CHAPTER 7: TECHNICAL DEVELOPMENT

Figure 7.1: Floor being sprayed

Figure 7.2: Fish handling

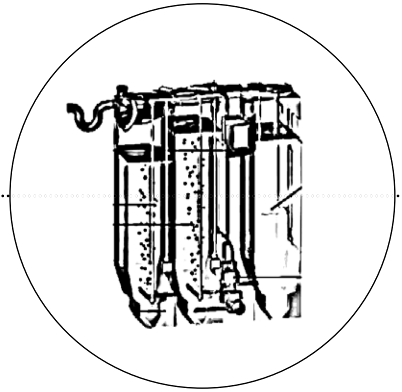


Figure 7.3: Water filtration

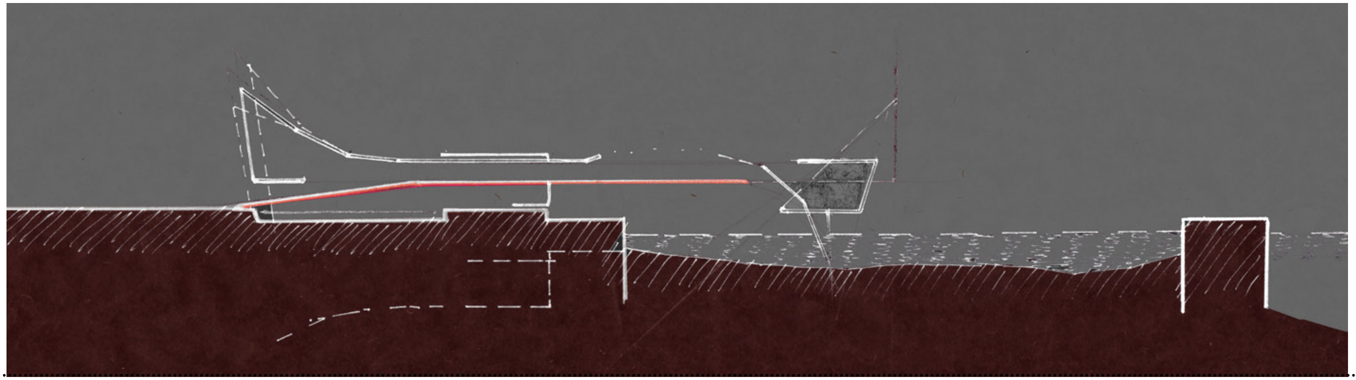


Figure 7.4: Early design sketch exploring tectonic concept

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.

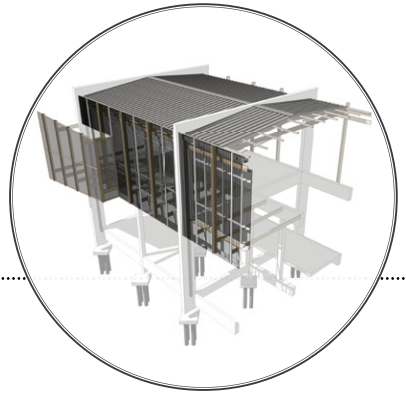


Figure 7.5: Tectonic language

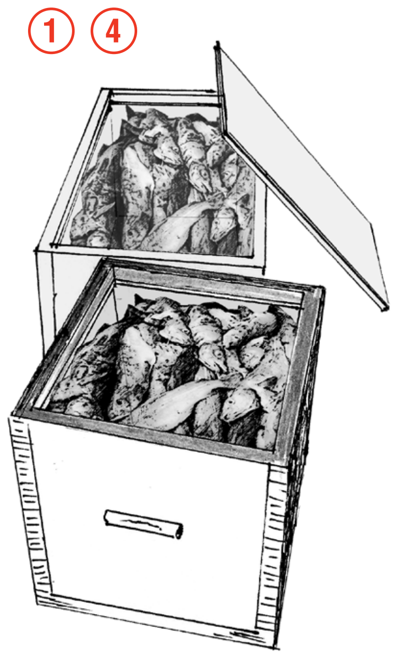


Figure 7.6.1: Typical fish boxes used to transport and temporarily store fish harvest

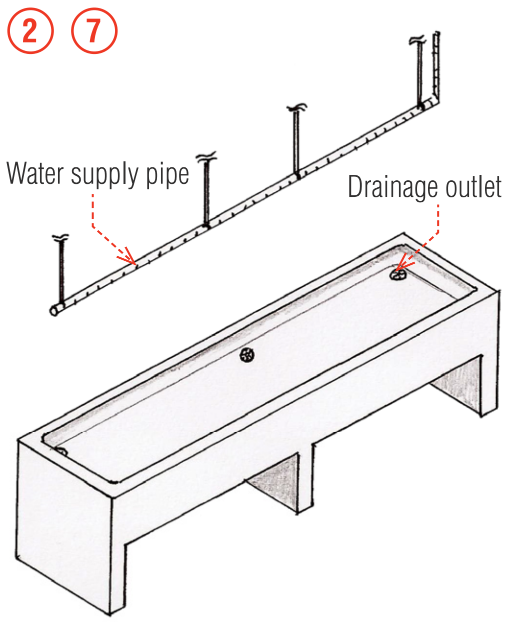


Figure 7.6.2: Typical fish washing concrete table

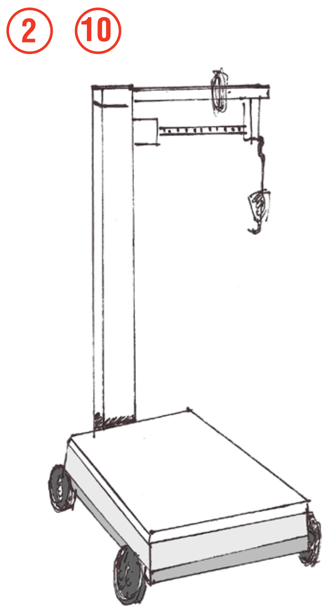


Figure 7.6.3: Typical fish weighing scale

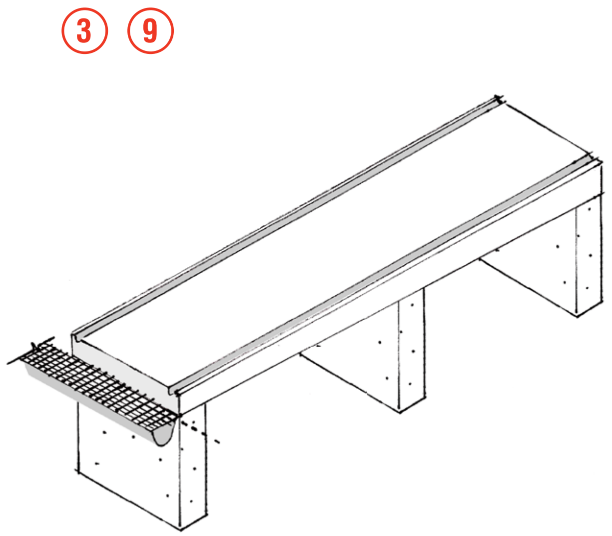
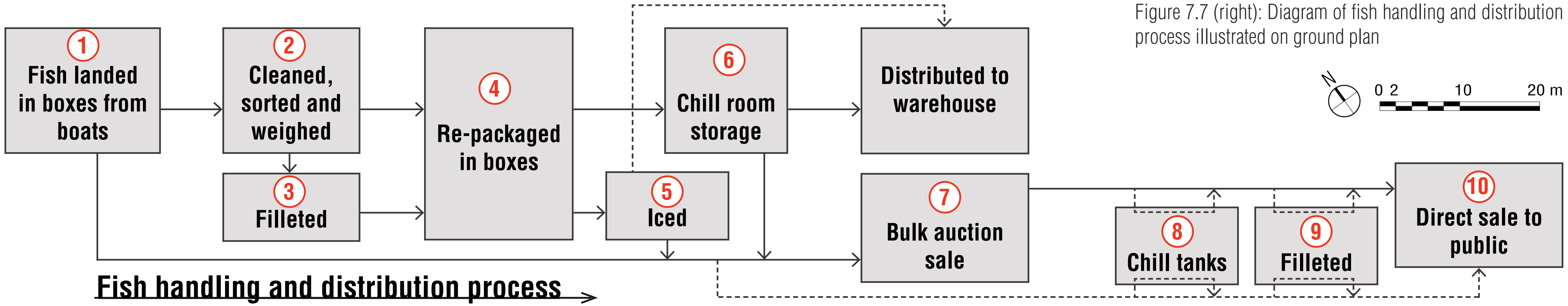
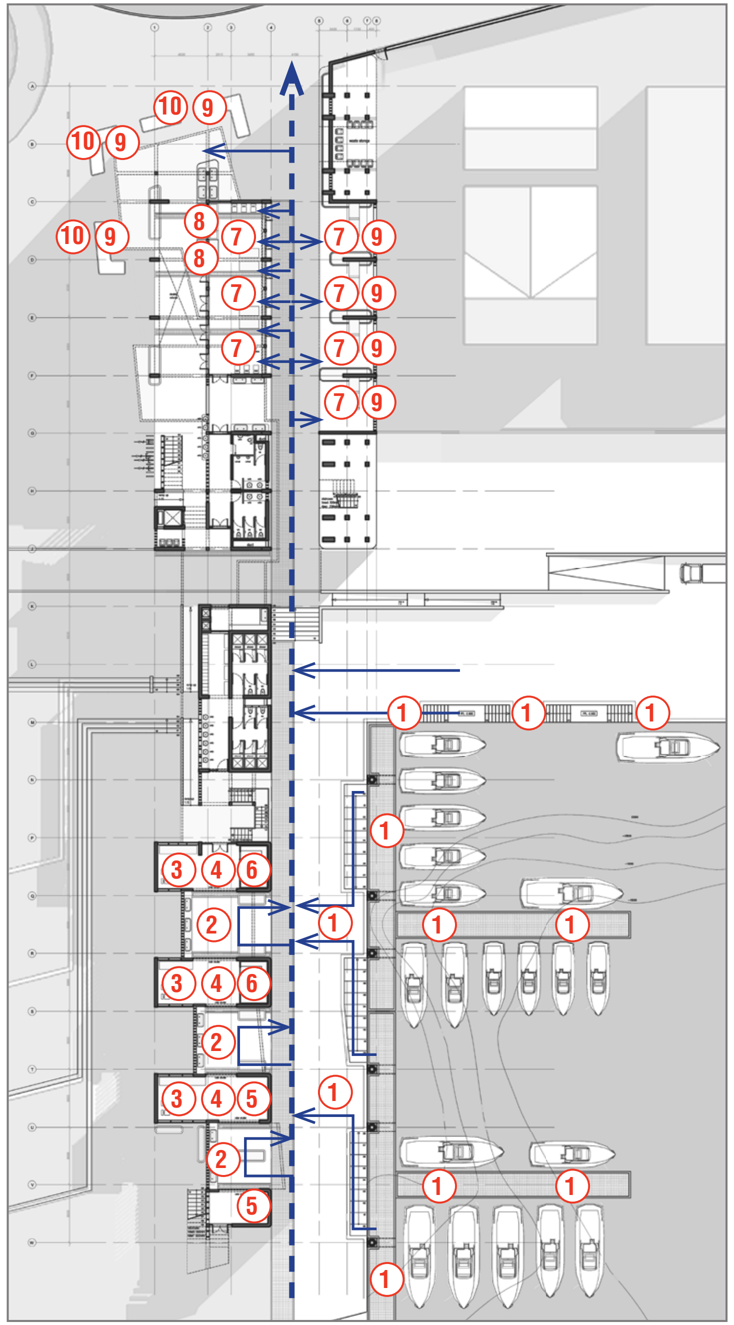


Figure 7.6.4: Typical fish filleting concrete table with drainage gutters and catchment grill

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





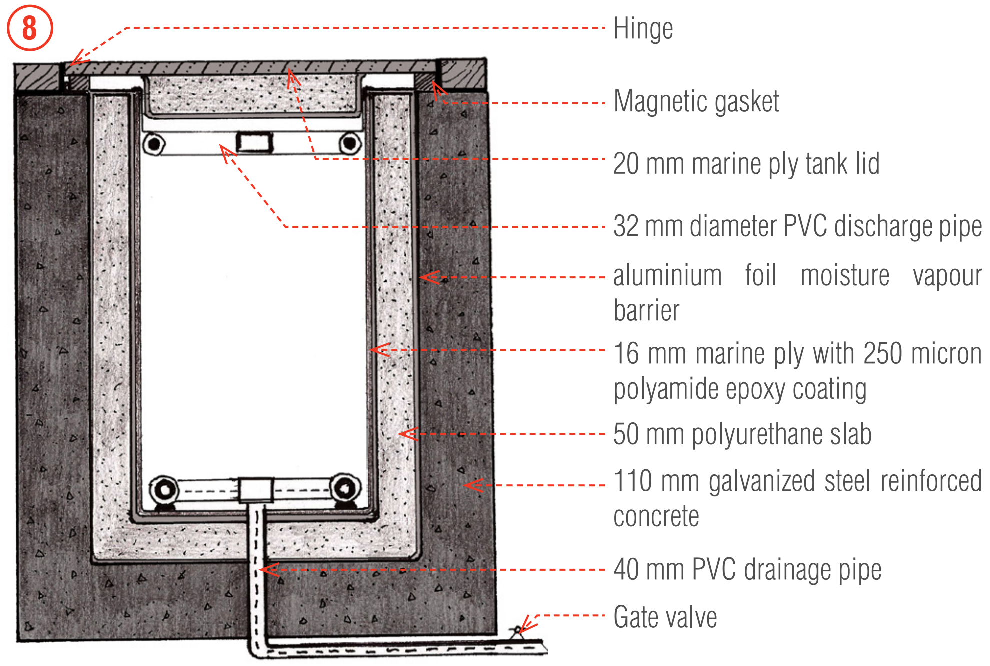


Figure 7.8.1: Typical insulated fish and ice concrete storage tank

Figure 7.8.2: Typical poly-ethylene air tight fish offal storage container

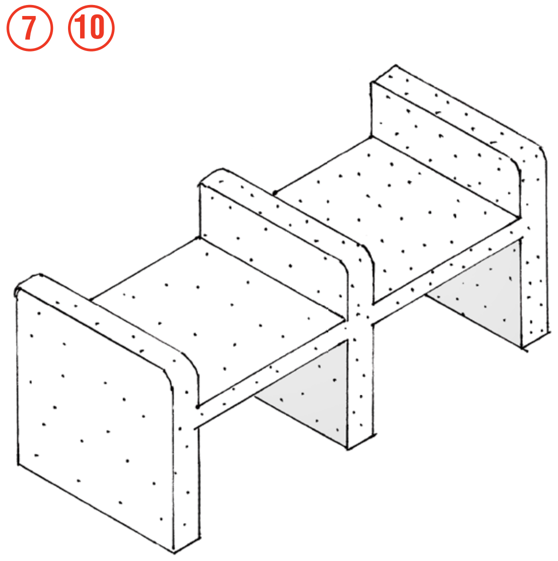


Figure 7.8.3: Typical fish auction and sale concrete table

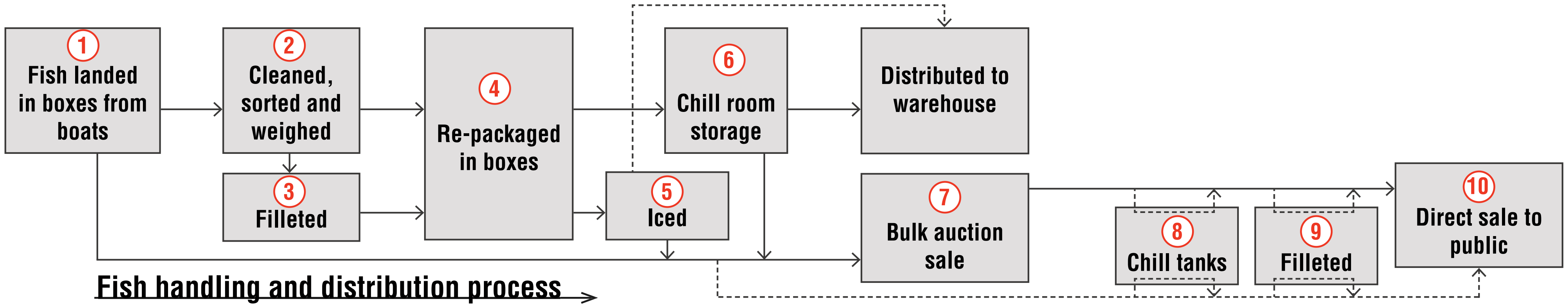


Table 7.1: Fish Handling areas: Accommodation requirements
Floor area design guidelines based on Constantine Memos' Port Planning (2004: 60 - 64) and based on an annual catchment of 1500 tons

Fish Sale areas	
Projected uses	Exhibition, temporary storage, auction/ bulk sale, small scale sale
Filleting and bulk sale	250 m² (7) (9)
Public sale	150 m² (in addition to sale on street pavement) (8) (9) (10)
Total designed area	400 m² (200 -400m² 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 m² 55 m² open sections (73% floor area)
Fish Processing	
Projected uses	Washing, sorting, weighing, packaging, temporary storage
Areas:	350m²
- Washing and sorting	115 m² (50-150 m² req.) (1) (2) (3)
- Weighing, arrangements and packaging	200 m² (150-300 m² req.) (2) (4) (5)
- Cold storage	30 m² (20-40 m² req.) (6)
- Total	345 m² (220-460 m² req.)
Occupation classification	D3 (Low risk industrial)
Personnel population	40
Required lighting levels	500 lux
Ventilation requirements	Natural ventilation: 90 m² 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

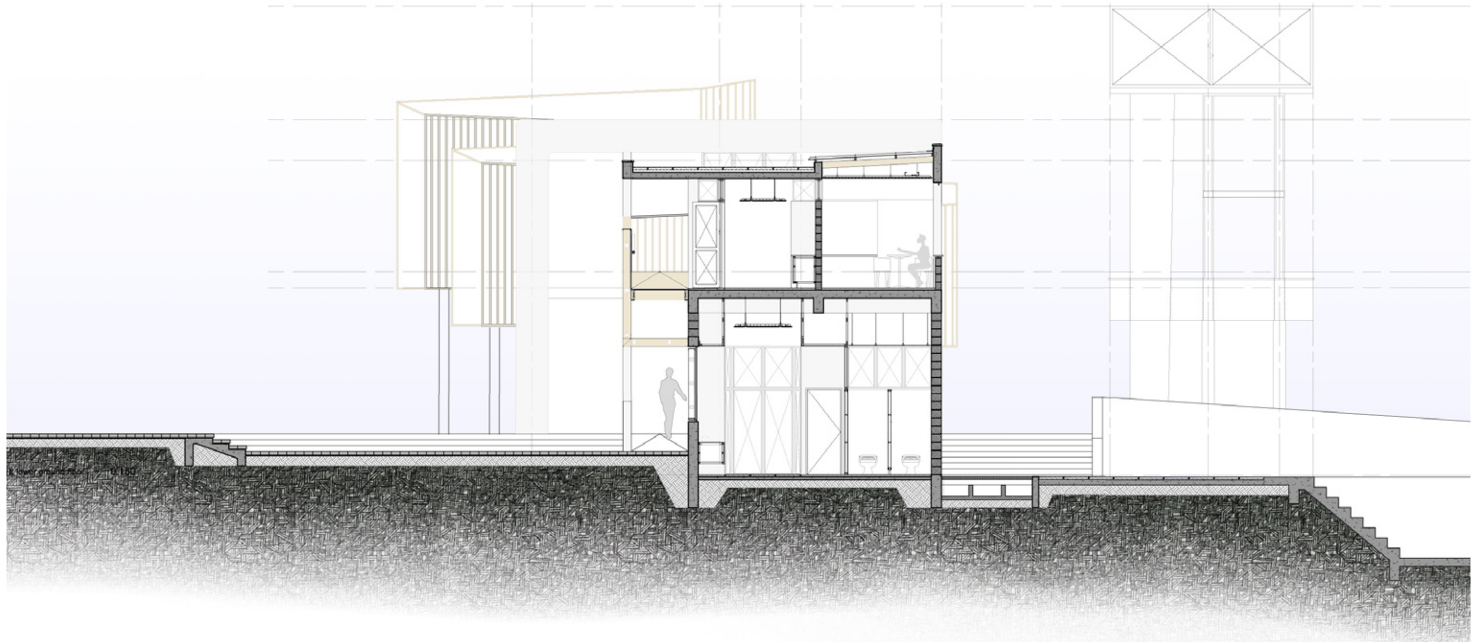


Figure 7.9: Cross section through restaurant and ablutions

0 1 5 m

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.

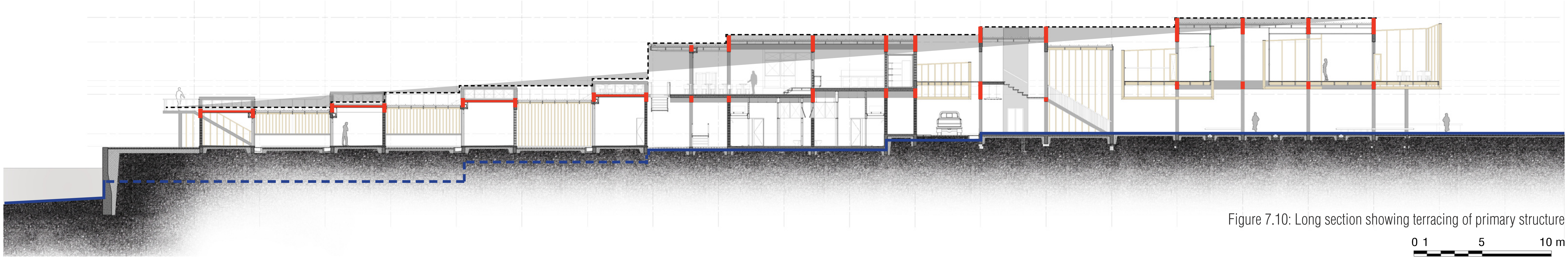


Figure 7.10: Long section showing terracing of primary structure

0 1 5 10 m

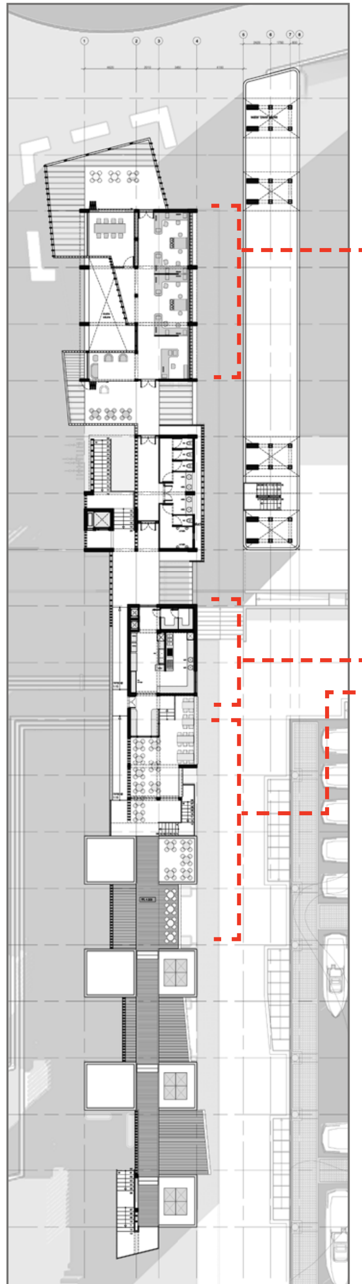


Figure 7.11

Harbour Management Offices	
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 m²
Occupation classification	G1
Population	14
Required lighting levels	400 lux with 700 lux at testing stations
Ventilation requirements	7.5 l/s required 32 m² openable sections (20% of floor area) Assisted with mechanical ventilation when required: filtration to get rid of potential smells

Fish Restaurant	
Kitchen area	60 m²
Restaurant patron area	100 m²
Occupation classification	A1
Population:	
Personnel	20
Patrons	90 (Max)
Required lighting levels	
- Kitchen	700 lux
- Restaurant floor	200 lux
Ventilation requirements	
- Kitchen	17.5 l/s required Majority natural ventilation. 10 m² openable sections (16% of floor area) Additional extractor fans located in cooking area
- Restaurant floor	Natural ventilation provided by folding stacking windows and doors: 22m² openable sections for 45m² indoor zone (50% of floor area)

Sanitary fixtures on both levels

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

Ventilation Requirements

25 l/s required

<u>Northern ground floor ablution block</u>
4 m² (15% of floor area)
<u>Southern ground floor ablution block</u>
5 m² (15% of floor area)
<u>Upper level ablutions</u>
4 m² (15% of floor area)

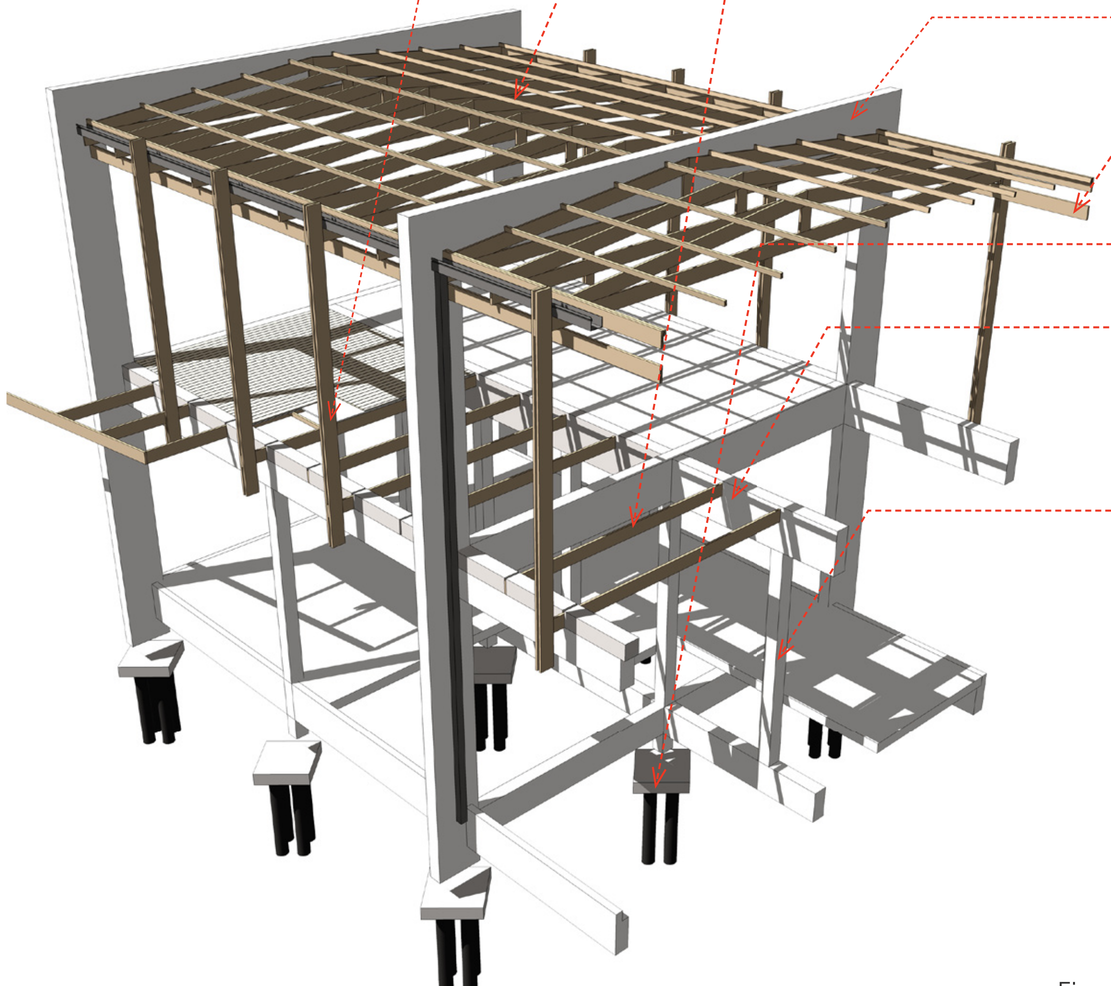


Figure 7.12.1: Primary structure perspective

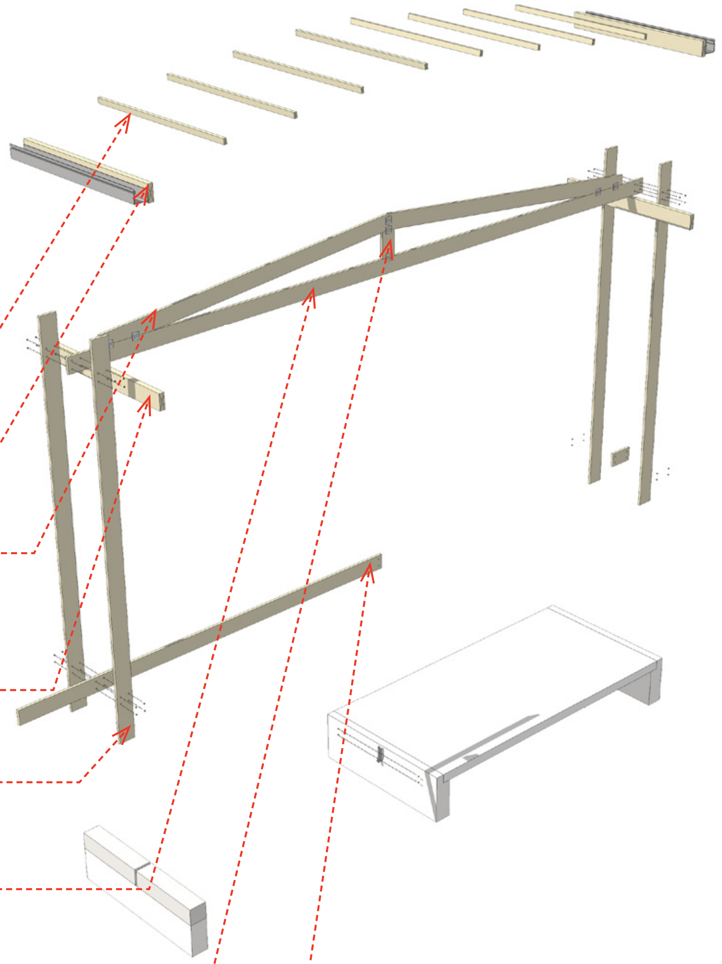


Figure 7.12.2: Primary structure exploded perspective

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

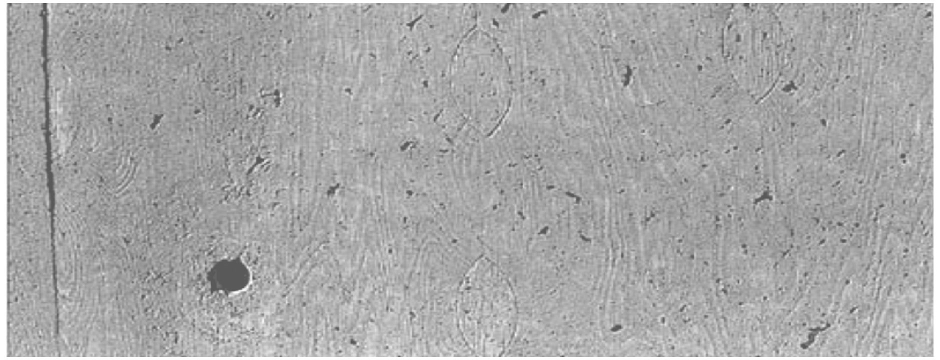


Figure 7.12.3: Concrete finish , rough sawn timber sheeting used for formwork

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.

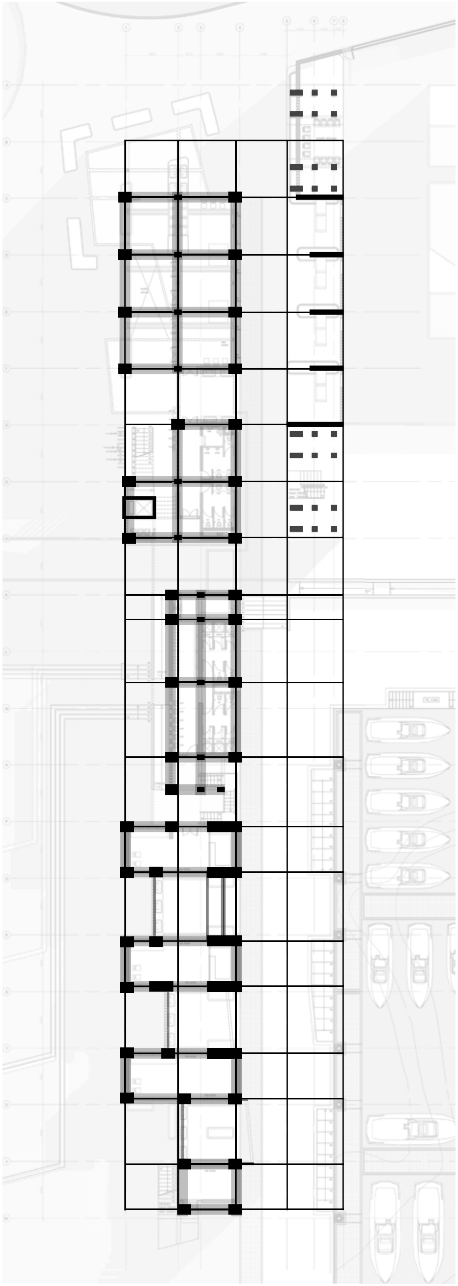


Figure 7.13: Diagram of structure

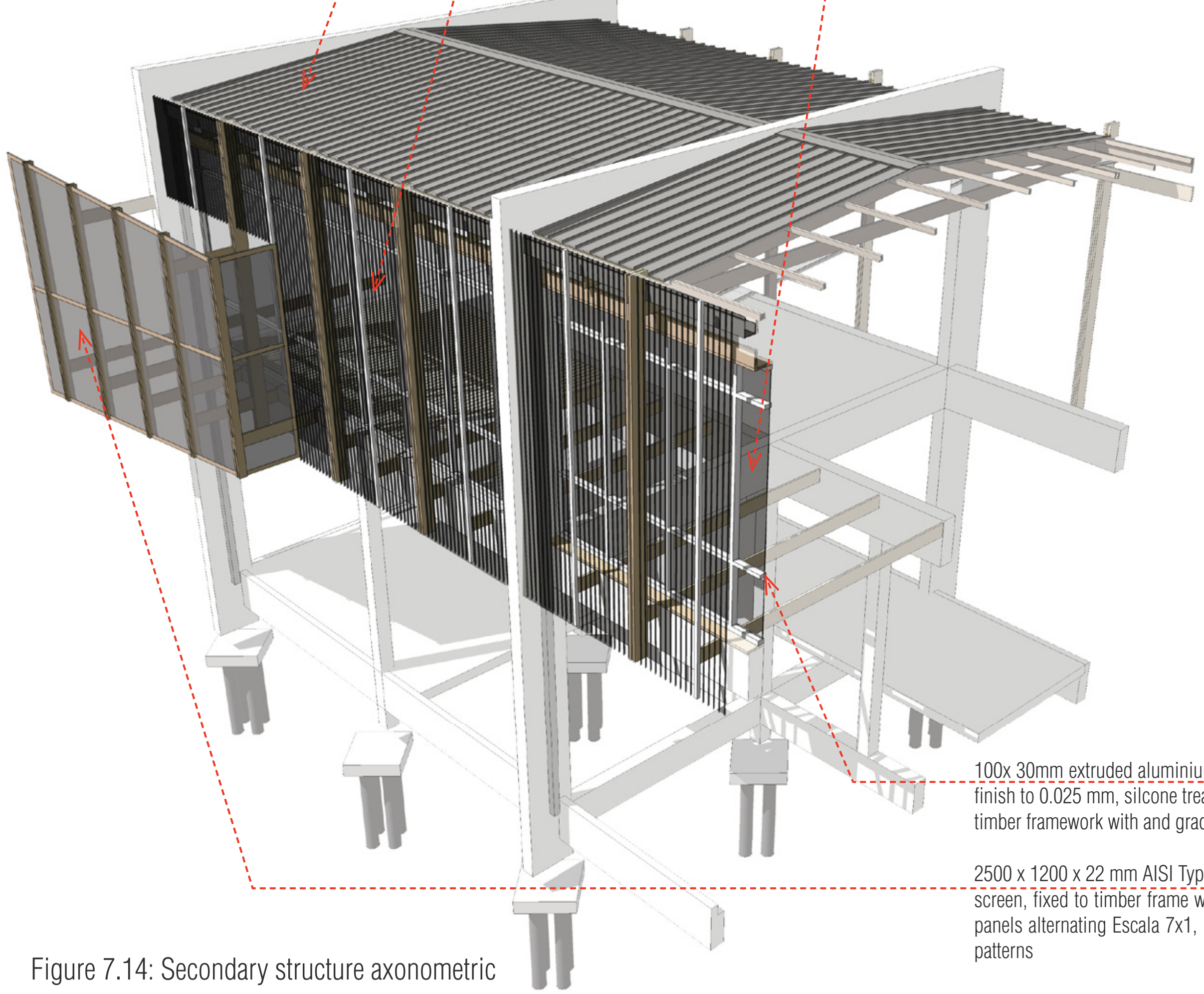


Figure 7.14: Secondary structure axonometric

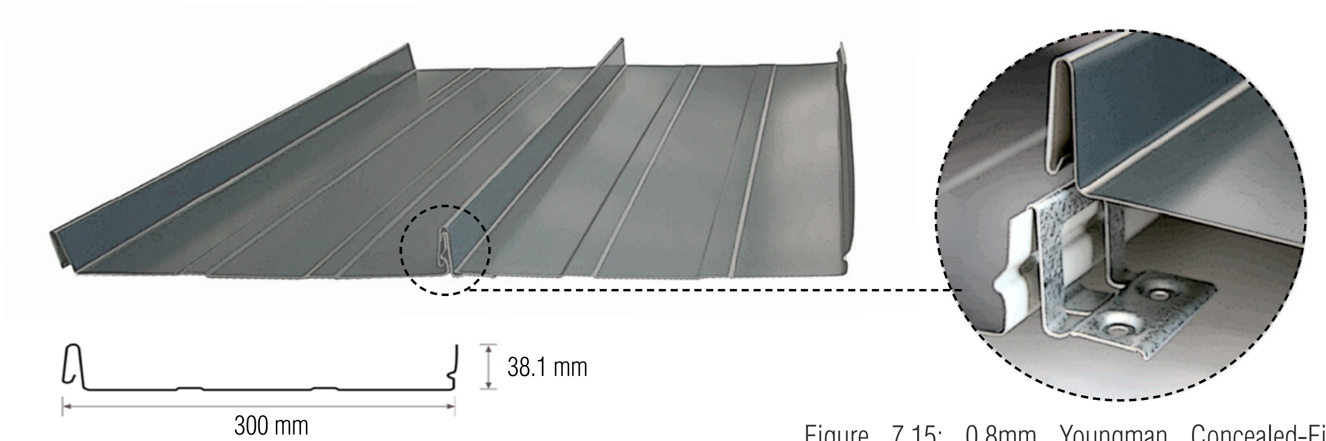


Figure 7.15: 0.8mm Youngman Concealed-Fix Snaplock 38.1mm EZ clad aluminium roof sheeting

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 the 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.

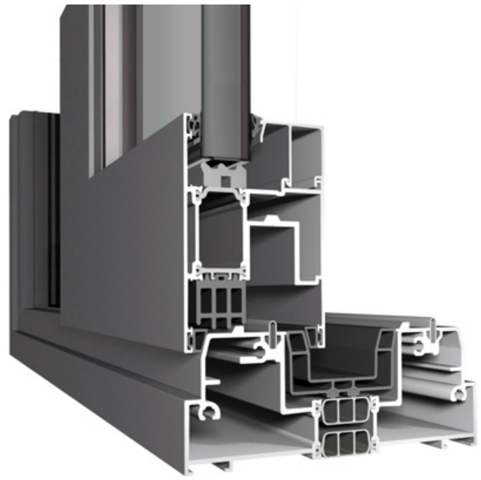


Figure 7.16.1: Diagram showing axonometric view of aluminium window system

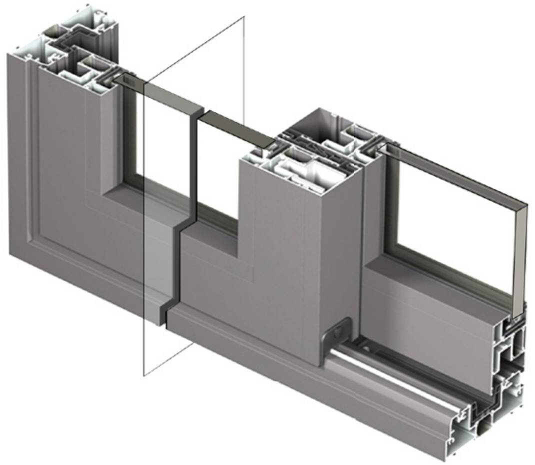


Figure 7.16.2: Diagram showing axonometric view of aluminium window system

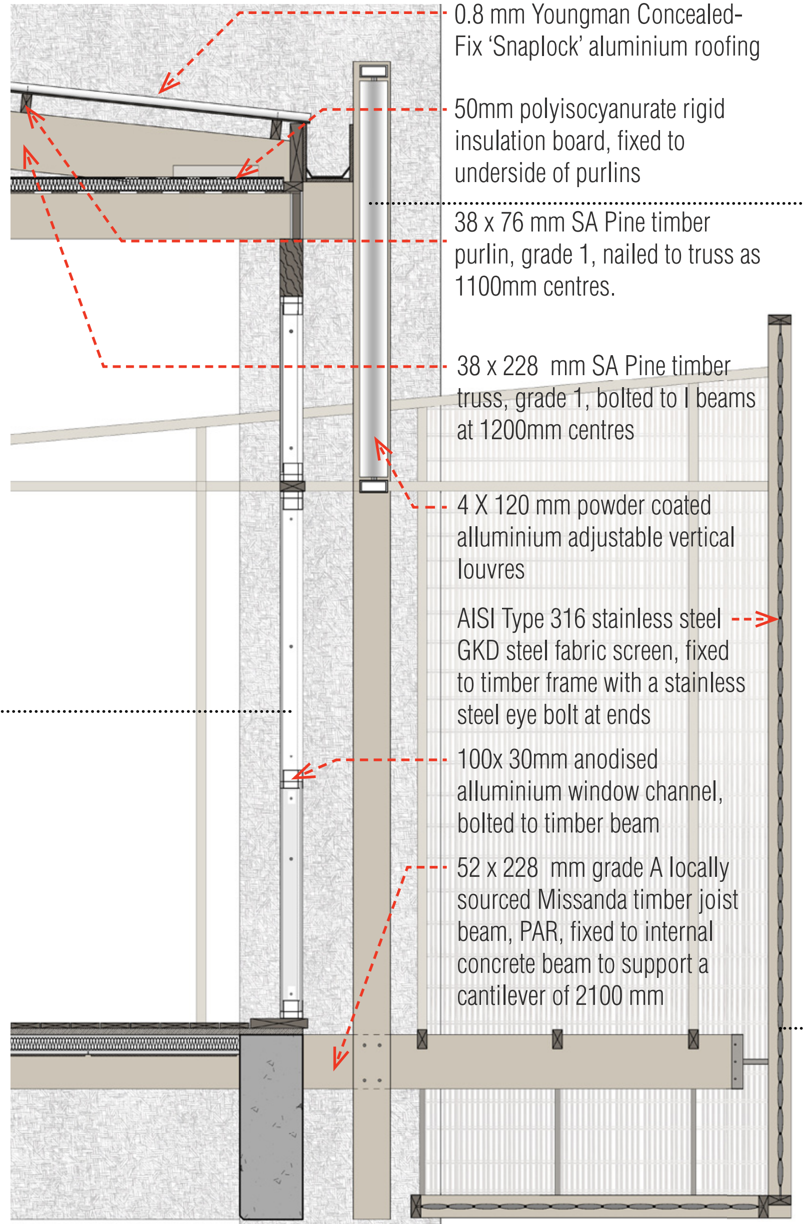


Figure 7.17: Typical section through building facade

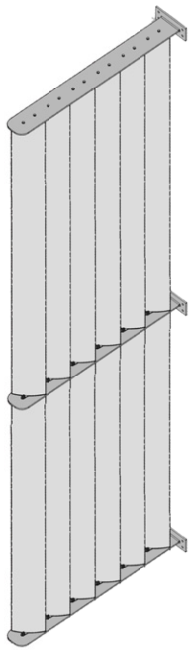


Figure 7.18.1: Diagram showing axonometric view of aluminium louvres

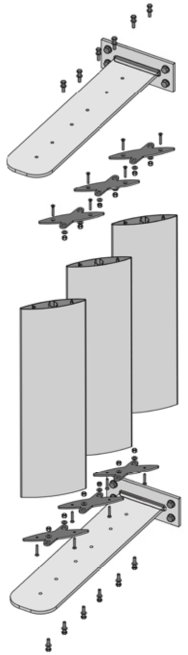


Figure 7.18.2: Diagram showing exploded axonometric view of aluminium louvres

Figure 7.18.3: Photo showing the application of aluminium louvred facade

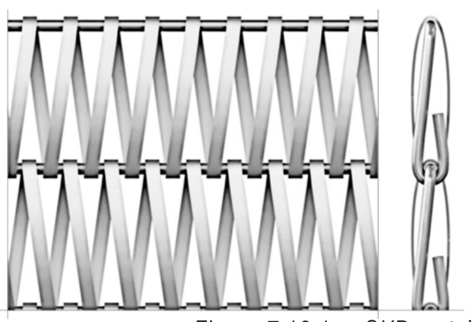


Figure 7.19.1: GKD metal fabric: Escale 5 x 1

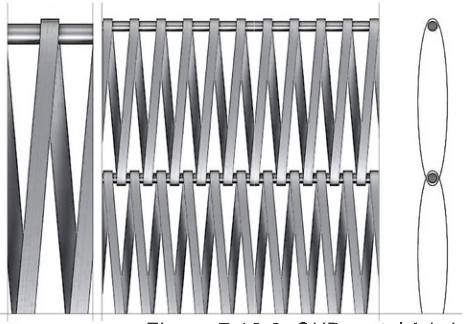


Figure 7.19.2: GKD metal fabric: Escale 7 x 1

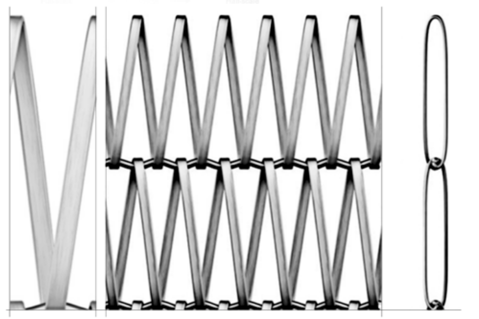


Figure 7.19.3: GKD metal fabric: Helix 6

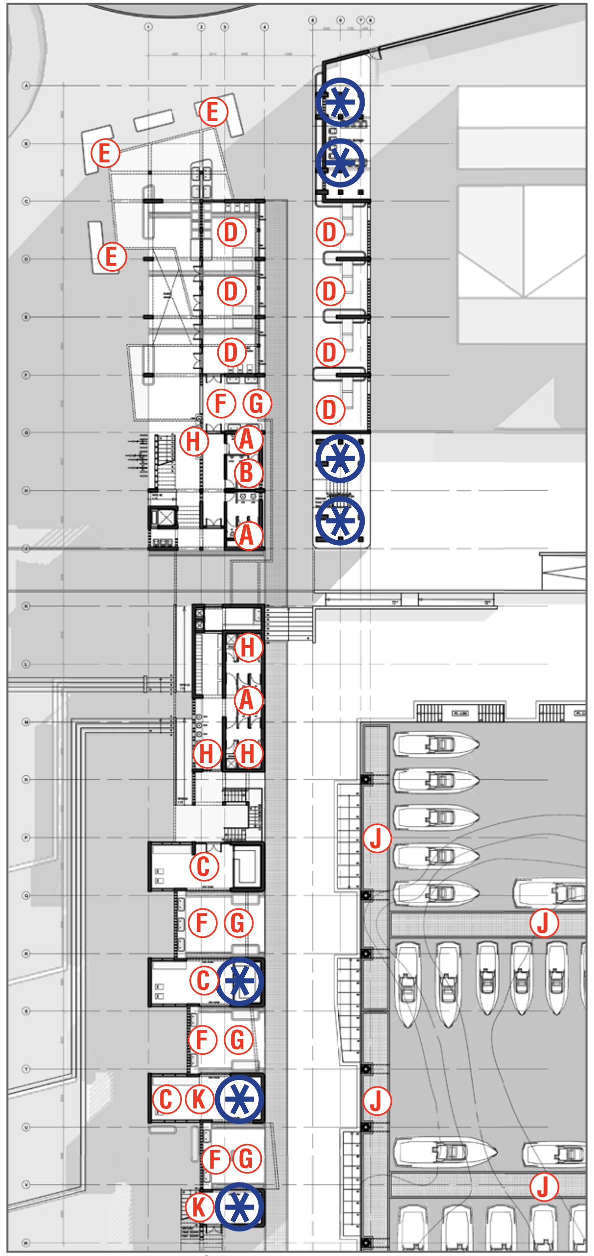


Figure 7.20: Ground floor plan showing position of water treatment and use processes

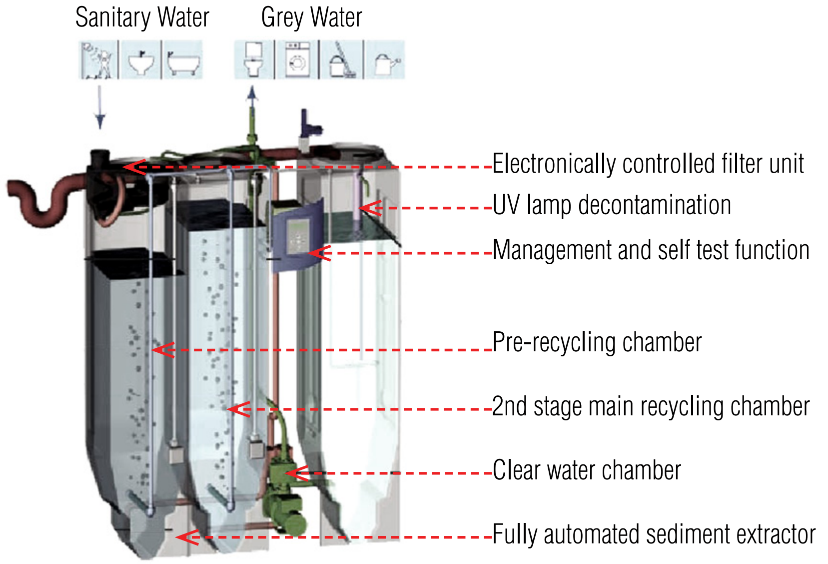
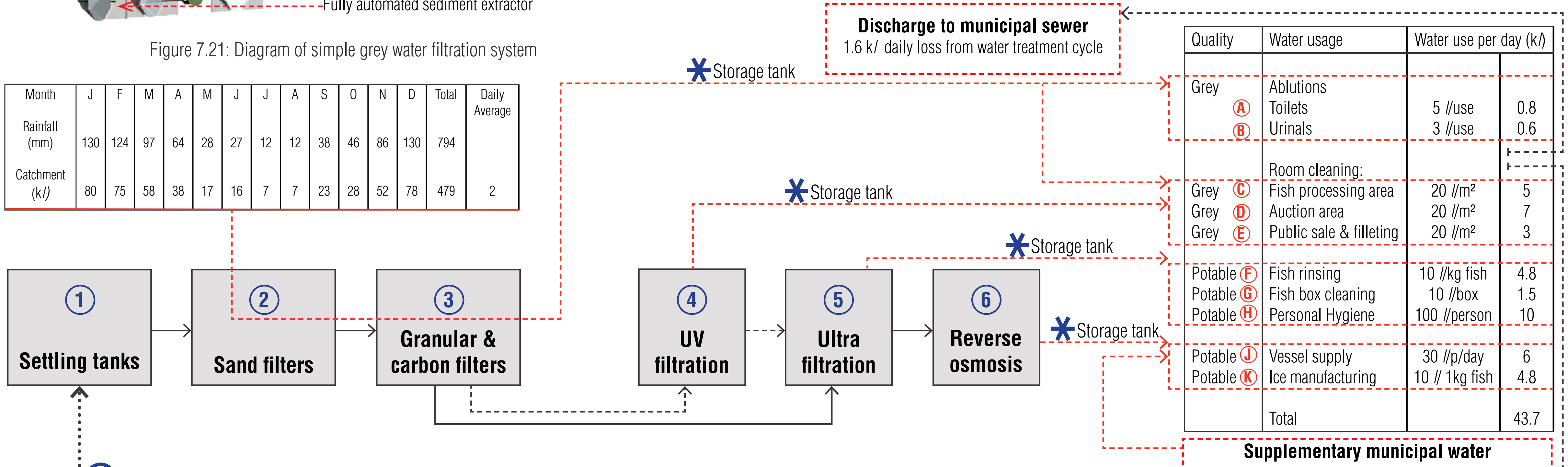


Figure 7.21: Diagram of simple grey water filtration system

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.

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 (kℓ)	80	75	58	38	17	16	7	7	23	28	52	78	479	2



Quality		Water usage	Water use per day (kℓ)	
Grey		Ablutions		
	A	Toilets	5 ℓ/use	0.8
	B	Urinals	3 ℓ/use	0.6
		Room cleaning:		
Grey	C	Fish processing area	20 ℓ/m²	5
Grey	D	Auction area	20 ℓ/m²	7
Grey	E	Public sale & filleting	20 ℓ/m²	3
Potable	F	Fish rinsing	10 ℓ/kg fish	4.8
Potable	G	Fish box cleaning	10 ℓ/box	1.5
Potable	H	Personal Hygiene	100 ℓ/person	10
Potable	J	Vessel supply	30 ℓ/p/day	6
Potable	K	Ice manufacturing	10 ℓ/ 1kg fish	4.8
		Total		43.7

Water treatment process

+- 20% Loss in water catchment and treatment process: 33.68 Kℓ recovered daily. 7.8 Kℓ daily municipal input required

CHAPTER 8: DRAWINGS

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

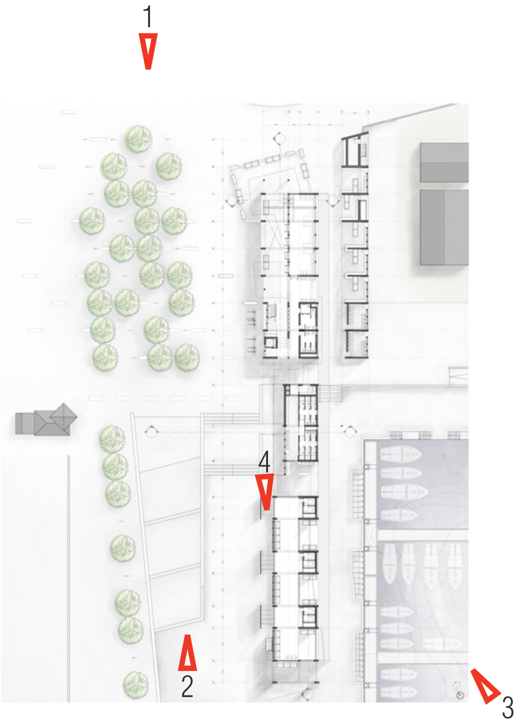


Figure 8.**4**: Perspective rendering: view along western edge of fishing processing area

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

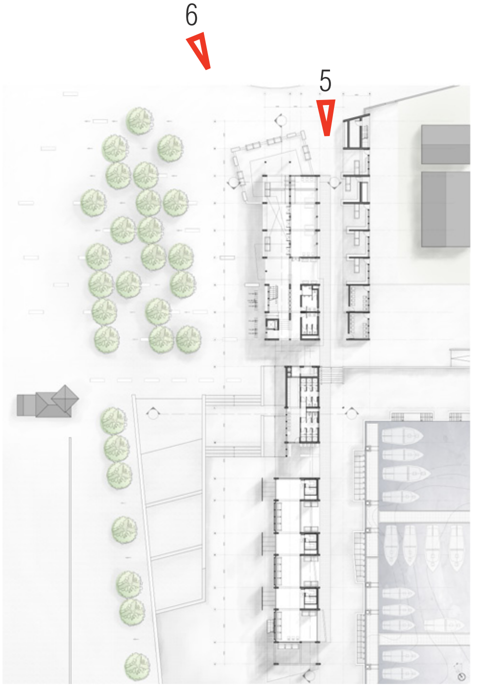


Figure 8.7: Site plan

Figure 8.8: Ground Floor Plan

0 5 25 m

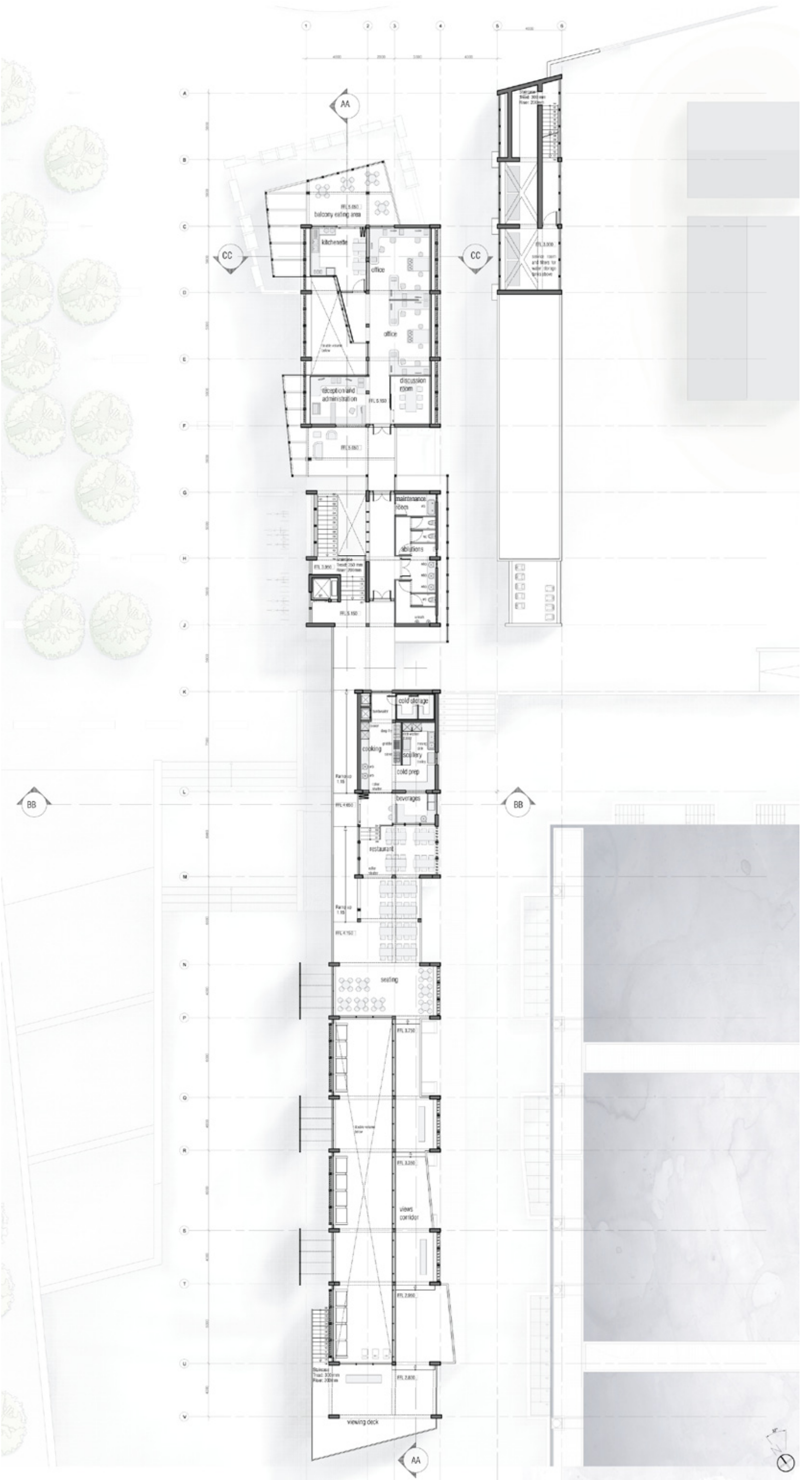


Figure 8.9: 1st Floor Plan

0 5 25 m

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

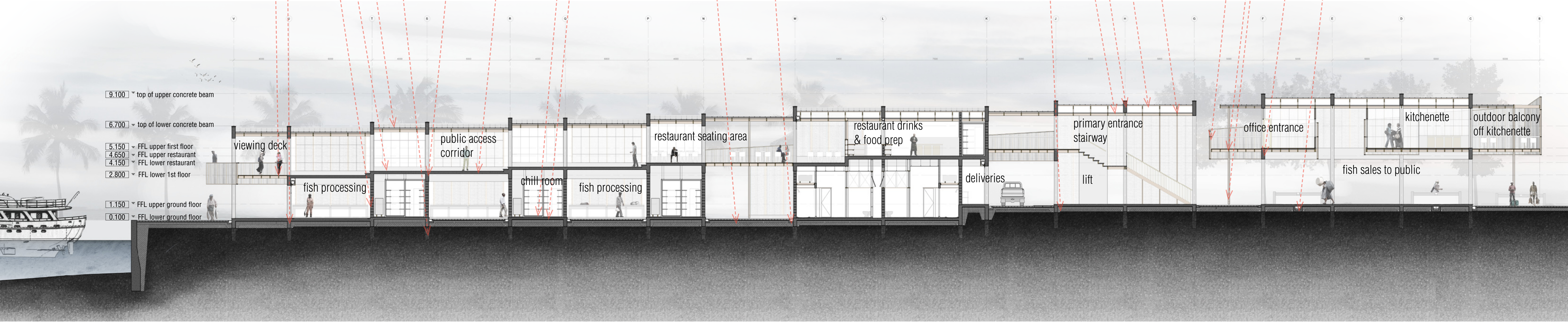


Figure 8.10: Section AA

0 2 10 m

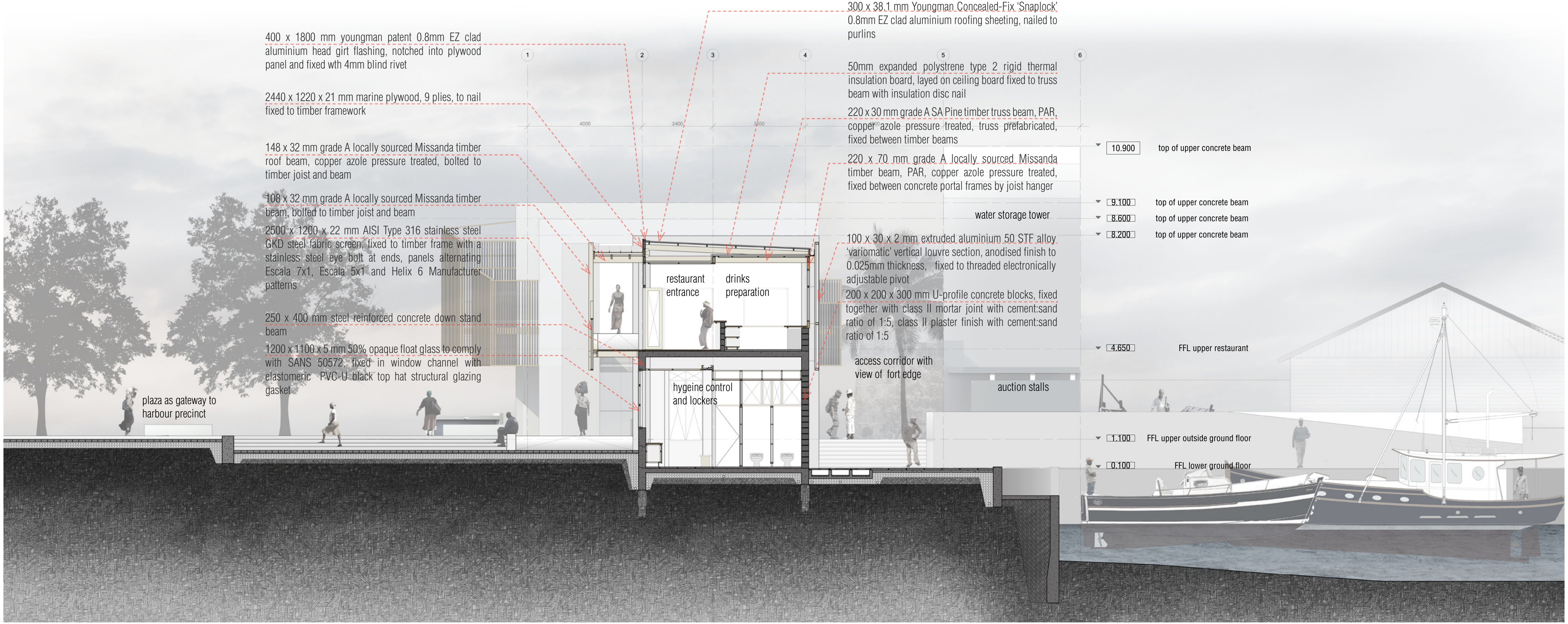


Figure 8.11: Section BB

0 1 5 m

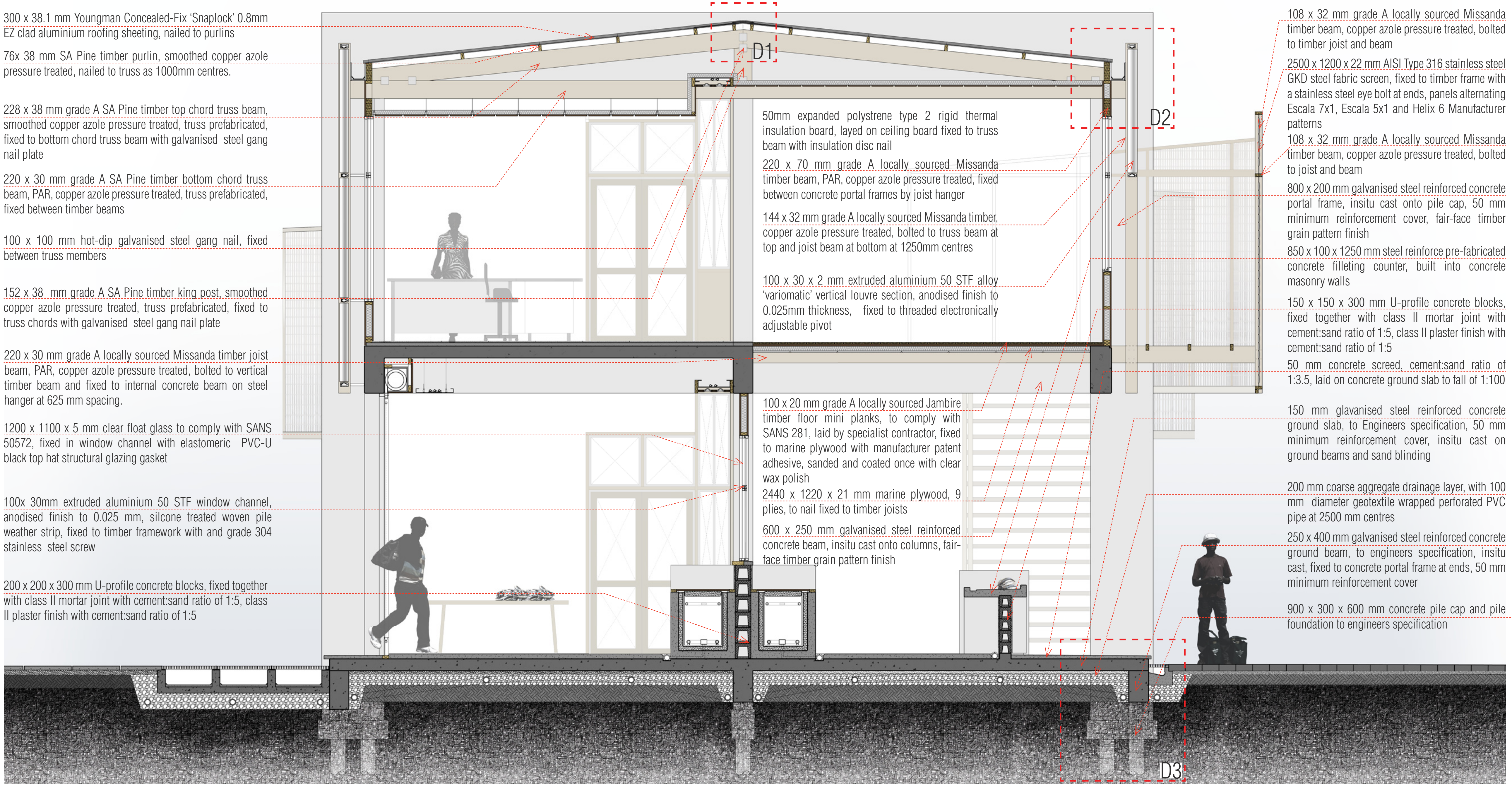


Figure 8.12: Section CC

0 400 2000 mm

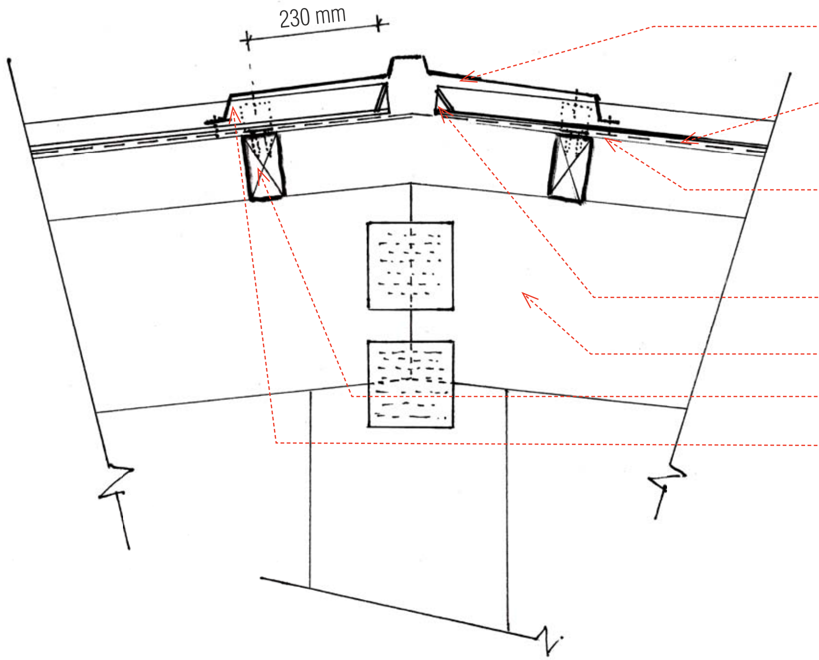


Figure 8.13: D1 roof ridge detail

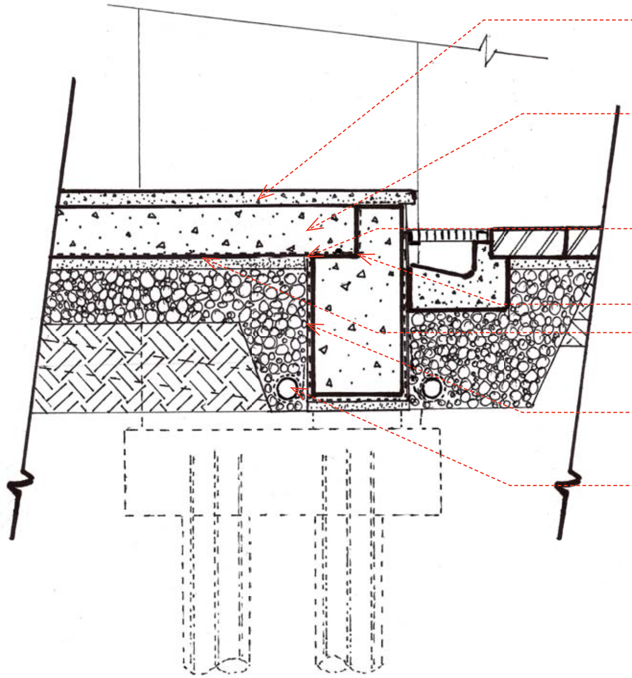


Figure 8.15: D3 ground beam waterproofing

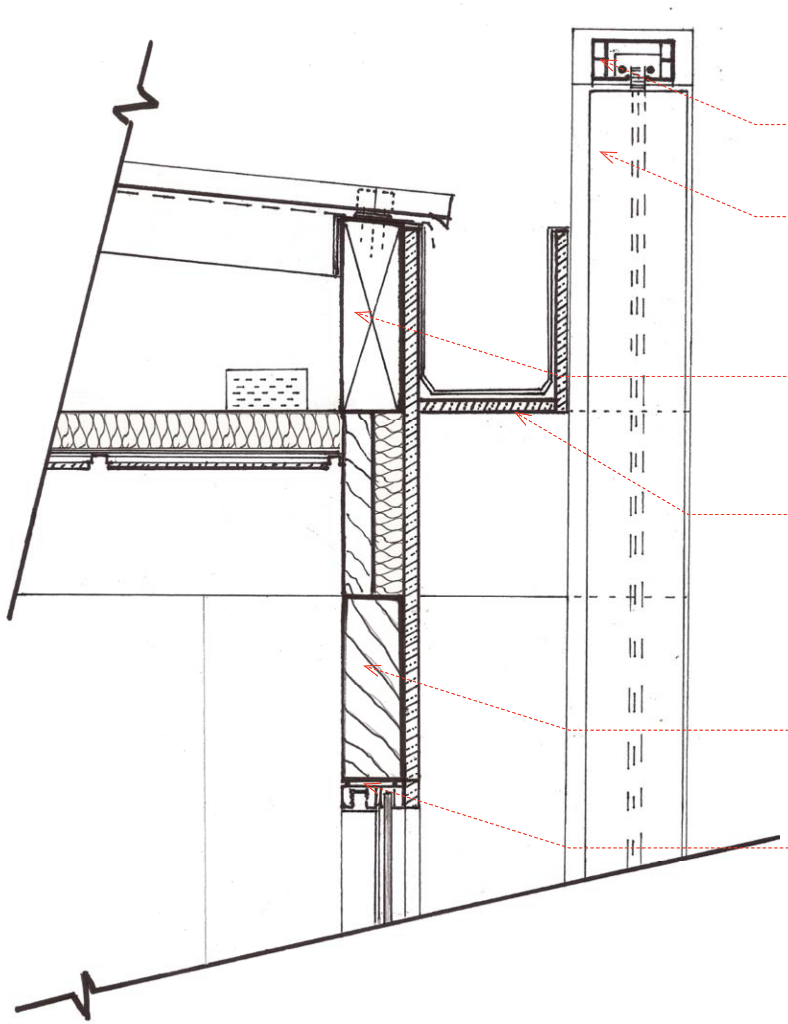


Figure 8.14: D2 truss end gutter and louvre detail

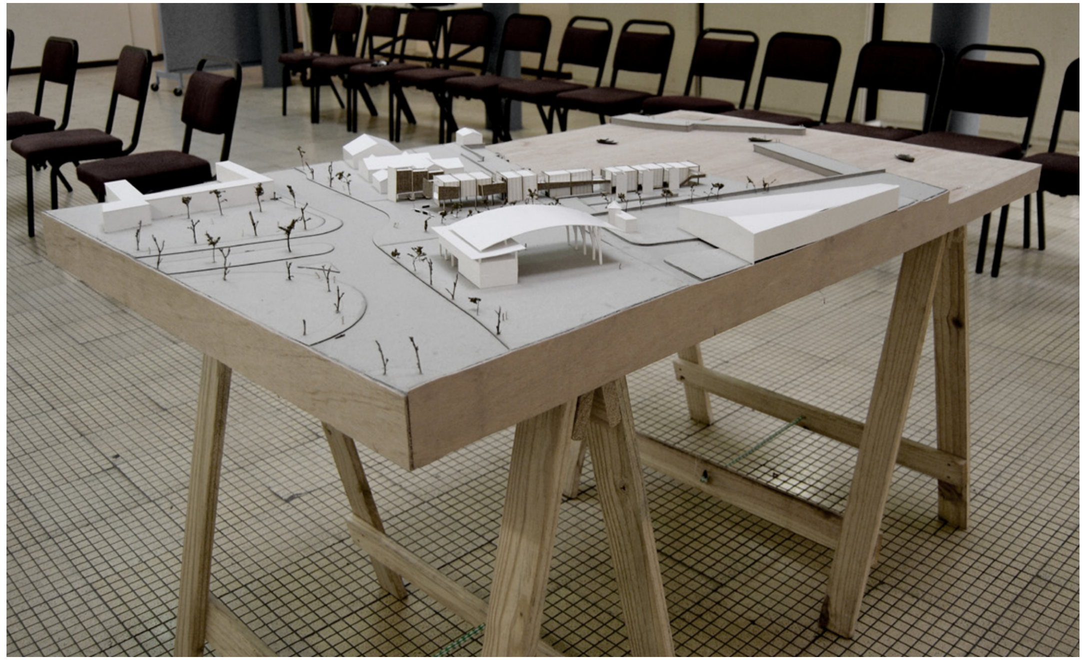


Figure 8.16: Model view 1

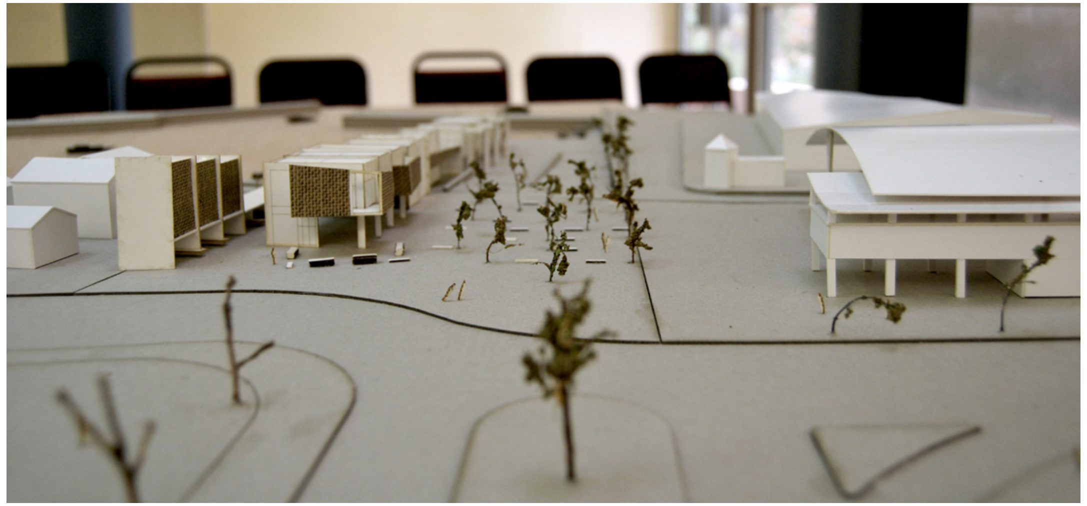


Figure 8.17: Model view 2

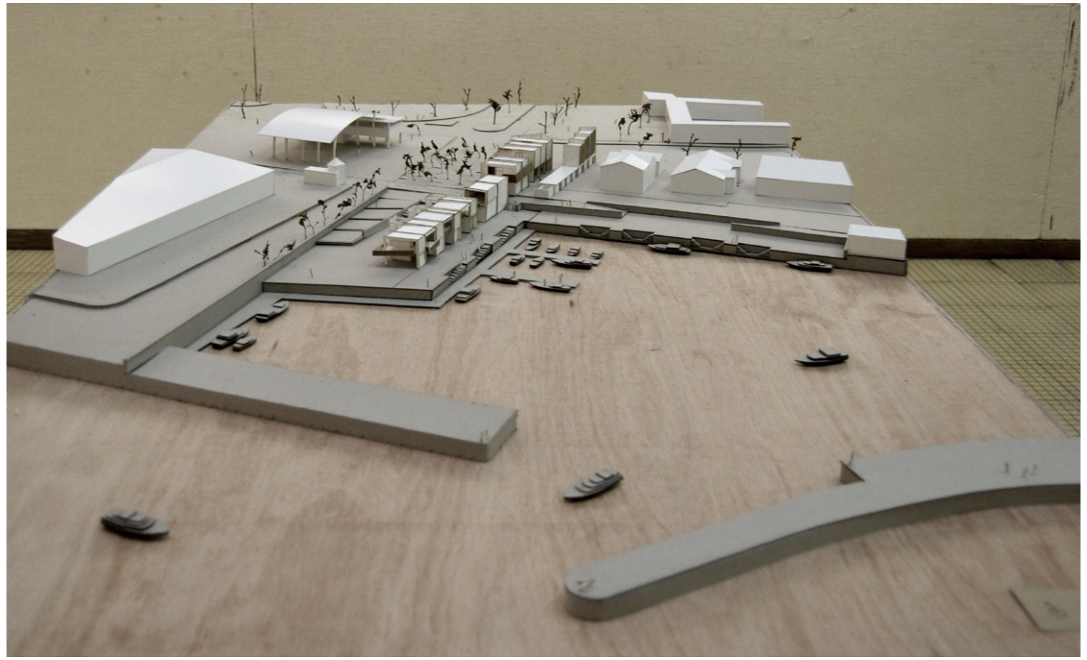


Figure 8.18: Model view 3

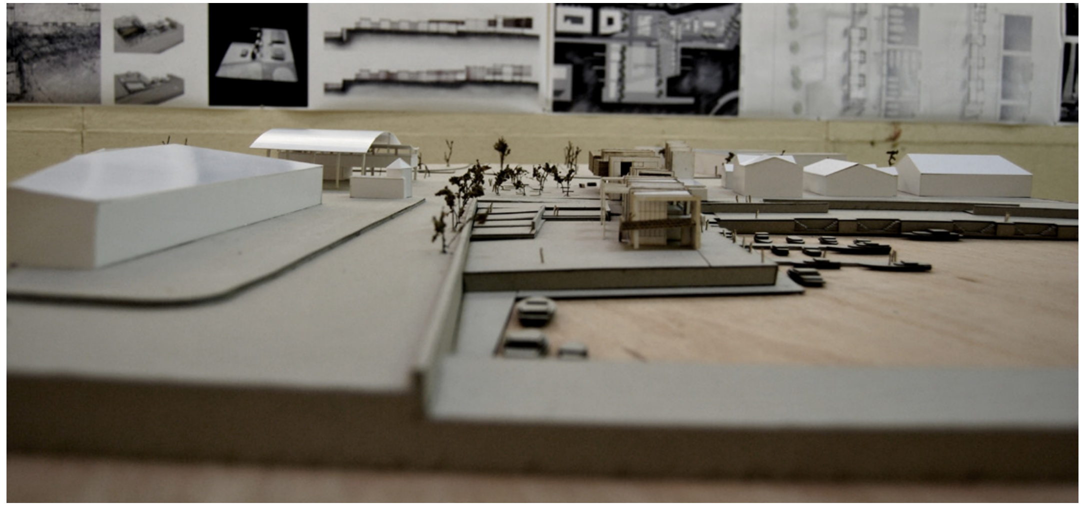


Figure 8.19: Model view 4

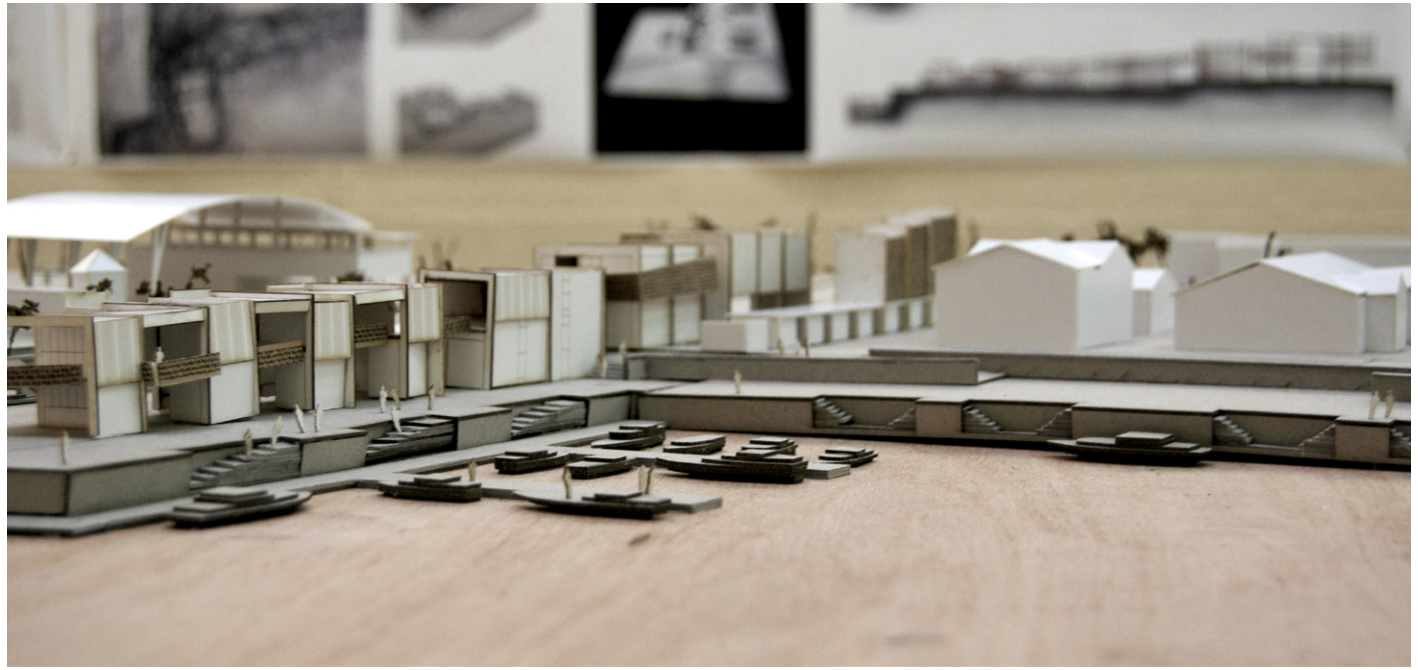


Figure 8.20: Model view 5

Figure 8.21: Model view 6