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
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.
Fish handling and distribution process

1. Fish landed in boxes from boats
2. Cleaned, sorted and weighed
3. Filleted
4. Re-packaged in boxes
5. Iced
6. Chill room storage
7. Bulk auction sale
8. Chill tanks
9. Filleted
10. Direct sale to public

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
Fish handling and distribution process

1. Fish landed in boxes from boats
2. Cleaned, sorted and weighed
3. Filleted
4. Re-packaged in boxes
5. Iced
6. Chill room storage
7. Distributed to warehouse
8. Chill tanks
9. Filleted
10. Direct sale to public

Fish Sale areas
- Projected uses
- Exhibition, temporary storage, auction/bulk sale, small scale sale
- Filleting and bulk sale
- Public sale
- Filleting and bulk sale
- Total designed area
- Occupation classification
- Population (sellers)
- Required lighting levels
- Ventilation requirements
- Natural ventilation: Majority of spaces are open covered spaces. Crossable section: 75 m²
- 55 m² open sections (73% floor area)

Fish Processing
- Projected uses
- Washing, sorting, weighing, packaging, temporary storage
- Areas:
  - Washing and sorting: 350 m²
  - Weighing, arrangements and packaging: 200 m² (150-300 m² req.)
  - Cold storage: 30 m² (20-40 m² req.)
  - Total: 345 m² (220-460 m² req.)
- Occupation classification:
  - Personnel population: D3 (Low risk industrial)
  - Required lighting levels: 40 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

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
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.
Fish Restaurant

<table>
<thead>
<tr>
<th>Area</th>
<th>Occupation classification</th>
<th>Population</th>
<th>Required lighting levels</th>
<th>Ventilation requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchen area</td>
<td></td>
<td>60 m²</td>
<td>100 m²</td>
<td>700 lux</td>
</tr>
<tr>
<td>Restaurant patron area</td>
<td></td>
<td>400 lux</td>
<td>700 lux at testing stations</td>
<td>7.5 l/s required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>32 m²</td>
<td>20% of floor area</td>
<td>Assisted with mechanical ventilation when required: filtration to get rid of potential smells</td>
</tr>
<tr>
<td>Restaurant floor</td>
<td></td>
<td>700 lux</td>
<td>200 lux</td>
<td>17.5 l/s required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>140 lux</td>
<td></td>
<td>Majority natural ventilation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 m²</td>
<td>50% of floor area</td>
<td>Additional extractor fans located in cooking area</td>
</tr>
</tbody>
</table>

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 ablation 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

3% l/s required

Northern ground floor ablation block

4 m² (15% of floor area)

Southern ground floor ablation block

5 m² (15% of floor area)

Upper level ablation

4 m² (15% of floor area)

Harbour Management Offices

<table>
<thead>
<tr>
<th>Area</th>
<th>Occupation classification</th>
<th>Population</th>
<th>Required lighting levels</th>
<th>Ventilation requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration of auction and handling facilities, regulation of harbour water quality as well as quality and treatment of water used in the facility.</td>
<td></td>
<td>150 m² G1</td>
<td>14</td>
<td>400 lux with 700 lux at testing stations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>90 (Max)</td>
<td>700 lux</td>
<td>7.5 l/s required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>32 m²</td>
<td>20% of floor area</td>
<td>Assisted with mechanical ventilation when required: filtration to get rid of potential smells</td>
</tr>
</tbody>
</table>

Sanitary fixtures on both levels

Total population of personnel: 20

Additional wash hand basins (WHB) due to additional hygiene requirements

Table 6 of SANS 10400 is referred to for ablation 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

Northern ground floor ablation block

4 m² (15% of floor area)

Southern ground floor ablation block

5 m² (15% of floor area)

Upper level ablation

4 m² (15% of floor area)
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.

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.
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 roof 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.
SECONDARY STRUCTURE

0.8 mm Youngman Concealed-Fix ‘Snaplock’ aluminium roofing
50mm polyisocyanurate rigid insulation board, fixed to underside of purlins

38 x 76 mm SA Pine timber purlin, grade 1, nailed to truss as 1100mm centres.

38 x 228 mm SA Pine timber truss, grade 1, bolted to I beams at 1200mm centres

4 x 120 mm powder coated aluminium adjustable vertical louvres

AISI Type 316 stainless steel GKD steel fabric screen, fixed to timber frame with a stainless steel eye bolt at ends

100x 30mm anodised aluminium window channel, bolted to timber beam

52 x 228 mm grade A locally sourced Missanda timber joist beam, PAR, fixed to internal concrete beam to support a cantilever of 2100 mm

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

0.8 mm Youngman Concealed-Fix ‘Snaplock’ aluminium roofing
50mm polyisocyanurate rigid insulation board, fixed to underside of purlins

38 x 76 mm SA Pine timber purlin, grade 1, nailed to truss as 1100mm centres.

38 x 228 mm SA Pine timber truss, grade 1, bolted to I beams at 1200mm centres

4 x 120 mm powder coated aluminium adjustable vertical louvres

AISI Type 316 stainless steel GKD steel fabric screen, fixed to timber frame with a stainless steel eye bolt at ends

100x 30mm anodised aluminium window channel, bolted to timber beam

52 x 228 mm grade A locally sourced Missanda timber joist beam, PAR, fixed to internal concrete beam to support a cantilever of 2100 mm

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

38 x 76 mm SA Pine timber purlin, grade 1, nailed to truss as 1100mm centres.

38 x 228 mm SA Pine timber truss, grade 1, bolted to I beams at 1200mm centres

4 x 120 mm powder coated aluminium adjustable vertical louvres

AISI Type 316 stainless steel GKD steel fabric screen, fixed to timber frame with a stainless steel eye bolt at ends

100x 30mm anodised aluminium window channel, bolted to timber beam

52 x 228 mm grade A locally sourced Missanda timber joist beam, PAR, fixed to internal concrete beam to support a cantilever of 2100 mm

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
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 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.

**Table 7.20:** Water usage per day (kL)

<table>
<thead>
<tr>
<th>Month</th>
<th>Rainfall (mm)</th>
<th>Catchment (kL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>130</td>
<td>80</td>
</tr>
<tr>
<td>F</td>
<td>124</td>
<td>75</td>
</tr>
<tr>
<td>M</td>
<td>97</td>
<td>58</td>
</tr>
<tr>
<td>A</td>
<td>64</td>
<td>38</td>
</tr>
<tr>
<td>M</td>
<td>28</td>
<td>17</td>
</tr>
<tr>
<td>J</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>J</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>A</td>
<td>46</td>
<td>38</td>
</tr>
<tr>
<td>M</td>
<td>86</td>
<td>64</td>
</tr>
<tr>
<td>D</td>
<td>150</td>
<td>80</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>479</td>
</tr>
</tbody>
</table>

Discharge to municipal sewer: 1.6 kL daily loss from water treatment cycle.
CHAPTER 8: DRAWINGS

<table>
<thead>
<tr>
<th>P.</th>
<th>126</th>
<th>PERSPECTIVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>131</td>
<td>SITE PLAN</td>
<td></td>
</tr>
<tr>
<td>132</td>
<td>PLANS</td>
<td></td>
</tr>
<tr>
<td>134</td>
<td>SECTIONS</td>
<td></td>
</tr>
<tr>
<td>138</td>
<td>DETAIL SECTION</td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>DETAILS</td>
<td></td>
</tr>
<tr>
<td>142</td>
<td>MODEL</td>
<td></td>
</tr>
</tbody>
</table>
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 galvanized steel.

50 mm concrete screed, laid on concrete slab, cement:sand ratio of 1:3, shell 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, 600 mm plaster finish with cement:sand ratio of 1:5.

250 x 600 mm reinforced concrete ground beam, in situ cast on concrete column.

200 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.

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.

50 mm concrete screed, laid on concrete slab, cement:sand ratio of 1:3, steel floated to hard smooth finish.

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

250 x 250 mm steel reinforced precast concrete SW channel.

250 x 400 mm steel reinforced concrete down stand beam.

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

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

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

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 galvanized steel reinforced concrete beam, in situ cast onto columns, fair-face timber grain pattern finish.

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

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

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

2500 x 1200 stainless steel GKD steel fabric screen.

100 mm concrete ground slab, in situ cast on ground beams, 50 mm sand blinding layer below to protect DPC.

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

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
300 x 1800 mm Youngman Concealed-Fix ‘Snaplock’ 0.8mm EZ clad aluminium roofing sheeting, nailed to purlins

50mm expanded polystyrene type 2 rigid thermal insulation board, laid on ceiling board fixed to truss beam with insulation clips.

220 x 350mm grade A 6AA Pine timber truss beam, PAR, copper azole pressure treated, fixed between timber beams.

220 x 75 mm grade A locally sourced Missanda timber beam, PAR, copper azole pressure treated, fixed between concrete portal frames by joist hanger.

Table 8.1: Materials Schedule

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Dimensions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Youngman Concealed-Fix ‘Snaplock’ aluminium roofing sheeting</td>
<td>300 x 1800 mm</td>
<td>0.8mm EZ clad, fixed to purlins</td>
</tr>
<tr>
<td>50mm expanded polystyrene type 2 rigid thermal insulation board</td>
<td>220 x 350mm</td>
<td>grade A 6AA Pine timber truss beam, PAR, copper azole pressure treated</td>
</tr>
<tr>
<td>220 x 75 mm grade A locally sourced Missanda timber beam</td>
<td>108 x 32 mm</td>
<td>PAR, copper azole pressure treated</td>
</tr>
<tr>
<td>2500 x 1200 x 22 mm AISI Type 316 stainless steel GKD steel fabric screen</td>
<td>250 x 400 mm</td>
<td>fixed to timber frame with stainless steel eye bolt at ends, panels alternating Escala 7x1, Escala 5x1 and Helix Manufacturer patterns</td>
</tr>
<tr>
<td>1200 x 1100 x 5 mm 50% opaque float glass</td>
<td>100 x 30 x 2 mm extruded aluminium 50 STF alloy 'variomatic' vertical louvre section</td>
<td>anodised finish to 0.025mm thickness, fixed to threaded electronically adjustable pivot</td>
</tr>
<tr>
<td>200 x 200 x 300 mm U-profile concrete blocks</td>
<td>250 x 300 mm</td>
<td>top rated in window channel with class II mortar joint with cement:sand ratio of 1:5, smooth plaster finish with cement:sand ratio of 1:4.5</td>
</tr>
</tbody>
</table>

Figure 8.11: Section BB
### DETAIL SECTION

**DRAWINGS**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Component Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 x 100 mm</td>
<td>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.</td>
</tr>
<tr>
<td>200 x 200 x 300 mm U-profile concrete blocks, fixed together with marine plywood with moisture control measures on top, using Herman Lyon's patent adhesive, sanded and coated once with clear wax polish.</td>
<td></td>
</tr>
<tr>
<td>76 x 38 mm</td>
<td>SA Pine timber purlin, smoothed copper azole pressure treated, nailed to truss at 1000mm centres.</td>
</tr>
<tr>
<td>360 x 38.1 mm</td>
<td>Youngman Concealed-Fix ‘Snaplock’ 0.8mm EZ clad aluminium roof cladding, nailed to timber joist and beam.</td>
</tr>
<tr>
<td>600 x 250 mm galvanised steel reinforced concrete beam, insitu cast onto columns, fair-face timber grain pattern finish.</td>
<td></td>
</tr>
<tr>
<td>200 x 200 x 300 mm U-profile concrete blocks, fixed together with marine plywood with moisture control measures on top, using Herman Lyon’s patent adhesive, sanded and coated once with clear wax polish.</td>
<td></td>
</tr>
<tr>
<td>100 x 20 mm</td>
<td>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.</td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
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<td>200 x 200 x 300 mm U-profile concrete blocks, fixed together with marine plywood with moisture control measures on top, using Herman Lyon’s patent adhesive, sanded and coated once with clear wax polish.</td>
<td></td>
</tr>
</tbody>
</table>
57kg / 18 m² type 60 bituminous roofing felt, laid on
purlins, adhesive applied before laying roof sheeting

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

100 mm galvanized steel reinforced concrete ground slab, to
engineer’s 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

220 x 70 mm grade A locally sourced Missanda timber beam,
PAR, copper azole pressure treated, fixed between concrete
portal frames by joist hanger

100 x 30mm extruded aluminium 50 STF window channel,
anodised finish to 0.025 mm, fixed to timber framework with and
grade 304 stainless steel screw

Figure 8.14: D2 truss end gutter and louvre detail

Figure 8.15: D3 ground beam waterproofing

Figure 8.13: D1 roof ridge detail

Figure 8.15: D3 ground beam waterproofing
Figure 8.20: Model view 5

Figure 8.21: Model view 6