques is delivered as an overview of the towns growth. It does, however, overlook the development of the areas peripheral to Lorenzo Marques; occupied by local inhabitants of the region. By prohibiting land ownership local inhabitants were restricted to renting within areas peripheral to the city: ... **the dominant African population was forced to occupy liminal spaces – physically at the margins of this city ... The ‘rentier’ basis for the colonial economy, based on taxation of transport and trade as well as migrant labour to South Africa (contracted from 1928) is thus expressed in the encirclement of the city to the northwest (informal housing for indigenes) and southwest (where the all important port and railway continued to expand into the bay).** (Jenkins, 2009: 9). Figures 10.15 & 10.16 show both the planned city network as well as the actual city network of 1953; in comparison of these 2 plans the degree to which liminal zones are excluded from the city planning of the first half of the 20th century is made evident.

### Addressing the wider metropolitan zone

In the early 1960s a local urban planning office was established by the city council. The issues addressed by this office included wider city scale development of transport networks, land use and infrastructure and, of significance, the inclusion of the neighbouring town of Matola within the city planning strategies of Lorenzo Marques. Part of this plan involved the expansion of port facilities all the way to Matola owing to the massive growth of its industrial sector. The period from 1960 to 1970 marked an increased growth of the economy of Lorenzo Marques, and resultantly a large densification (in height) of the formal city. At the same time Frelimo was formed in 1962 as a movement fighting for the independence of Mozambique from Portugal.





Figure 10.17: View towards the city centre from the 'Reed City', showing more established informal housing areas to the right and more recent areas to the left.

In 1974, following the Carnation Revolution, in which Portugal turned from a dictatorship state to a democratic state, Mozambique achieved independence. Subsequently there was an exodus of many Portuguese citizens from the country, Frelimo took over the rule of Mozambique, Lorenzo Marques was renamed Maputo and a brief period of peace followed. Shortly after in 1975 a 17 year long civil war broke out leaving Mozambique one of the most impoverished countries in the world by its end in 1992 (Newitt, 1995: 554). While construction work during this period slowed dramatically in the inner (formal) city, it is important to note that urban growth and restructuring continued and in fact dominated in the informal (edge) areas of the city with a large influx of formerly marginalized citizens from the rural surrounds moving to the city.

Maputo, like many African cities, is a place of contrasts and dualism. The political climate of the 70's and 80's profoundly effected the socioeconomic climate of Maputo, this socioeconomic climate - specifically the dominance of the informal economy during and after the civil war - had a profound and marked influence on the spatial and occupational development of the city. The dominance of the informal economy, coupled with the near collapse of the formal economy, additionally couple with the mass exodus of the city by the Portuguese in the mid 70's can be seen to have created the platform for the establishment of many informal economic activities in the heart of the Cement City. It was estimated in 2000 that 50% of the Maputo workforce was employed in the informal sector of the economy (Jenkins, 2000: 213). The result is that Maputo is often considered to be a place where extremes exist side by side; Helgesson discusses the humanly tactile nature of this coexistence:

***In Maputo: a truckload of people singing at the top of their voices. A patch of pavement transformed into a miniature smithy. This has been constant in the socialist and capitalist phases of Mozambican history... The Chaotic visibility of Maputo makes it painful but also humanly accessible... (Helgesson, 2008: 268).***

## APPENDIX B: THEORY: HISTORIC REVIEW

P.	171	THE RATIONAL
	173	THE COUNTER RATIONAL
	175	ARCHITECTURAL PRACTICE
	175	TIME AND 'CHANGEFULNESS' IN ARCHITECTURE
	176	FLEXIBILITY
	177	REACTIONS



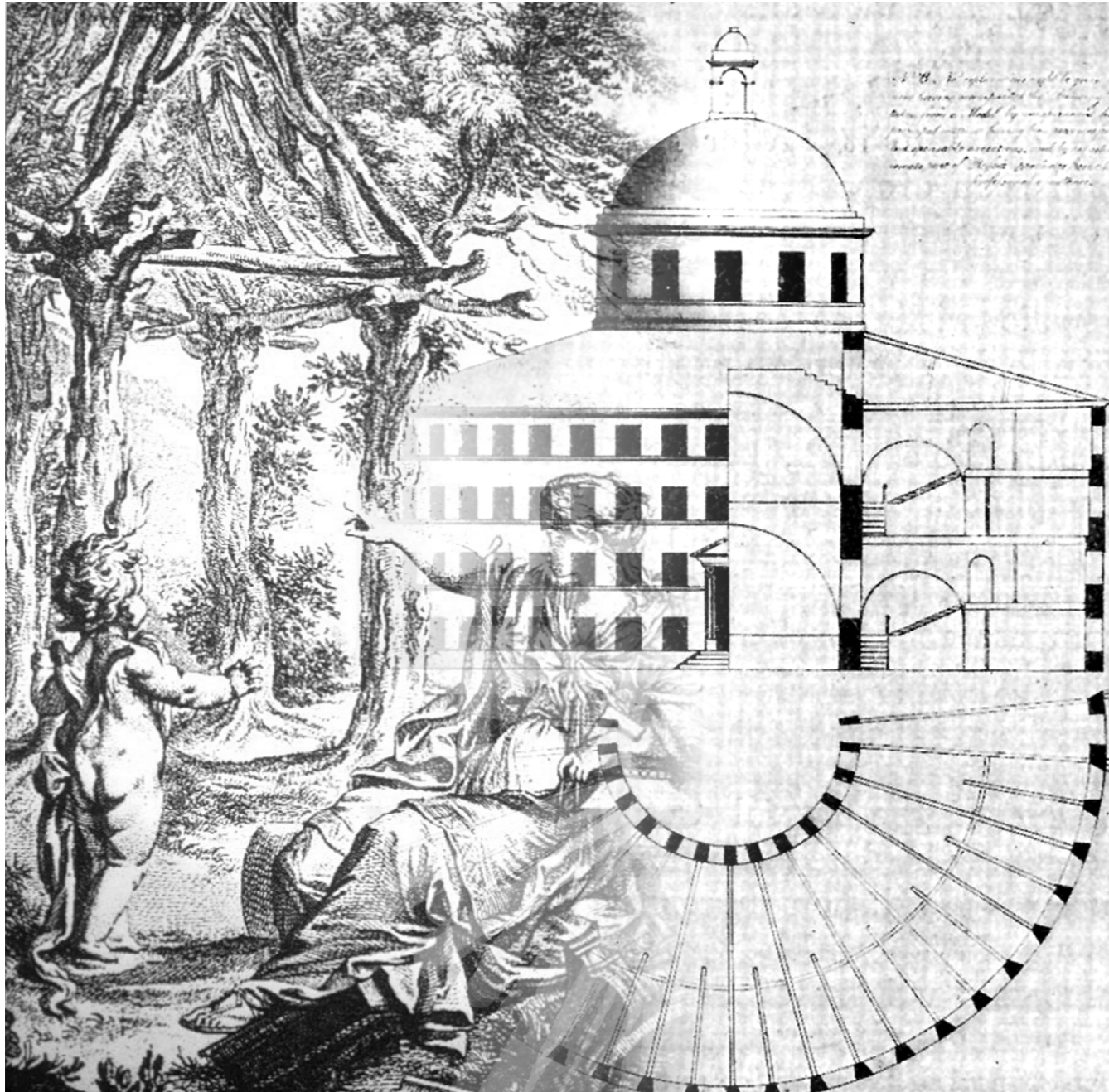


Figure 11.1: Charles Eisen's engraving of the Vitruvian primitive hut overlaid on Jeremy Bentham design of the Panopticon

## The Rational

The Age of Enlightenment brought with it ideas of progress and utopia, coupled closely with the idea of utopian man whose mind is liberated and whose consciousness manifests from his ability to think and reason rationally. In his Essay, The Third Typology, architectural historian, Anthony Vidler, considers two typologies in architecture that embody this evolving mindset of the enlightenment period namely, the primitive hut - conceptually discussed under Laugier - and the Panopticon - under the discussions of Foucault (Vidler, 1976: 260).

### The Primitive Hut:

Within the context of the Rationalist mindset of the 18th century, Laugier sought to position the core concepts of architecture within a reduction of form to embody purely functional and reduced structural order: Laugier proposed that a natural basis for design was to be found in the model of the primitive hut. (Vidler, 1976: 260).

### The Panopticon - Human power:

The Commercial revolution (16th century – 18th century) followed by the Industrial Revolution (18th Century – 19th Century) were both paralleled in time and partially in ideology with the Age of Enlightenment (Cheney, 2010: 19). Following on the progressions of the Industrial Revolution there was a growing interest in late 19th Century and early 20th Century European philosophy with the development of utopian social models, human control over it, and a race for the domination of global markets and resources (Vidler, 1976: 206). Within this context Foucault illustrates how this domination enslaves society by comparing it with Bentham's Panopticon and its typological ideals of functionalism, rationality and control that embody much of the thought of the modern period (Mason, 2002: 14).



Figure 11.2: Fountain, 1917,  
Marcel Duchamp, 1964 Replica

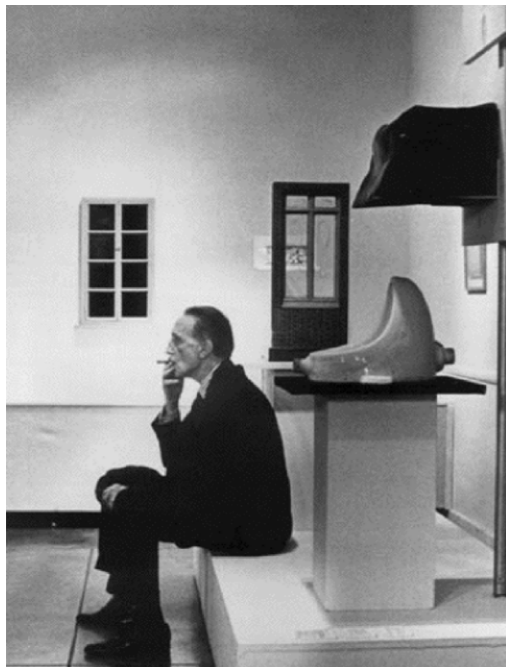


Figure 11.3: Photograph of artist  
Marcel Duchamp sitting and  
smoking in front of his artwork:  
Fountain

In this comparison we can trace, through typological analogy, the progressive shifts after the Enlightenment of the social, political, economic and technological systems in the Western World. In these shifts reductionism and the rational perverted into utopian control, surveillance and normalisation; the primitive hut effectively morphed into the Panopticon. According to Kleiner and Mamiya (2005: 1033) it is the often violent form that this control assumed that can be seen (with the advantage of hindsight) as the cause for its own eventual undoing.

### The Counter Rational

Following the events of the Second World War, the mid-20th Century witnessed a mass reaction against the rationally ordered and controlled (Rowe 1975: 268). These reactions can be considered in part as an extension of a Post-Structural thinking; where there is an effort to undo the pre-determined as an aspiration towards the affirmative cause of re-definition (Derrida, 2004). Stated in specific reference to the individual there is a move toward a recognition of each individual's subjective perceptions; this in an effort to undo the fixed notions of the aspiration towards 'Utopian Man'; in part to re-establish identities. It is from this that an idea of the individual establishing identity through difference is found (Kim and Mc Cann, 2003: 253).

### Architectural practice

In line with the above concepts the relationship between the user and the designer in the built environment is brought into question in the mid-20th Century: the user's perceptions and interactions are seen to drive the design. Whereas previously there was the tendency to create architectural form from an outside, objectified and normalised point of view (Fleishman, 2009: 13), the architect's role now shifted to one of facilitator of the design process. The user moved from a position of submissiveness to one of assertiveness.





Figure 11.4: Interior photograph of Maison de Verre, designed by Pierre Chareau and Bernard Bijvoet, 1931. An example of mechanical flexibility.



Figure 11.5: Nakagin Capsule Tower, designed by Kisho Kurokawa, 1972. An example of a combination of mechanical flexibility and modular flexibility.

### Architectural practice (continued)

Jonathan Hill parallels these ideas with Barthe's, Death of the Author (1967) and describes an analogical death of the designer (Hill, 2003: 68). From this background Hill differentiates between three types of users, namely; the passive user, the active user and the creative user (2003: 9-27). Important to note here is that the so called 'death of the designer' is not an end in itself, it is considered as a result of a new type of user; namely the creative user; and in this light suggests the birth of a new type of designer - the type of designer who concerns themselves with temporality, uncertainty and resultantly plurality.

### Time and 'changefulness' in architecture

***An existing space may outlive its original purpose and the raison d'être which determines its forms, functions, and structures; it may thus in a sense become vacant, and susceptible of being diverted, re-appropriated and put to a use quite different from its initial one.*** (Lefebvre, 1991: 167)

In order for the user to find expression in relation to a building they need to take perceptual possession of it. The interpretation is that this is best achieved by allowing an engagement with and the realisation of one's own influence on a built work (Dirsuweit, 2009: 3).

Within the latter half of the 20th Century the concept of flexibility, which has at the core of its considerations 'time and uncertainty' (Hill, 2003: 30), is introduced and widely explored within Post-Modern architectural theory. Flexibility was seen as a solution to address uncertainty while still retaining formalistic order and can be considered within 2 categories:

## 1 Mechanical Flexibility

Buildings as final products that can mechanically change to accommodate a variety of preconceived uses – within this category of flexibility a portion of the building fulfils multiple functions (Hill, 2003: 358); usually elements in the building can move or rotate to allow for this. The user in this instance becomes Hill's 'active user' as they actively change aspects of the building to suit their desired function; and

## 2 Modular Flexibility

Buildings as products that are easily changeable in future through an additive or subtractive process. This suggests either that the parts and fixtures can easily be replaced by new and different parts and fixtures. This type of flexibility usually makes use of modular, demountable design (Hill, 2003: 358).



Figure 11.6 : Eames House, Charles and Ray Eames, 1952. An example of modular flexibility.

## Reaction

In Lessons for students in Architecture, Herman Hertzberger discusses these concepts of flexibility in relation to functionalism. His criticism of the first form of flexibility (as categorized above) is that it can be seen as an extension of functionalism, which seeks to isolate several solutions to a problem and maintain control of function in time over the user. His criticism of the second form of flexibility is the vagueness at its core. It produces a solution that can cater for all problems, but not necessarily the best solution for an isolated set of problems; this neutrality can often have the opposite effect than intended and lead to a stagnation of use. (Hertzberger, 2001: 246)

With these descriptions of flexibility and their various criticisms in mind, three notions are considered as standing out. The first is the idea that for something to be adaptable in use it has to retain and exemplify a modular simplicity (Hill 2003: 39). The second idea is that varied and differentiated use can often be hindered by mass uniformity (Hertzberger, 2001: 147), and the third is that 'variance' in the use of architecture results primarily from the temporal action of human beings. Hertzberger describes this concept as polyvalency and it is this that becomes the starting point in the establishment of a normative stance in architectural theory in chapter 2.



A special thanks to :

Dr. Jacques Laubscher and Marga Viljoen for their continuous guidance throughout the project

The organisers of the Maputo Studio 2011 Workshop for making it possible to work in Maputo and, my fellow participants for enriching the workshop

Catherine Deacon, Candice Devenish, Thomas Kriel and Helena Michaletos for their invaluable assistance in the final stages of preparation for my exam

To my parents Joan Dekker and Leslie Devenish for their continuous support and encouragement

Sharon Campbell-Smith and Geo. Constable Printers for the printing of my dissertation book

## CITED REFERENCES

- ANDRAG, B., 2007. *Oppositions*. Master's Dissertation. Johannesburg: the University of the Witwatersrand.
- ARENDT, H., 1998. *The Human Condition*. Chicago: University of Chicago Press.
- BACHELARD, G., 1958. *The Poetics of Space*. New York: Orion Press.
- BAKKER, H., 2009. *Headoffice & factory for TriBeCa*. In *Digest of South African Architecture*, 2009, pp.58-59.
- BAKKER, H., 2011. *Interview: TriBeCa Coffee Factory*. Pretoria: 26 March 2011, Unpublished.
- BARTHES, R., 1967. *The Death of the Author*. [Online] Available at: <http://www.deathoftheauthor.com/> [Accessed 17 April 2011].
- BIGHAM, G., 2012. Interview: *Discussion on opportunities for water treatment in urban fish auction facility*, held on 5 May 2012, Johannesburg: Unpublished
- CARTER, P., 2003. *Mythforms: Techniques of Migrant place-making*. In *Drifting: Architecture and Migrancy*. New York: Routledge. pp.82-98.
- CHENEY, P., 2010. *Revolutionary Commerce: Globalization and the French Monarchy*. Cambridge, MA.: Harvard University Press.
- CHING, F., 2007. *Architecture: Form, Space & Order*. New Jersey: John Wiley and Sons.
- CUNNINGHAM, D. & GOODBUN, J., 2009. Interview: *Rem Koolhaas and Renier de Graaf*. In *Radical Philosophy*, 154, pp.35- 47.
- DE BOECK, F. & PLISSART, M., 2006. *Kinshasa: Tales of the Invisible City*. Antwerp, Belgium: Ludion.
- DELEUZE, G., 1990. *Logic of Sense*. London: The Athlone Press
- DERRIDA, J. 2004. Interview in: *Deconstructivist architects* [video recording]. New York: Michael Blackwood Productions
- DICKSON, S. & DOVEY, K., 2002. *Architecture and Freedom? Programmatic Innovation in the Work of Koolhaas/OMA*. In *Journal of Architectural Education*, 56(1), pp.5-13.
- DIRSUWEIT, T.C. 2009. *Public space and the politics of propinquity in Johannesburg*. Conference Presentation. Johannesburg, University of the Witwatersrand: South African Cities Conference
- DOVEY, K., 2004. *Fluid City: Transforming Melbourne's Urban Waterfront*. Sydney: UNSW Press.
- DUNNE, A., 1999. *Hertzian Tales: Electronic Products, Aesthetic Experience and Critical Design*. London: Royal College of Art.
- FAGERSTROM, C., 2003. *View from Barcelona*. In the *Architectural Review*, 213(1276), pp.34-35.
- FICHTNER-RATHUS, L., 2007. *Foundations of Art and Design*. Boston: Cengage Learning.
- FLEISHMAN, M., 2009. *CARGO: Staging Slavery in the Cape*. Johannesburg: Unpublished, Presented at the 2009 South African Cities Conference.

- FOUCAULT, M., 1986. *Of Other Space*. In *Diacritics*, 16(1), pp.22-27.
- FRAMPTON, K., 1983. *Towards a Critical Regionalism: Six Points for an Architecture of Resistance*. In H. Foster, ed. *The Anti-Aesthetic. Essays on Postmodern Culture*. Seattle: Bay Press. pp.16-30.
- GUYOT, A., 2009. *Spaces for enchantment and the unknown*. Stellenbosch University: Thesis Submission for MPhil in Sustainable Planning and Management.
- HELGESSION, S., 2008. *Johannesburg, Metropolis of Mozambique*. In *Johannesburg the elusive metropolis*. Johannesburg: Wits University Press. pp.259-70.
- HERTZBERGER, H., 2001. *Lessons for students in Architecture*. Rotterdam: 010 Publishers.
- HERZOG, J. & DE MEURON, P., 2004. *190 Forum 2004 Building and Plaza*. [Online] Available at: <http://www.herzogdemeuron.com/index/projects/complete-works/176-200/190-forum-2004-building-and-plaza.html> [Accessed 5 February 2012].
- HILL, J., 2003. *Actions of Architecture*. New York: Routledge.
- HOOKS, B., 1989. *Feminist theory: from margin to center*. California: Pluto Press.
- JENKINS, P., 2000. *City Profile Maputo*. In *Cities*, 17(3), pp.207 - 218.
- JENKINS, P., 2009. *Xilunguine, Lourenço Marques, Maputo – structure and agency in urban form: past, present and future*. In *African Perspectives 4: The African city centre (re-)sourced*. Pretoria/ Tshwane, 2009.
- JONKHOFF, W. & MANSHANDEN, W., 2001. *Infrastructure Productivity Evaluation*. New York: Springer.
- KIM, S.K. & MC CANN, C.R. 2003. *Feminist theory reader: local and global perspectives*. London: Routledge
- KLEINER, F. & MAMIYA, C., 2005. *Gardner's Art through the Ages*. 12th ed. New York: Cengage Learning.
- KOOLHAAS, R. et al., 2001. *Mutations*. Barcelona: ACTAR.
- KWINTER, S., 2001. *Architectures of Time: Toward a Theory of the Event in Modernist Culture*. Cambridge: MIT Press.
- LAGE, L. & MABANA, R., 2009. *Maputo Baixa: the heritage value of this area is under risk due to development pressure*. Pretoria: *African Perspectives Conference 2009*, Translator: Edna Peres.
- LEFÈBVRE, H., 1991. *The Production of Space*. Cambridge, MA.: Blackwell.
- MASON, G., 2002. *The spectacle of violence*. New York: Routledge.
- MCPHERSON, G., 2011. *Interview: Current and Future Port Management*. Maputo: June 2011, Unpublished.
- MEMOS, C., 2004. *Port Planning*. In G. Tsinker, ed. *Port engineering : planning, construction, maintenance, and security*. Langue: ANGLAIS. pp.7-64.
- MIGUEL, E., 2007. *Lonja de pescado, Benicarló, Castellón = Fish market in the port of Benicarló, Castellón*. In *Via arquitectura*, 17, pp.38-43.
- NEWITT, M.D., 1995. *A History of Mozambique*. Hong Kong: C. Hurst & Co. Publishers.



- NYAMBIR, T.J., 2002. *Future Management and Rehabilitation of Maputo Fishing Port in Mozambique*. Iceland: The United Nations University, Fisheries Training Program.
- ORTON, A., 1991. *The way we build now*. New York: E&FN.
- ROWE, C. 1975. *Collage City*, In Nesbitt, K., *Theorizing a New Agenda for Architecture*. New York: Princeton Architectural Press. pp. 266- 294
- VIDLER, A., 1976. *The Third Typology*. In Nesbitt, K., *Theorizing a New Agenda for Architecture*. New York: Princeton Architectural Press.
- WARK, M., 2001. *Telegram from Nowhere*. In Mutations. pp.30-39.
- ZELEZA, T., 1997. *A Modern Economic History of Africa: The Nineteenth Century*. Kampala: East African Publishers.

## FIGURES REFERENCES

- ALLEN, E., 2008. *Fundamentals of Building Construction: Materials and Methods*. New York: Wiley.
- AMADALVAREZ(ALIAS), 2004. *2004 Universal Forum of Cultures*. [Online] Available at: <http://en.wikipedia.org/wiki/File:BCN-ParcForum-4923.jpg> [Accessed 9 August 2011].
- ARANGO, J., 2010. *Maestria en Arquitectura*. [Online] Available at: [http://maestriarq.metroblog.com/john\\_arango](http://maestriarq.metroblog.com/john_arango) [Accessed 16 March 2012].
- BAKKER, H., 2011. *Interview: TriBeCa Coffee Factory*. Pretoria: 26 March 2011, Unpublished.
- BARDOU, F., 2011. *El Forum - Citadade de Barcelona*. [Online] Available at: <http://www.panoramio.com/photo/49616725> [Accessed 3 March 2012].
- BAUER, M., et. al., 2010. *Green Building: Guidebook for Sustainable Architecture*. Springer-Verlag: Berlin
- CASSIMO, M., 2011. *Maputo Harbour Photograph series*. Maputo: Unpublished.
- CHING, F., 2007. *Architecture: Form, Space & Order*. New Jersey: John Wiley and Sons.
- CROUCHER, A., 2012. *Architectural photography through pinhole*. [Online] Available at: <http://www.behance.net/gallery/Architectural-Pin-hole-photography/3133017> [Accessed 19 March 2012].
- DONOVAN, P., 2008. *News Center*. [Online] Available at: <http://www.buffalo.edu/news/9245> [Accessed 5 May 2012].
- FISHERIES, FAO, 1988. *Small-scale fish landing and marketing facilities*. [Online] Available at: <http://www.fao.org/docrep/003/t0388e/t0388e00.html> [Accessed 3 March 2011].
- FORJAZ, J., 2004. *José Forjaz, Arquitectos*. [Online] Available at: <http://www.joseforjazarquitectos.com/> [Accessed 6 March 2011].
- GKD-USA, 2000. *GKD Metal Fabrics*. [Online] Available at: [http://www.gkdmalfabrics.com/products/helix\\_6.html](http://www.gkdmalfabrics.com/products/helix_6.html) [Accessed 18 April 2012].

- GREGORY, R., 2004. *Blue lagoon: Forum 2004 Building and Plaza*. In *Architectural Review*, 216(1291), pp.56-63.
- JENKINS, P., 2000. *City Profile Maputo*. In *Cities*, 17(3), pp.207 - 218.
- JENKINS, P., 2009. *Xilunguine, Lourenço Marques, Maputo – structure and agency in urban form: past, present and future*. In *African Perspectives 4: The African city centre (re-)sourced*. Pretoria/ Tshwane, 2009.
- KOOLHAAS, R. et al., 2001. *Mutations*. Barcelona: ACTAR.
- KROKO, R., 2008. *Montessori primary school*, Delft, Netherlands, 1960-66. [Online] Available at: <http://www.flickr.com/photos/krokor/5473863079/in/photostream/> [Accessed 5 August 2011].
- LOBATO, A., 1968. *Biografia da Cidade*. [Online] Available at: <http://edomingos.tripod.com/id1.html> [Accessed 9 July 2011].
- MERRILL, L., 2010. *Streets*. [Online] Available at: [http://www.leighmerrill.com/?page\\_id=472](http://www.leighmerrill.com/?page_id=472) [Accessed 23 October 2011].
- MIGUEL, E., 2007. *Lonja de pescado, Benicarló, Castellón = Fish market in the port of Benicarló, Castellón*. In *Via arquitectura*, 17, pp.38-43.
- MORAIS, J.S., 2001. *Maputo: Património da Estrutura e Forma Urbana*. Lisbon: Rolo & Filhos.
- PILLOTON, E., 2007. *Modern Prefab: Nakagin Capsule Towers*. [Online] Available at: <http://inhabitat.com/modern-prefab-nakagin-capsule-towers/> [Accessed 16 March 2012].
- PLEATFARMER(ALIAS), 2009. *Mirrored Wall inside Verner Panton's Home*. [Online] Available at: <http://www.pleatfarm.com/2009/11/19/mirrored-wall-verner-panton-home/> [Accessed 16 September 2011].
- REYNAERS ALUMINIUM, 2011. *CP 155*. [Online] Available at: [http://www.reynaers.com/upl/634158423048290000\\_CP%20155%20-%20H0.23D2.00.pdf](http://www.reynaers.com/upl/634158423048290000_CP%20155%20-%20H0.23D2.00.pdf) [Accessed 3 May 2012].
- ROUGEAU, K., 2008. *Marcel Duchamp: Fountain*. [Online] Available at: <http://paperstreetsupplies.com/art-and-artists/marcel-duchamp-fountain/> [Accessed 2 June 2011].
- SHULMA, J., 1997. *The work of Charles and Ray Eames*. New York: Harry N, Abrams.
- SUNPLAN AG, 2009. *Sunline*. [Online] Available at: <http://www.sunplan.ch/beweglich.html> [Accessed 25 April 2012].
- TSCHUMI, B., 1976. *Advertisements for Architecture*. [Online] Available at: <http://www.tschumi.com/projects/19/#> [Accessed 12 February 2012].
- UNKNOWN, 2010. *Cruising into Maputo on the Sinfonia*. [Online] Available at: <http://www.southafrica.to/transport/cruises/Starlight/Sinfonia/Sinfonia-Maputo.php5> [Accessed 6 December 2011].
- WOOD, R., 2011. *Marcel Duchamp and a prediction about art and craft*. [Online] Available at: <http://www.heritagecrafts.org.uk/index.php/news/hca-blog/item/55-marcel-duchamp-and-a-prediction-about-art-and-craft> [Accessed 5 September 2011].
- YOUNGMAN, 2008. *Roofing and Sheeting Metal Works*. [Online] Available at: <http://www.youngman.co.za/products/YoungmanBrochure1.pdf> [Accessed 25 April 2012].