

05 _ DESIGN DEVELOPMENT

5.1 INTRODUCTION

The design development phase is seen as the refinement of the design concept for realization into a building. All investigations, analysis and guidelines preceding this are incorporated to inform the design process and guide the result. During design development it becomes important to give closer attention to all aspects of the design.

5.2 AIM AND OVERVIEW OF THE CHAPTER

5.2.1 Aim

The aim of this chapter is to illustrate key findings and objectives, to show how design decisions were made in an attempt to refine the design to a product.

5.2.2 Overview of the chapter

The chapter commences with a discussion of the exploration iterations that were progressively refined into the baseline conceptual intent. The refined concept is then correlated with appropriate precedents that lead into four architectural design imperatives.

The design imperatives are discussed in some detail followed by considerations and decisions relating to structure, building climate and material choice. The designer is of the belief that design development and technical investigation are interchangeable, and therefore they are consolidated into one chapter.

“A concept, whether a rationally explicit statement or a subjective demonstration, establishes an order, a field of enquiry, a limited principle.”
_ Steven Holl

5.3 CONCEPTUAL DESIGN INTENTIONS

The design intention for the dissertation was to create a valid public space that provides infrastructure to Maputo’s water transport system.

The conceptual premise was one of threshold, movement and connection.

The design concept firstly focusses on defining a threshold between land and sea. Next a rethinking of transport architecture from pragmatic infrastructure perspective on the one hand, to its possibilities as meeting point and social space on the other. The theme of movement was explored, with the spatial order being one of articulated moments along a path as destination points along a route.

Particularly in an African context, a flexible, multi-functional product is most appropriate. By designing the building to cater for a variety of functions, it engages the community on numerous levels without demanding participation. Public space in an African urban condition should allow for informal exploration and gradual discovery of unprogrammed space.

The design exploration further involved investigating the mediation of two broad categories of user, namely the city dweller drawn to the waterfront for recreation, and the transport user. These two broad categories have the potential for a multi-faceted place.

Fundamentally, the importance was placed not on what the intervention IS (form) but what it DOES (for the user).

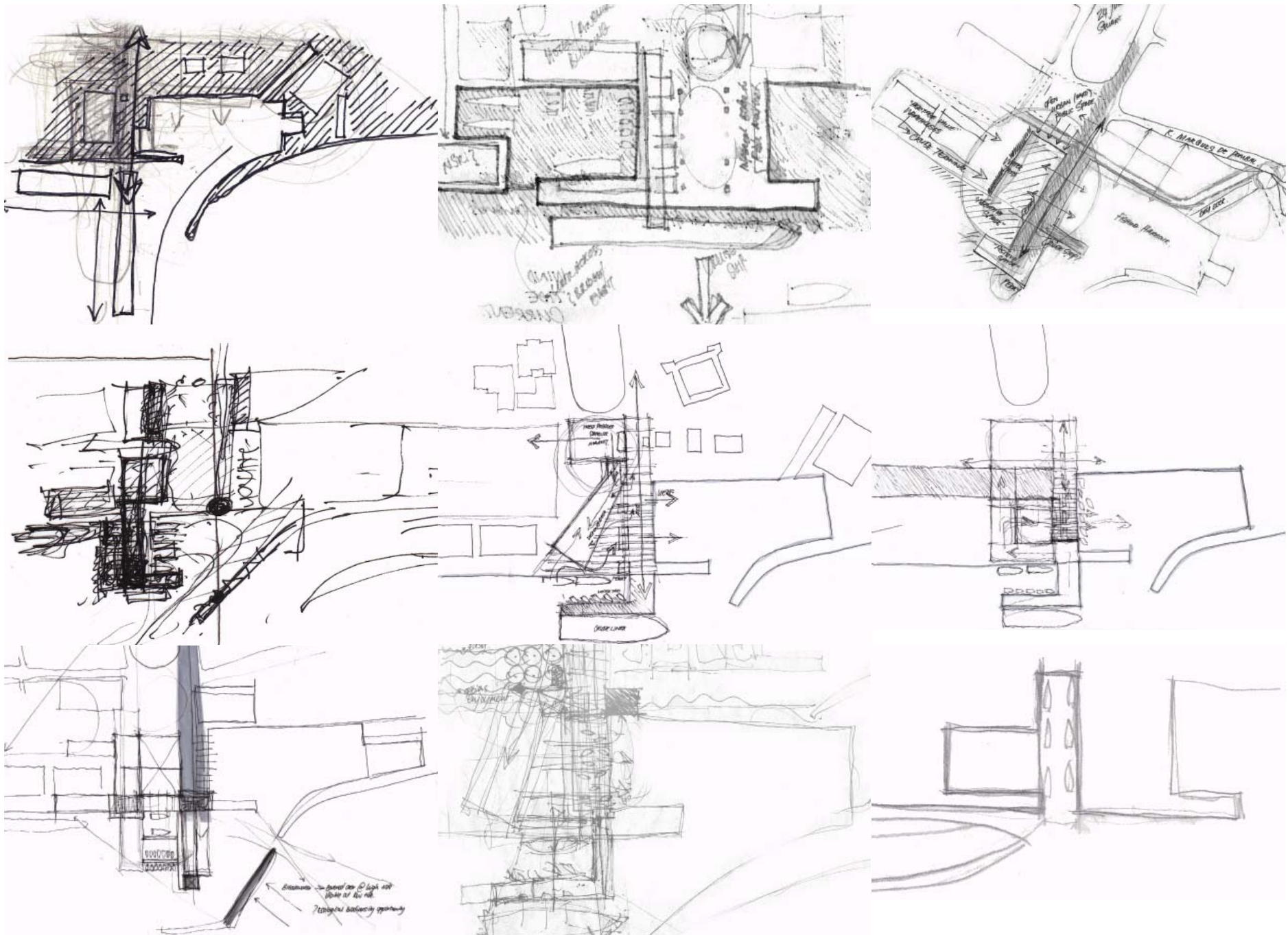


fig. 5.1_ Selection of conceptual exploration sketches testing site options against the conceptual intentions of the design
By author

fig. 5.2
Initial parti
diagram
By author

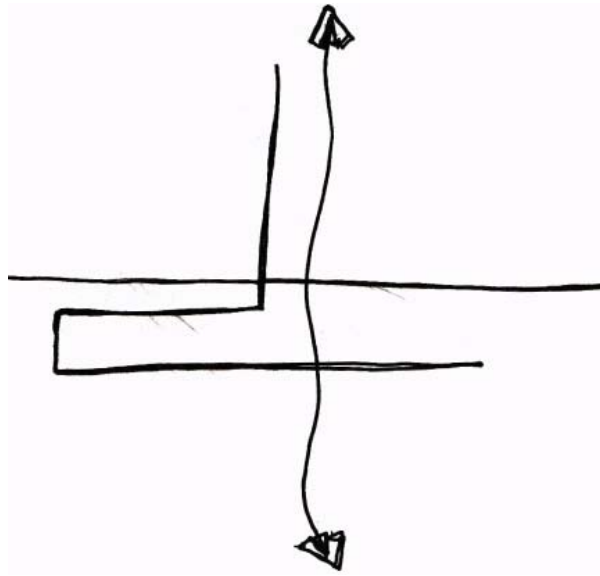
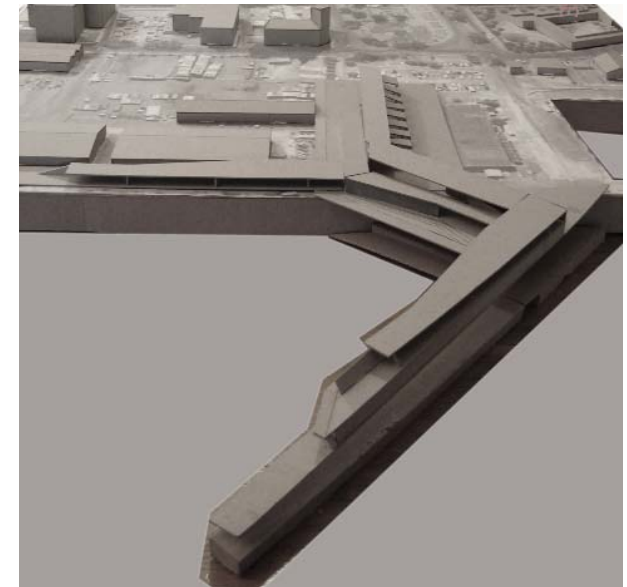


fig. 5.3
View of first
iteration
model from
the southern
side



5.4 SPATIAL EXPLORATION OF CONCEPT

The spatial exploration of the concept was done using rough conceptual models. This allowed for three dimensional exploration of the intentions. These models proved useful to gain an understanding of scale and spatial qualities.

5.4.1 First Iteration Model

The intention with the first model was to explore the notions embedded in the initial parti diagram in three dimensional spatial media. The marrying of different users including the possibility of combining ferry commuter and cruise ship travellers in one facility.

The model investigated the connection between land and sea. The approach was to extend the land

into the sea. In addition the model investigated the marrying of different user groups into one facility and explored different levels and planes for these different users. The iteration also explored the architectural translation of contrast, light and shadow, solid and void, land and sea.

Through this model it became clear that extending into the sea was inappropriate to the site and context. In addition the scale of the structural intervention required was firstly inappropriate to the design intention and secondly would be a particularly costly exercise.

_ Design Conclusions

- Building out into the water is unsuitable in the current context. It requires an intensive structural intervention to support a cruise

ship exposed to wind and currents, and it compromises the shipping approach into Maputo and Matola ports.

- The connection of the building to the urban square requires more detailed consideration.
- The pragmatics of how the users of the facility move through and to the building should be considered.
- Building out into the water is not an appropriate solution. However, the need for increased waterside access for boats still needs to be addressed.

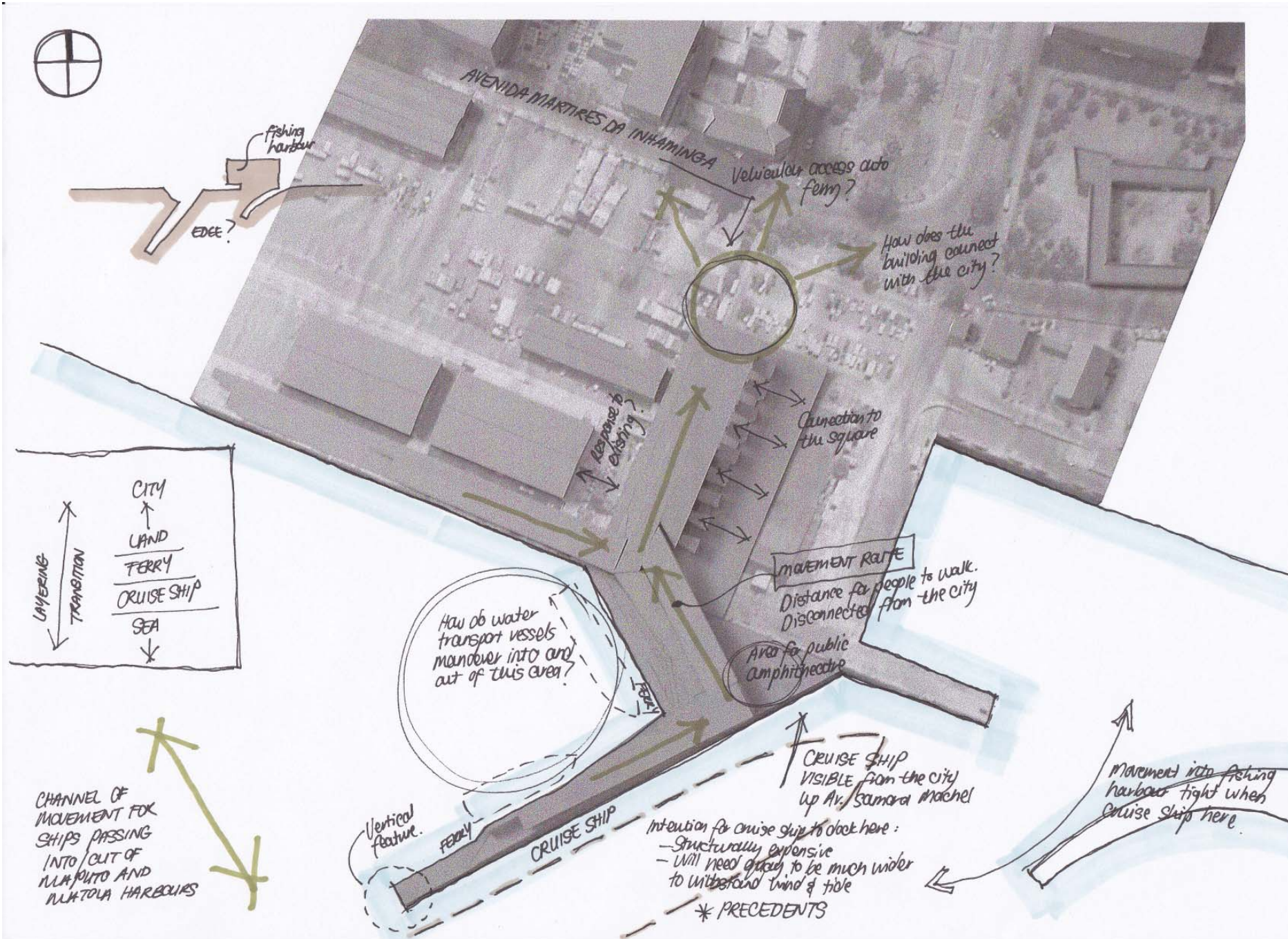
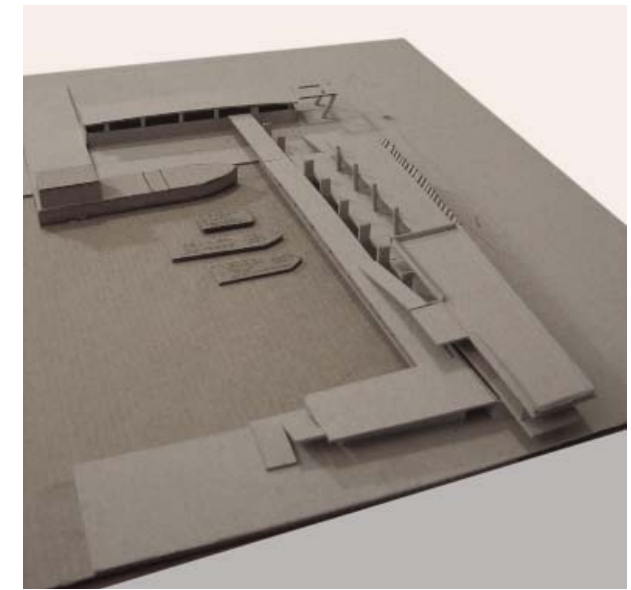
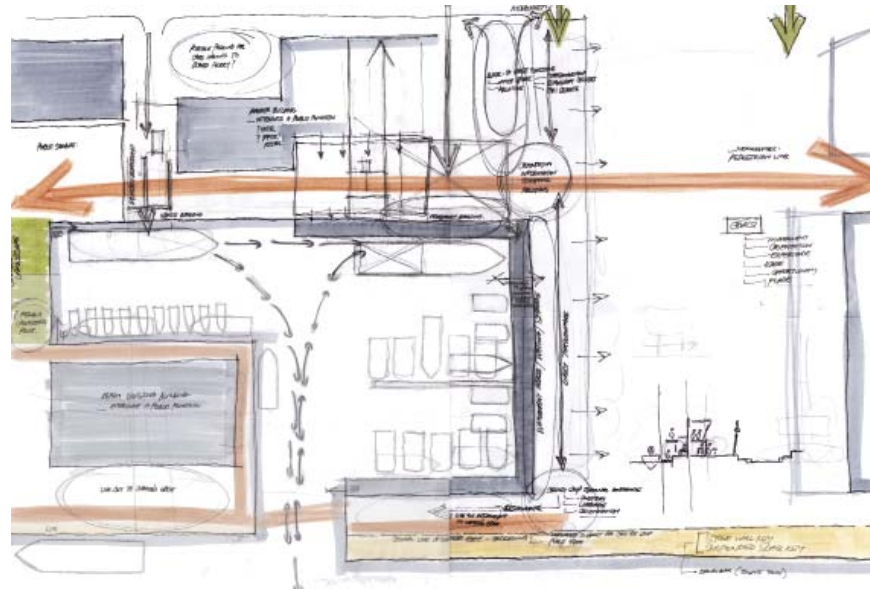


fig. 5.4_ Conceptual investigation of first iteration model showing findings, lessons and pitfalls.

fig. 5.5_ Spatial exploration of site potential during second iteration

fig. 5.6_ Second iteration model



5.4.2 Second Iteration Model

The second iteration responded to the lessons learnt from the first iteration. The first major change stemmed from building out being an inappropriate solution. The second iteration thus increased waterside edge by cutting into the existing edge to form a new harbour and settling the proposed building alongside it. This approach allowed for sufficient waterside access for boats and proved economically more viable and contextually more appropriate. A harbour study comparing world-wide precedents with the norms in Maputo discussed in Chapter 3 was part of this iteration.

Spatially, the exploration in this second iteration again dealt with movement. It again tested the possibilities of movement routes on different levels including roof access, with movement between the

planes occurring via ramps. The iteration also included the design intention of commuter users and cruise ship users being accommodated in the same building.

The spatial investigation in this iteration revealed that a terminal building is more successful as a linear building and that a corner building is unsuitable. It became clear that a linear building parallel to a body of water would best serve the programmatic function of the facility.

The model result was very rigid and formal but was a useful step in the iterative process.

It clearly revealed the need to better resolve the practicalities of how the large ferry and smaller water taxis manoeuvre themselves alongside the building.

_ Design Conclusions

- A linear building typology that avoids right angles is most suitable.
- Practicalities of how the boats move in and out of the harbour are important design informants.
- Each user type must be investigated and designed for. This includes an understanding of how vehicles and pedestrians move through the building and board the vessels.
- It is important to acknowledge the experiential impact of water, and investigate how to design for building users interacting with it.

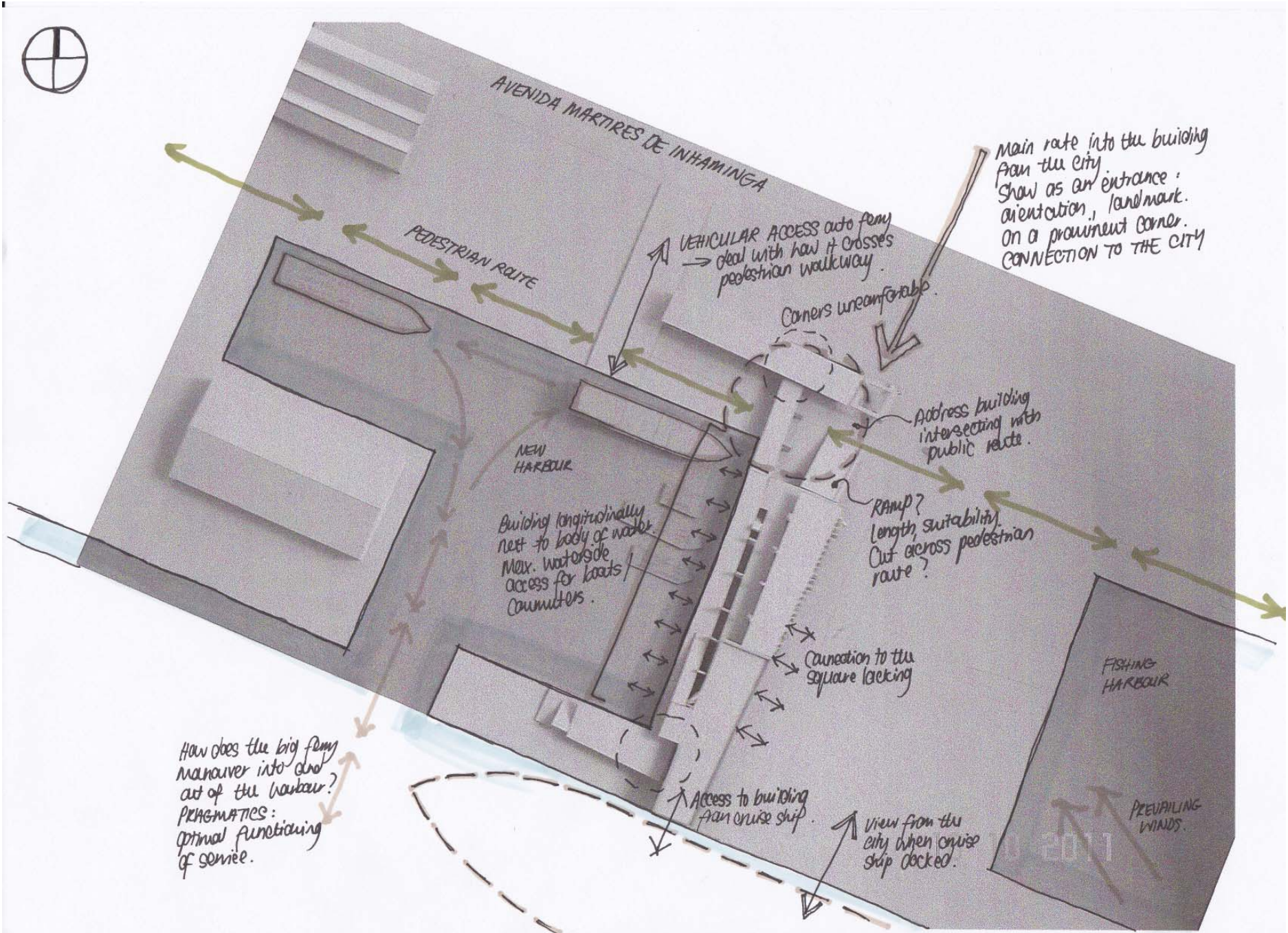


fig. 5.7
Conceptual investigation of ideas and shortcomings shown on the second iteration model

fig. 5.8_
Third iteration
model,
southeastern
facade

fig. 5.9_
Third iteration
model,
northern
facade onto
harbour edge



5.4.3 Third Iteration Model

The third iteration used a 1:200 scale, increasing from the previous two iterations at 1:500 scale. This investigation expanded on the second iteration allowing for spatial issues made evident in the previous model to be better explored. This concept model was adjusted to create a linear building.

The increased scale of the model greatly increased clarity of design issues. During this iteration five main design issues emerged. The first issue related to the exploration of a movement route one floor up, parallel to the ground plane. The model revealed this not be an appropriate design decision. The reason being that removing the public from the ground plane contradicts the intention of catalyzing the public place through large numbers of people.

Inhabiting the roof was the second issue that was shown to be unnecessary for similar reasons. By introducing public access to the roof the

success of the substantial ground plane public space as proposed in the urban plan would again be compromised.

The third issue that was revealed in this iteration was the notion of access to different levels via ramps. This proved unsuccessful as the ramps cut public spaces off from each other and inhibited public movement routes.

The fourth issue revealed in this investigation led to a reconsideration of the ferries' relationship to the building as this is critical to the optimal functioning of the transport system. Understanding of how the water vessels move, and in what way pedestrians and vehicles interact with the vessels would be critical to the design resolution.

The fifth issue that became clear was that within the functioning of the building as part of the larger waterfront precinct, the cruise ship would

be optimally catered for west of the ferry terminal site, independent of the ferry transport building.

The third iteration again made it clear that the form needed to be better articulated through the movement needs of the user.

_ Design Conclusion

- Main public movement is most appropriate on the ground plane
- Ample public space at ground level makes inhabited roof unnecessary
- Ramps as mode of entry are unsuitable as they fragment the spaces.
- The cruise ship travellers should be accommodated elsewhere as the functional needs and typological expression of a cruise and ferry terminal are different and not suitable for combining on this site and in this context.

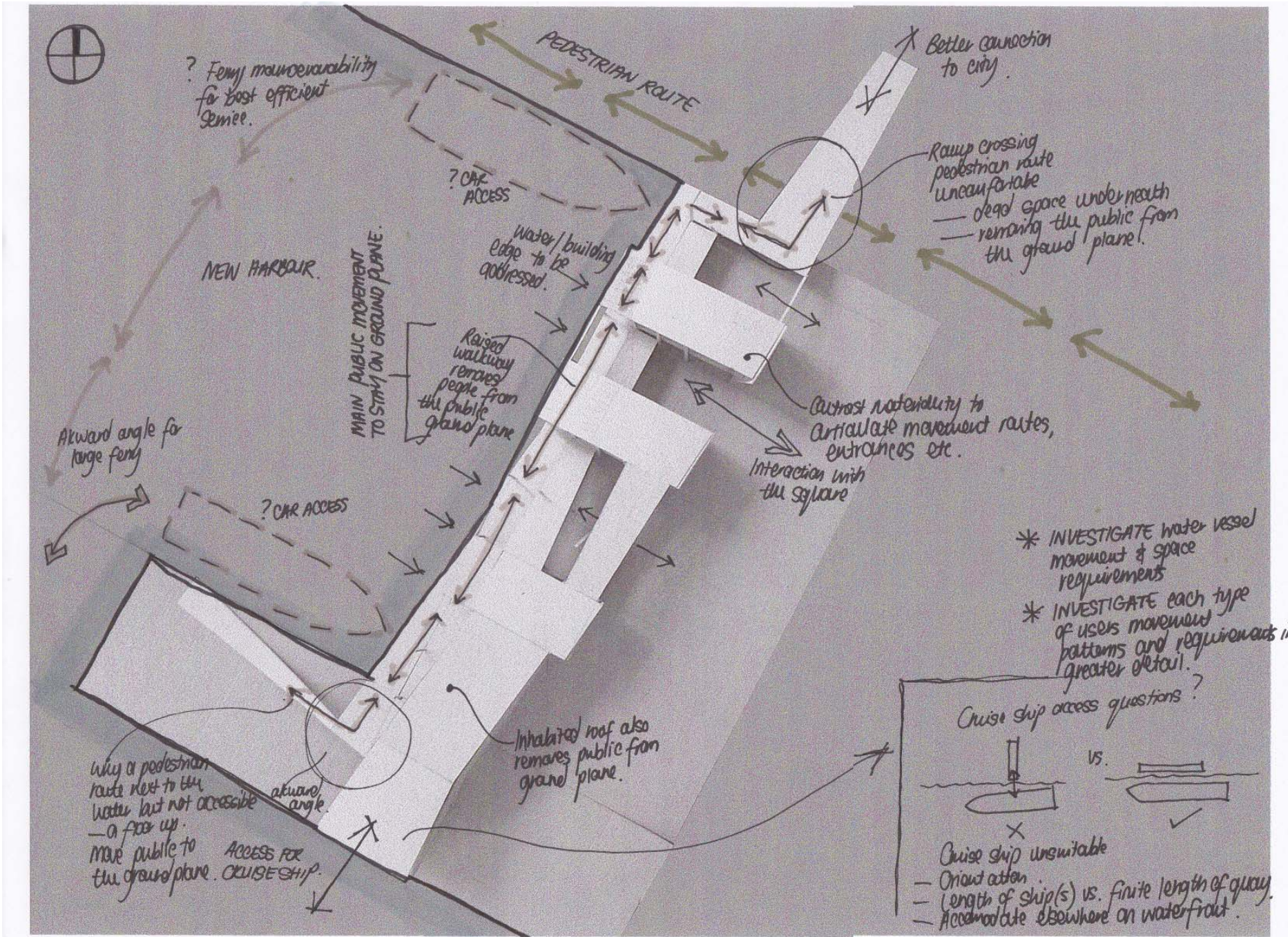


fig. 5.10_ Conceptual investigation of ideas and shortcomings shown on the third iteration model

fig. 5.11_
Fourth iteration
model, northern
facade onto
harbour edge

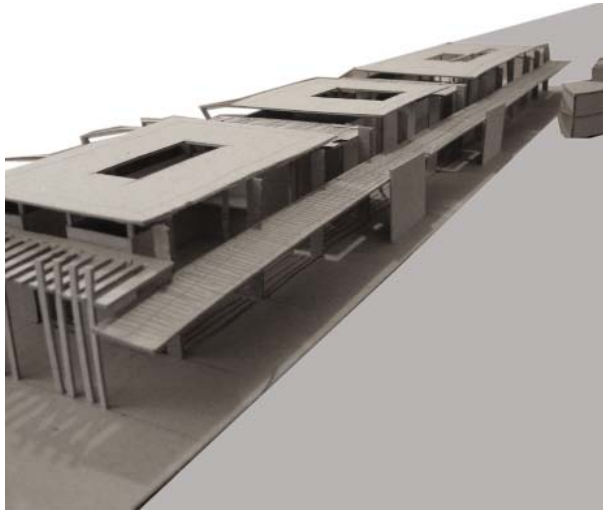


fig. 5.12_
Fourth iteration
model, northern
facade onto
harbour edge,
from southern
perspective

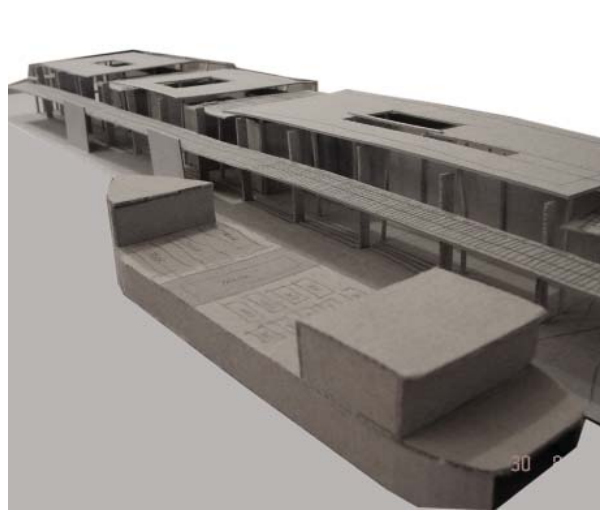
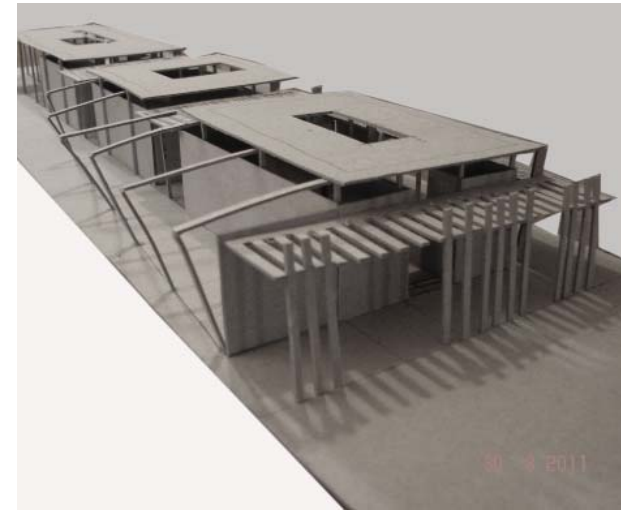


fig. 5.13_
Fourth iteration
model,
southeastern
facade



5.4.4 Fourth Iteration Model

The fourth iterative spatial model consolidated the lessons from the previous three iterations.

Firstly this investigation focused on the spatial implications of bringing the consolidated public surface back down to the ground plane and secondly how the building would connect with the context on all sides, namely the harbour to the northwest, open sea to the southwest, the public urban space to the southeast, and the connection to the harbour precinct and city on the northeastern edge.

Requirements in terms of movement, orientation, climate and functional aspects were also redefined as well as the effect of any level changes on those with disabilities.

The final spatial iteration was then tested against the requirements of the user, ensuring that the design was user- and movement-driven rather than form driven.

Finally the model made the need for attention to edge conditions clear: this design is about threshold.

Design conclusions

- User movement is the important driver behind space planning in the design
- Definition of entrances and other means of orientation within the building are important. An ordering system is required through the site, as the design execution of the building is linear.
- The treatment of edge conditions requires attention which must focus on threshold.

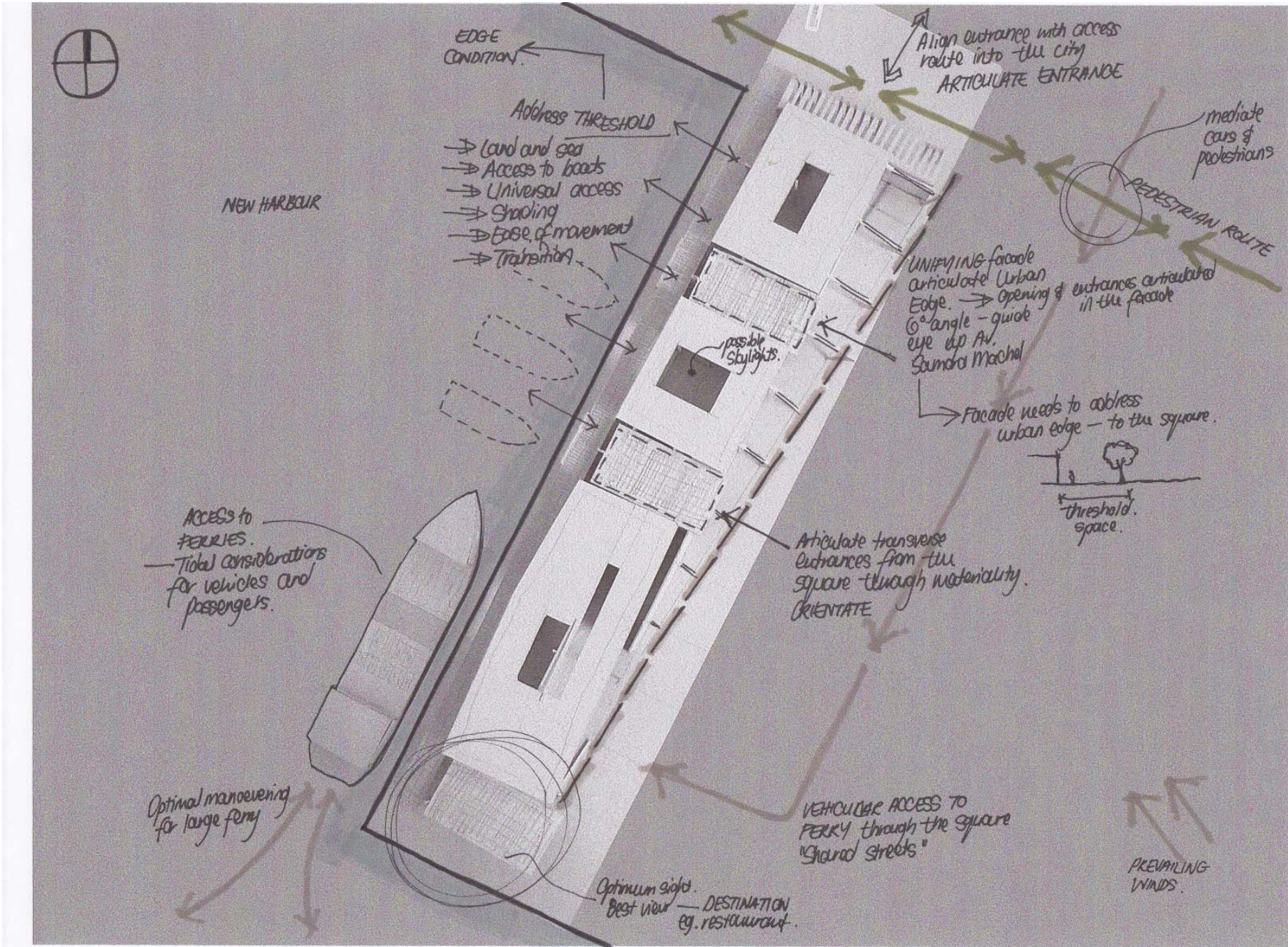


fig. 5.14_ Conceptual investigation of ideas and shortcomings shown on the fourth iteration model

fig. 5.15_
Conceptual
exploration
of waterfront
precinct spatial
development
opportunities

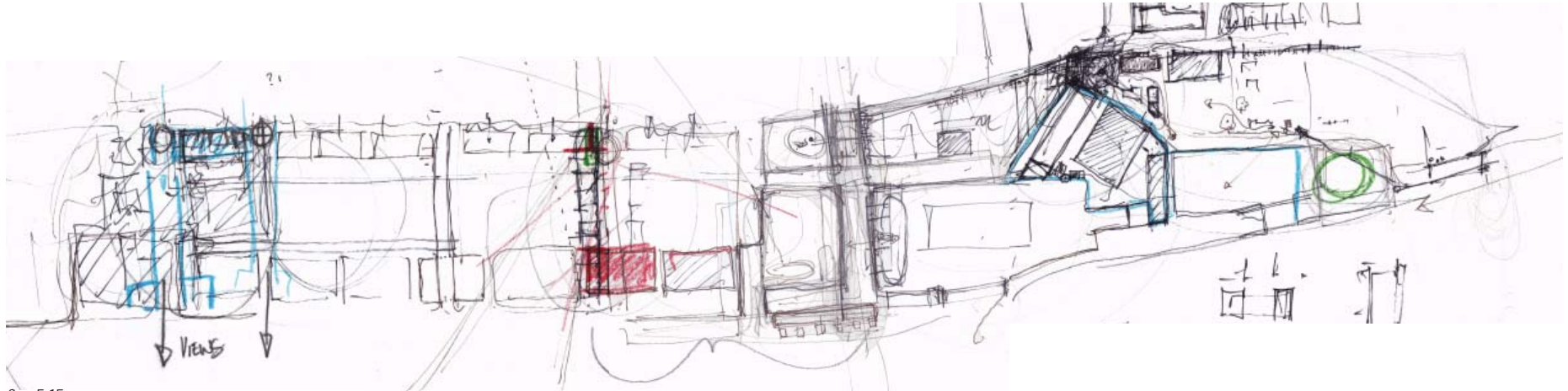


fig. 5.15_

5.4.5 Iterative exploration of concept translated to waterfront precinct scale

The conceptual conclusions reached through the iteration process are explored in figure 5.15, with the conclusions illustrated in figure 5.164. The figure depicts the water transport facility and harbour integrated into the context. The harbour is shown as zoned into clear areas of use. Additionally it shows exploration of the development of the waterfront, as discussed in greater detail in Chapter 3, referencing the new cruise ship berth.



fig. 5.16_ Iterative exploration of waterfront precinct spatial development

fig. 5.17_ Conceptual diagram of waterfront precinct intentions
By author

fig. 5.16_

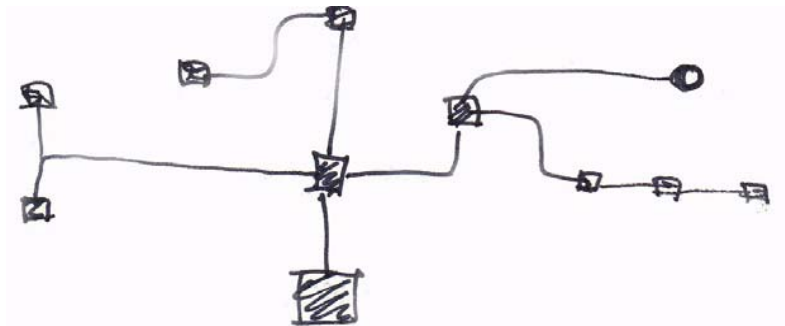
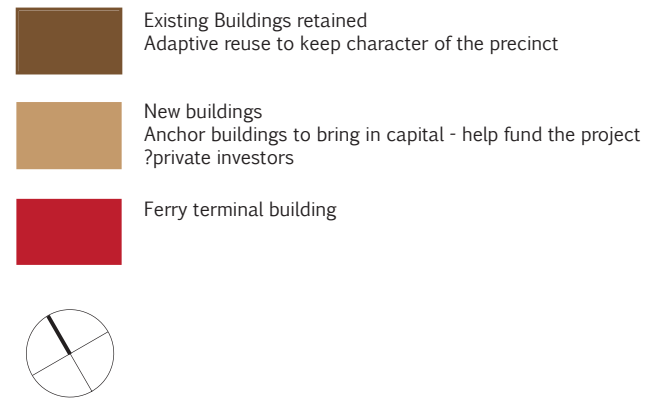
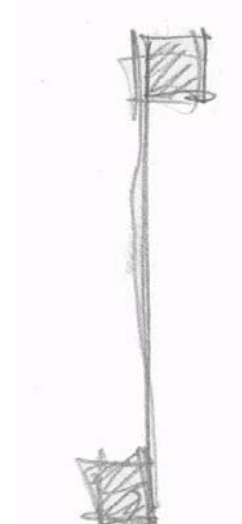
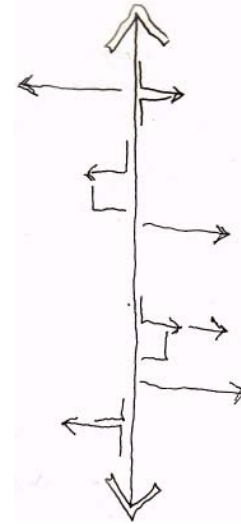
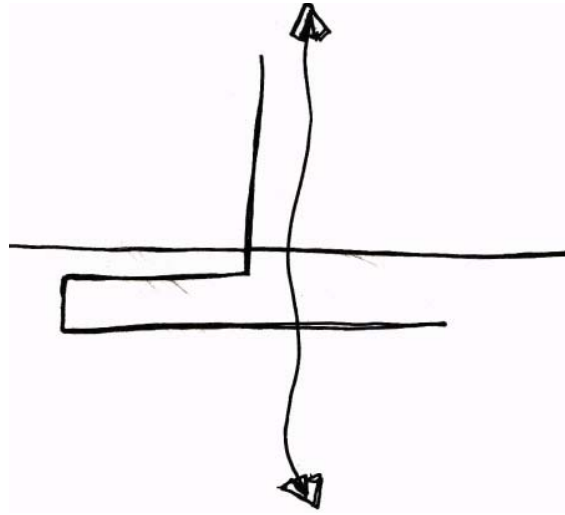


fig. 5.17_

fig. 5.18_ Series of concept sketches showing development of the parti diagram during the iterations



5.4.6 Conclusion of the iterative exploration of the concept

Each iteration aided in refining the complex balance needed in this design. The balance firstly required that the building not be designed as an object in space, but be integrated into the context on all sides, namely the square, the sea, the harbour and the Baixa.

From a more pragmatic perspective the balance recognized the transport planning as important, but equally important is the building's relationship to the Baixa and its role as catalyst and anchor of the waterfront redevelopment.

The key objectives of the design are then identifiable as:

1. Provide for the optimal functioning of an expanding water transport system
2. Provide universal access to water transport, which was not so at the current terminal
3. Design for the user by identifying the different user requirements
4. Design the building and its relationship to the surrounds as a catalyst for placemaking at the new Waterfront precinct. Edge conditions are particularly important.
5. Design an architecturally integrated building acknowledging the diverse contextual dimensions of the place, to produce an architecture of fit.

6. A loose-fit building with infrastructural service cores and plenty flexible movement space allows for flexibility.

5.5 CONCEPT REFINEMENT

The iterative process refined the concept and defined what the building needs to be and needs to provide. The initial concepts of threshold, movement and connection were recognized as fundamental to a balance in the design.

In addition the balance between the building's role as terminal and its role in catalysing waterfront regeneration must be retained and developed.

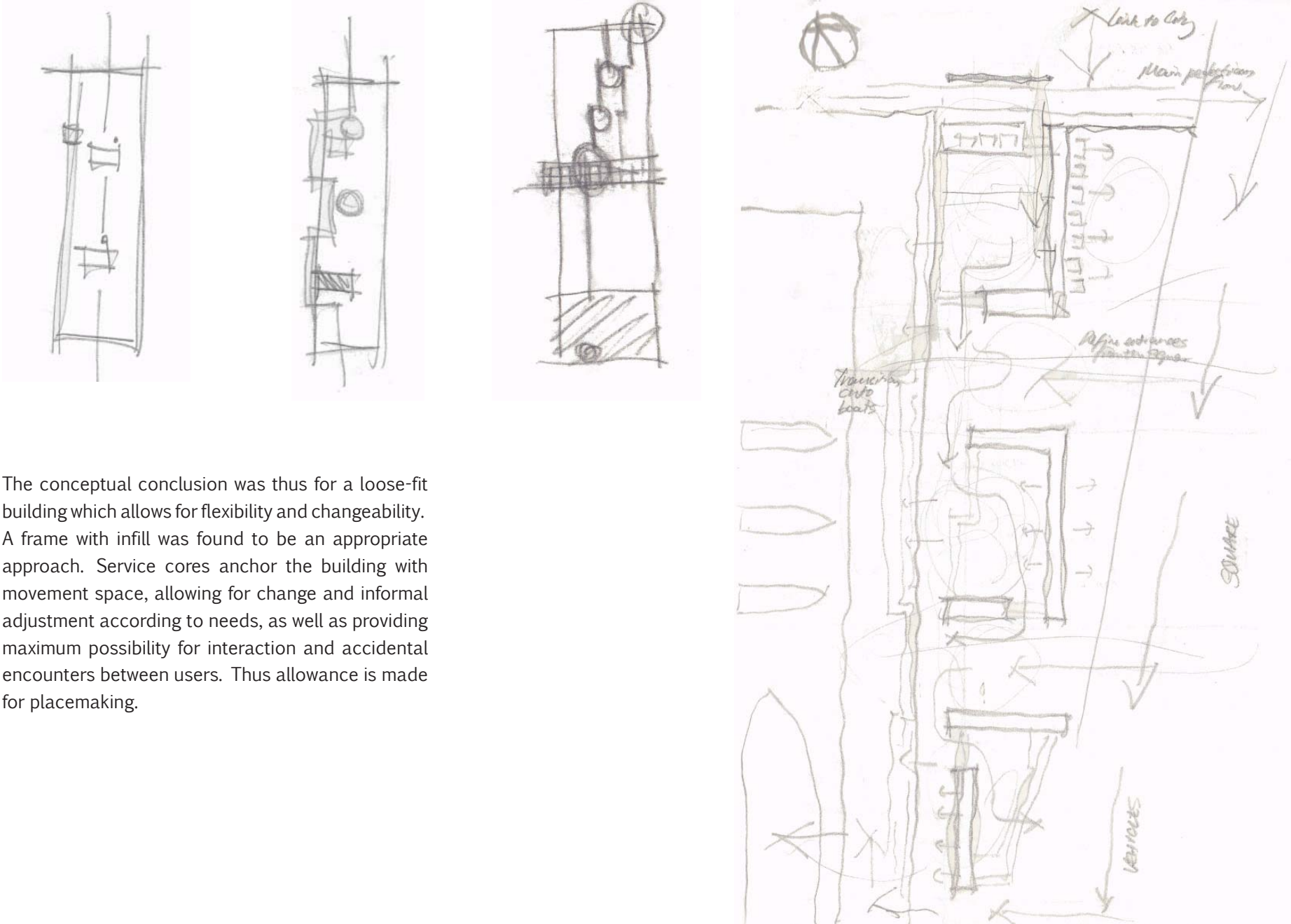


fig. 5.19
Sketch showing
conceptual
refinement

The conceptual conclusion was thus for a loose-fit building which allows for flexibility and changeability. A frame with infill was found to be an appropriate approach. Service cores anchor the building with movement space, allowing for change and informal adjustment according to needs, as well as providing maximum possibility for interaction and accidental encounters between users. Thus allowance is made for placemaking.

Fundamentally, the importance was placed not on what the intervention IS (form) but what it DOES (for the user).

Within the broad framework the concept is tested as to how the space will provide for each user. The transport user remains the driver of the facility but is complemented by a recreational and a destination user. This mix of users will bring the local and the global; the formal and the informal into contact with each other, as discussed in greater detail in the theory chapter.

5.5.1. Transport User

The category 'transport user' can be broken down into three broad categories, as discussed in preceding chapters. The movement patterns of transport users of the facility are mapped in general terms in figure 5.20, showing the predominant use of the water side of the building.

The first category of transport user is an infrequent traveller or tourist who requires orientation and has some time for recreation.

The second category is the long distance commuter, using the facility as part of a regional travel itinerary. These individuals require ease and amenities, but may also engage in recreational activities.

The third category is the daily commuter and forms the bulk of people using the facility. This group requires ease, and the use of amenities provided.

Fundamentally, all travellers require ease of movement through the building and between the building and the ferries. A clear, unobstructed choice of movement routes through the building to and from entrances to water transport vessels is necessary.

5.5.2 Recreational User

The recreational users are less predictable as they may have time to meander through the building by choice. They may be using the building with

no intention of using of the transport facilities associated with it. Thus figure 5.21 depicts possible flexible movement routes for this category of user towards destinations such as restaurants and cafés within the building. The recreational user may also be drawn into the building through connections with the city and the waterfront pedestrian routes.

5.5.3 Destination User

In an attempt to create lively public space at a transit point where transport, recreation and commercial activities all merge, the destination user was a very important driver behind the design. Thus this user relies on what the building provides as a means of livelihood. This user ranges from a formal retailer to the informal trader appropriating in-between space.

Figure 5.22 depicts indicative movement routes of this user category, with markers indicating point of sale.

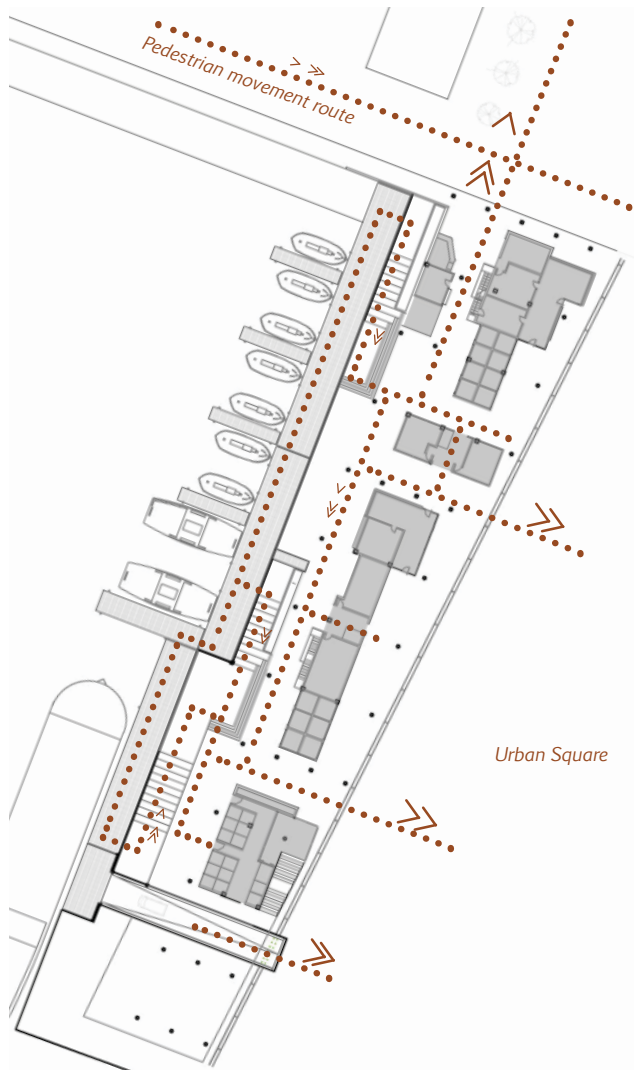
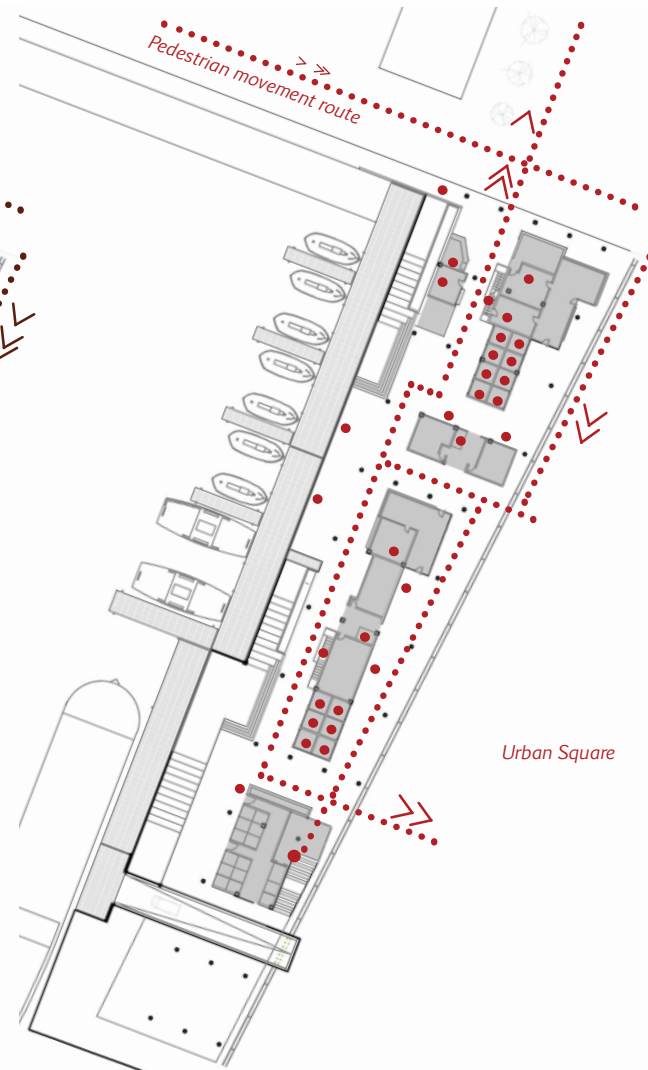


fig. 5.20_



The Recreational User
fig. 5.21_



The Destination User
fig. 5.22_

fig. 5.20_ The Transport User. Map depicting the projected predominant movement patterns of this category of user within the building. Linear movement predominantly occurs on the northwestern travel edge.

fig. 5.21_ The Recreational User. Map depicting the projected predominant movement patterns of this category of user within the building. Unpredictable movement patterns lead towards destinations such as restaurants.

fig. 5.22_ The Destination User. Map depicting the projected predominant movement patterns of this category of user within the building. Movement predominantly occurs directly to place of work. Markers indicate point of sale.

5.6 PRECEDENTS

5.6.1 Baragwanath Transport Interchange

Soweto, South Africa

Urban Solutions Architects

This precedent is relevant as it focuses on the movement of large numbers of people as the design generator and ordering system. It was chosen to better understand the increased formalization that occurs around transport interchanges of a traditionally informal nature.

The Baragwanath project provides for one of the busiest transport nodes in South Africa. The facility is located opposite the Chris Hani Baragwanath Hospital, one of the largest of its kind in South Africa

The planning principle for the building is centered on a covered arcade which acts as an orientating spine along the length of the intervention. It stretches for over 1300 metres, and is on average only 50 metres wide. The arcade acts as the binding element onto which all functions and amenities are attached.

The facility's length is differentiated spatially through functions clustered along its length. Entrances and orientation are emphasized by focal towers colourfully mosaiced by local artists. (Urban Solutions, 2006:045) Variations in height articulate public spaces and break the continuous snake of commuters. Designated places provide the infrastructure for markets, ablutions and seating. A variety of trading stall sizes and configurations cater for different traders' needs.

The robustness required for a public facility such as this is found in the choice of material. The sensitivity and lightness of the geometry however prevent the result being a heavy concrete building. In the opinion of Professor Alan Lipman, "the standard of workmanship is exceptionally polished: joints are neat and surfaces smooth where required... The level of craftsmanship and detail create a happy conjunction." He goes on to state that the building reflects permanency, and respects the ritual of daily commuting by mass transport (Joubert, 2009:141).

The building acknowledges the important and permanent role of a public transport interchange as a gathering place for a large number of citizens.



fig. 5.23_



fig. 5.24_



fig. 5.25_

fig. 5.23_ Entrance to the Baragwanath Transport Interchange. The entrance is defined as a landmark to aid in the orientation of users.

fig. 5.24_ The movement arcade allows for trade to take place along its length.

fig. 5.25_ Variations in trader stall size and composition caters for different retail needs.

Lessons learnt:

- Orientation and identification of entrances are crucial to transport interchange facilities
- A building can become a work of artistic expression, whilst still providing infrastructural necessities.
- Incorporating local artwork enhances the sense of identity and ownership of a building by locals.
- The area is accessible by vehicles, but they drive slowly and do not hinder pedestrians.
- Robustness of a public building does not have to come at the expense of craftsmanship. Quality detailing and dignified spaces can be achieved regardless.
- Movement routes and location of amenities require planning for the successful activation of the building length.

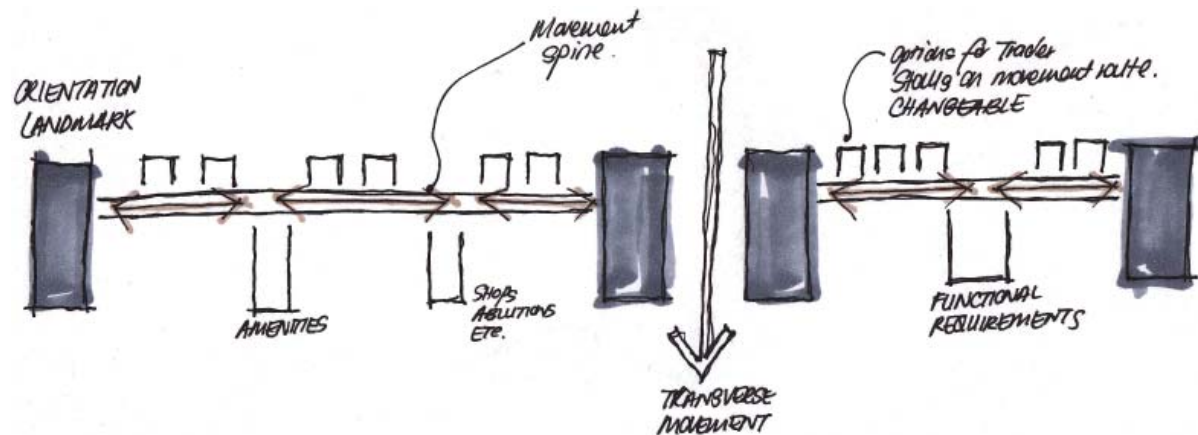


fig. 5.26_

fig. 5.26_ Conceptual sketch exploring the spatial logic of the plan. By author



5.6.2 Yokohama International Port Terminal

Yokohama, Japan

Foreign Office Architects

The value of this precedent lies in the designers' approach to the interface between the terminal building and public place. The aim of the precedent study is to better understand the merging of these two components.

Although not on the same scale or specific program as this dissertation topic, this precedent also has a common focus on movement and connection of the building to the city.

The Yokohama terminal is located on the waterfront, in close proximity to an urban park.

The brief was for an international port terminal, acting dually as a cruise terminal for visitors and as a public space offering amenities to the citizens of Yokohama. The resultant design is a landscaped public space that wraps around the cruise terminal facility. The symbolic presence as a gateway becomes less important as the functional structure becomes the foundation for a public space. The dynamics of movement were a departure point in the design process (Moore, 2002:67).

The aim was to investigate a new possibility for mediation, whereby the two components laid out in the brief become integrated, challenging the borders of segregation usually implemented in such a scheme (Unknown, 1995:19). "The citizens and the passengers are weaved through the

enforcement of connections between their respective circulation systems. The relative position of the terminal facilities and the equipment for urban leisure is reversed to increase the interaction between the two systems” (Unknown 1995:19).

The main building houses the departure and arrival facilities, including ancillary facilities required; one level below houses parking facilities; the roof level is designed as an urban park for pleasure, allowing for views back over the city. The park is a combination of soft landscaping and sculptural timber decking. The main terminal space allows for flexibility through the cruise-ship related infrastructure being removable. Thus the space becomes multi-functional.

The project is essentially a cruise terminal. It provides a connection to the water and a sense of arrival whilst fluidly providing a threshold for visitors and locals.

Lessons learnt:

- Successful integration of and provision for different user groups occurs as the building challenges the borders between programmed building and public space. This lesson can be reinterpreted within the African context of Maputo.
- The precedent is a successful example of movement and fluidity translated into architectural form
- Flexible use of space successfully reduces the risk of space not being used when a ship

is not berthed at the facility. This can be interpreted at Maputo in providing a facility that exists due to the presence of water transport, but simultaneously caters for stand-alone programmatic functions.

5.7 ARCHITECTURAL DESIGN IMPERATIVES

The design challenges requiring investigation at an architectural level are connection, orientation and interaction, mediation and contextualism. These four fundamental design imperatives are individually considered in sections 5.8 to 5.11 following.

5.8 CONNECTION

The theme of connection was addressed in the design development by investigating the edge conditions of the building. The contrasting edge conditions on the southeast and northwest of the building as well as the public space to the east are particularly important.

The northwestern side of the building is referred to as the 'travel edge' as it is the threshold between the building and the water.

The southeastern side of the building is referred to as the 'public edge', as it is the interface of the building with the public square. Located to the east of the building, the character of the public square to the east of the building, and how the building communicates with the square is investigated.

5.8.1 Travel Edge

The design considerations for the travel edge involve the movement of large numbers of people. The design aims to celebrate the water's edge, providing opportunities for engagement and appreciation between the user and the water.

The tidal range in Maputo is in excess of 3.7 metres. In a design sense this significantly influences the access to boats for both vehicles and pedestrians, as one of the horizontal planes are constantly moving. Precedents of moving buildings were investigated but found to occur in areas with minimal tidal ranges. The tidal range in Maputo amounts to change of over a story in height.

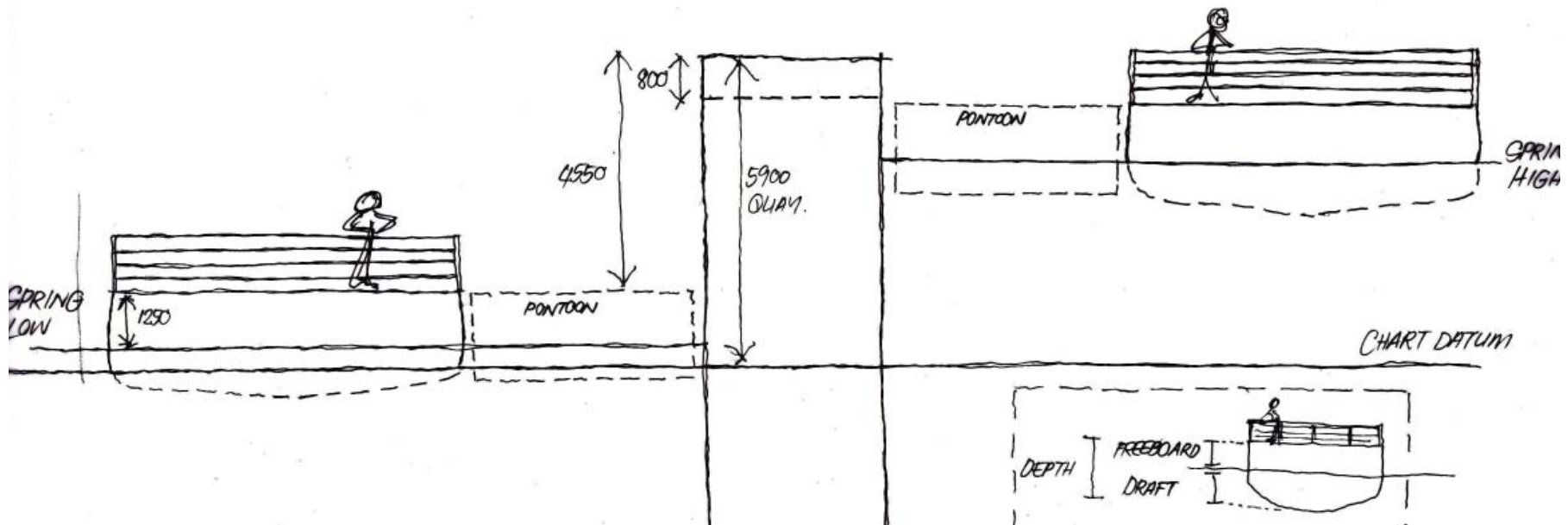


fig. 5.28_ Sketch depicting the tidal range of Maputo, and the dimensional change between land and sea.

Pedestrian Access

The design must provide public access to the ferries at all tidal variations.

The use of a ramp for pedestrian access to the pontoon was investigated and ruled out. The length of the ramp required to cater for the 1:12 universal access ramp slope at spring low tide was in excess of 40 metres. In addition, the structural support required for such a ramp would need to be movable and mounted on rollers to allow for tidal variations. The ramp would form a barrier rather than a connector between the building and the sea. This compromised the design intent of connection to the water.

Stationary steps proved to be the optimum design solution, providing threshold, connection and possibilities for sitting and engaging with the water.

The steps were designed with a generous tread, acting as individual landings. pontoons floating alongside the steps rise and fall with the changing tide, thus access to the pontoon and subsequently the water transport vessels is possible at any tidal stage from the step nearest to the level of the water.

In this way water was used in the design to emphasize the passage of time through changing tides throughout the day. As the tide rises, so the pontoons float upwards, and the steps disappear to form pools of water adjacent to the building.

Universal Access

The design decision to use steps to ensure the pontoons and water transport vessels are accessible to pedestrians required universal access to be addressed. The requirement is for access between the fixed building level and the changing levels of the floating pontoons.

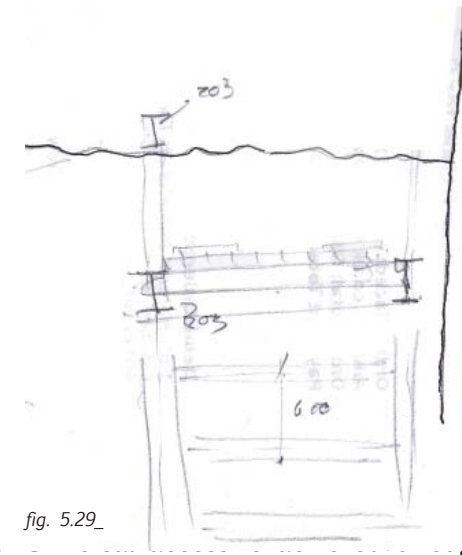
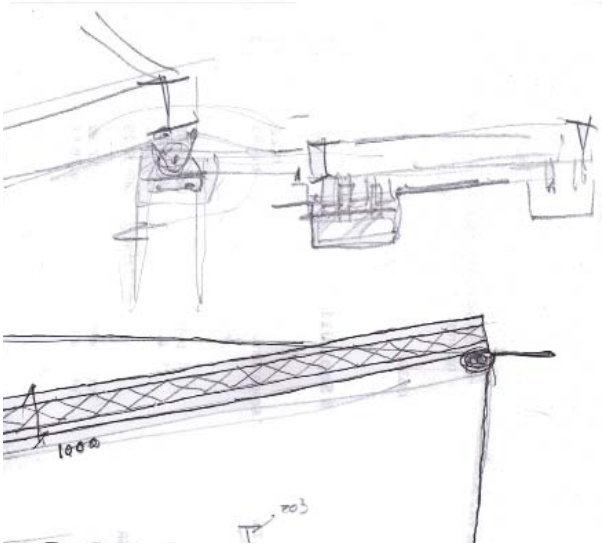


fig. 5.29_

an outdoor wheelchair platform lift. The wheelchair platform mechanism is based on lifts available commercially, which are suitable for outdoor application and do not require invasive building works. (Handson Lifts, 2011). The lift will be fitted with a sensor to ensure that it comes to a halt at the correct required level according to the changing tide.

To ensure maximum safety for the user, design considerations will include safety railings and a non-slip surface.

The lift is centrally located midway along the length of the travel edge to ensure minimum distances to any of the water transport vessels.



Vehicular Access

Vehicular access to the large ferry must be able to accommodate cars and light trucks. The current facility provides vehicular and pedestrian access to the ferry from the same point, causing congestion and bottlenecking at peak times, with vehicles posing a danger to pedestrians.

The design proposal here is to provide separate and controlled vehicular access to the ferry via a dedicated ramp. The structure of the vehicular access ramp is based on that of the current ramp, which proves to be a successful solution for cars getting onto and off the ferry. The detail design of the ramp will be subject to a Marine Engineer's investigation.

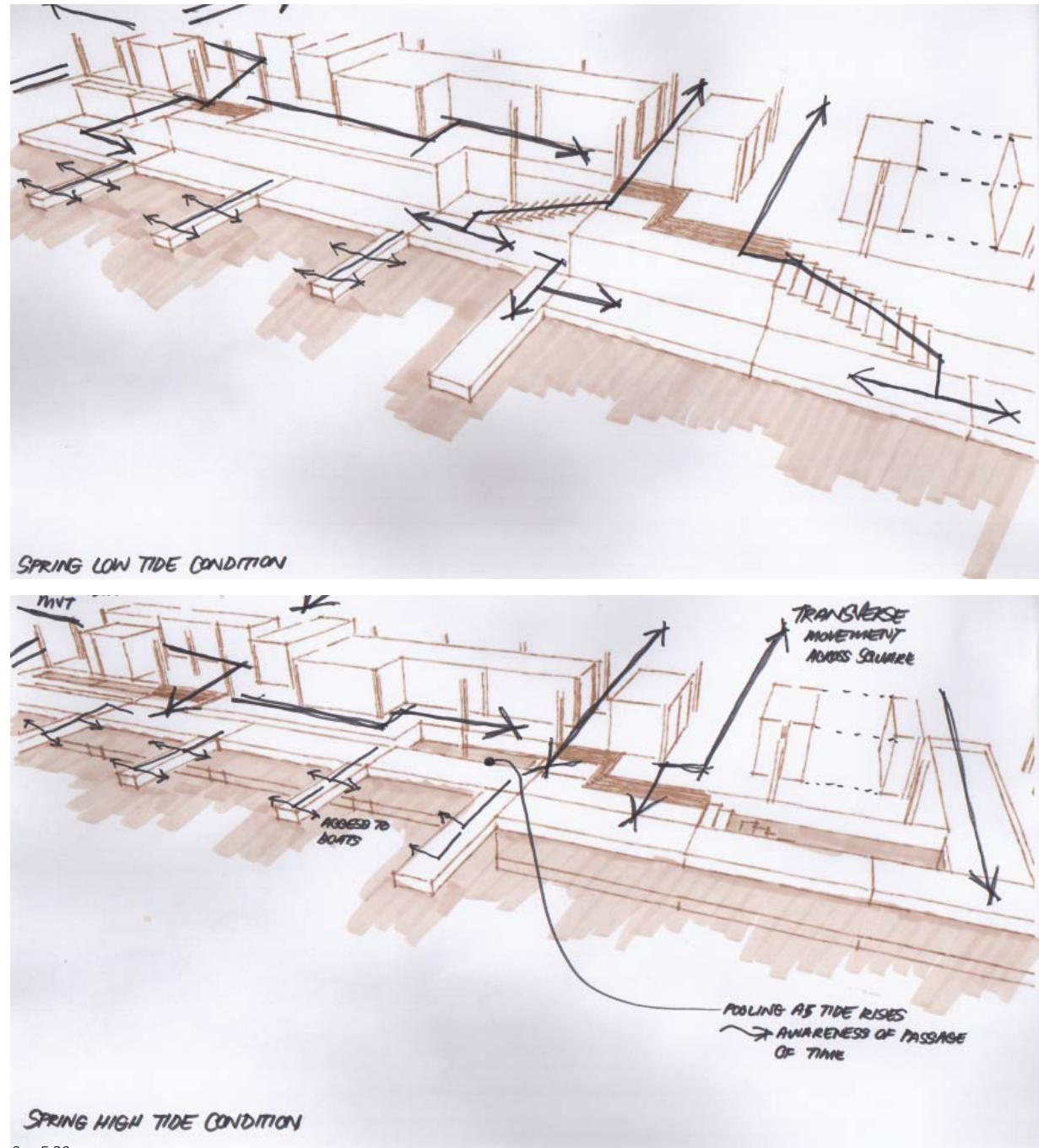


fig. 5.30_

fig. 5.29_ Technical investigation into vehicular ramp detailing

fig. 5.30_ Design exploration into the effects of high and low tide on the building's public interface between land and water

fig. 5.31_
Senecio
Tamoides
 (Canary
 creeper)

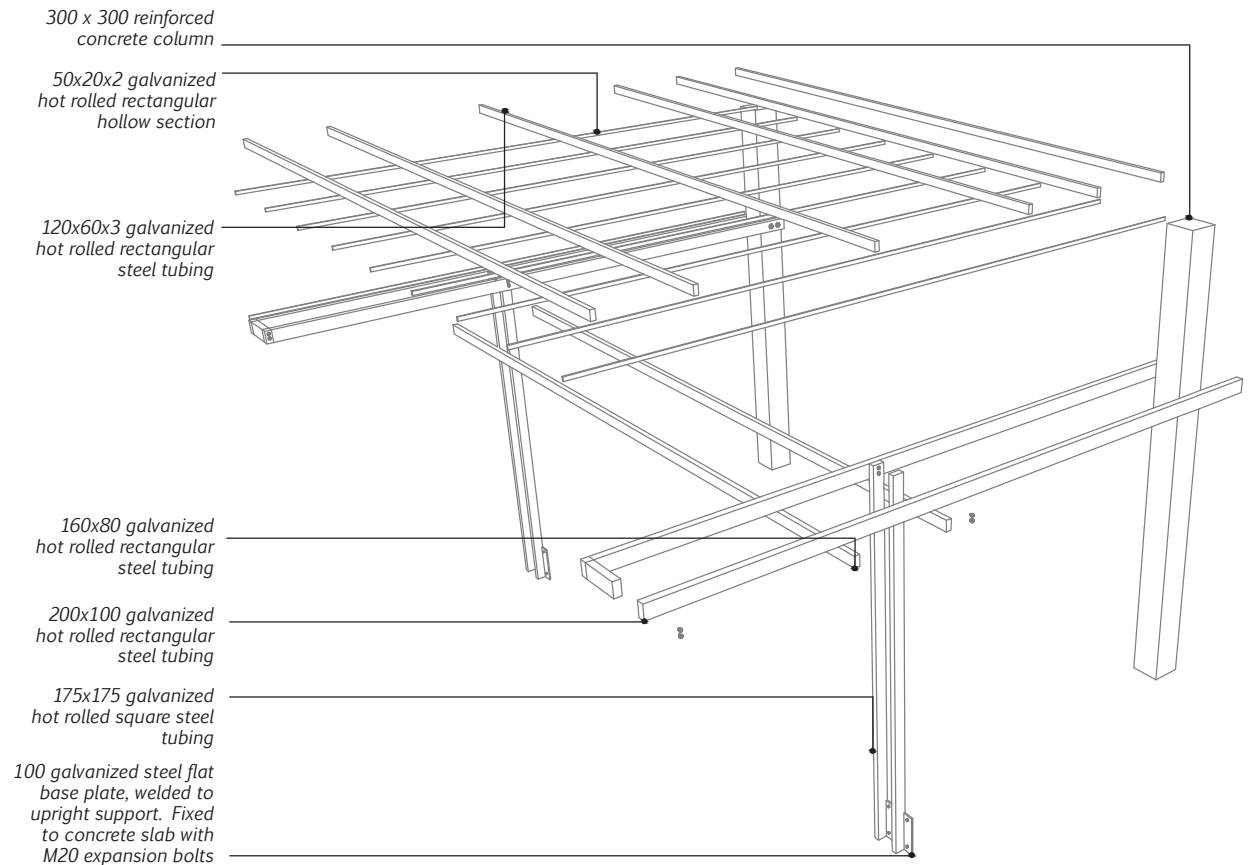


fig. 5.32_
 Detail of
 pergola on
 Travel Edge

Commuter thermal Comfort

Shading of the northwestern travel edge gives passengers relief from the heat and humidity. As the site is a typically hard urban precinct, greenery is introduced by planting a pergola to provide shade.

The plant suggested for the pergola is *Senecio tamoides*, commonly known as the Canary creeper. It is an evergreen perennial, capable of climbing several meters. The plant occurs naturally in the Maputo region and thrives in the warmer climate. It grows in full sun, and as it is a hardy plant it is particularly well suited to this harsh marine environment. The scented canary yellow flowers bloom in clusters during late summer and early autumn.



5.8.2 Public Edge

The public edge refers to the southeastern edge of the building, the edge facing onto the public square. As this facade faces onto a flexible event space, the requirement is for a defined urban edge whilst not compromising the movement and access needs of a permeable public building. Deliberate transverse movement into the building from the square as well as filtering in and out through meandering is intended. A facade screen provides a uniform impression towards the city with movement requirements and access through the screen clearly designed.

A second layer of consideration between the building and the public space is the treatment of the car. As vehicular access to the square is required in order for cars to board the ferry, the effect of the car on

a largely public space needed addressing. Vehicular access to the periphery of a public square has proved successful at places such as Praca do Comercio and Praca do Rossio, the two main squares in Lisbon.

As the vehicular access here is not a public thoroughfare, but rather a destination specific vehicular track, the proposal is a shared streets approach. This approach caters for a street thoroughfare, by demarcating the space through bollards, seating and planting.

The road is thus not defined in the traditional sense through level changes and painted lines, but is more subtly referenced through paving layout on a continuous surface. This ensures that when cars are not present, pedestrians once again take ownership of the space.

It was important here to ensure connection between different parts of the precinct, thus vehicular access should not become a barrier. Reference was again made to the successful way in which cars and pedestrians co-inhabit the street at Catembe, and at the Baragwanath Transport Interchange.

fig. 5.33_ Sketch depicting possible use of flexible public space as an urban market, with traders stalls arranged throughout the square.

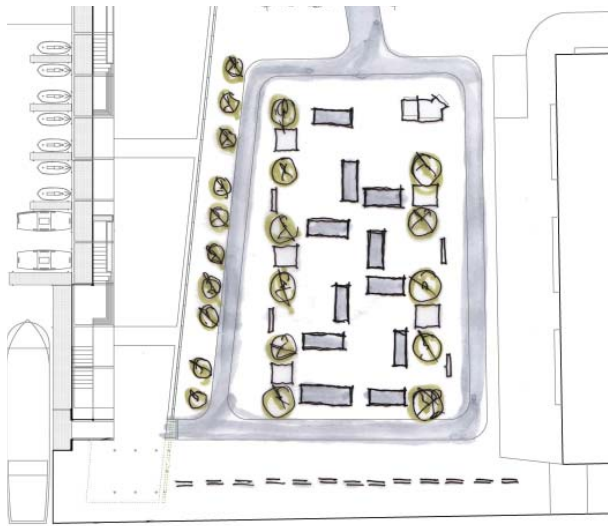


fig. 5.33_

fig. 5.34_ Sketch depicting possible use of flexible public space for outdoor exhibitions, with exhibitions arranged throughout the square.

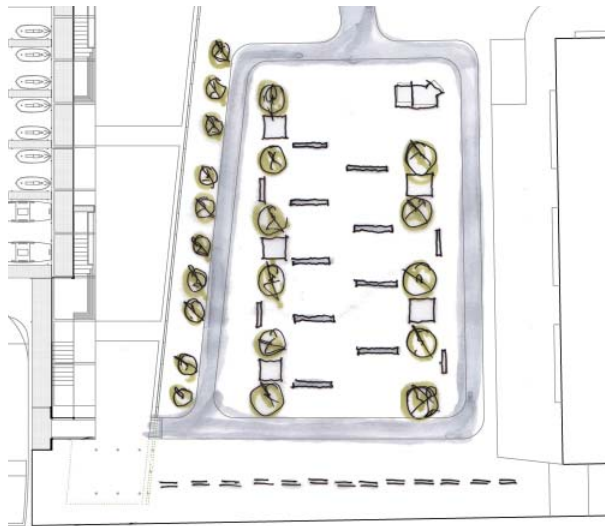
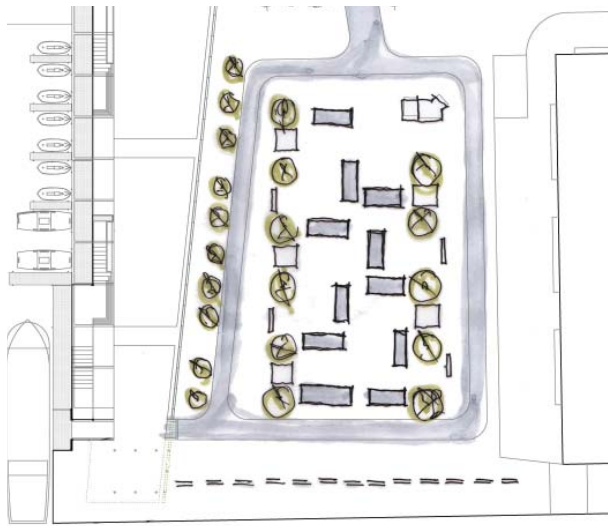


fig. 5.34_

fig. 5.35_ Sketch depicting possible use of flexible public space for public concerts, with a suggested stage location.

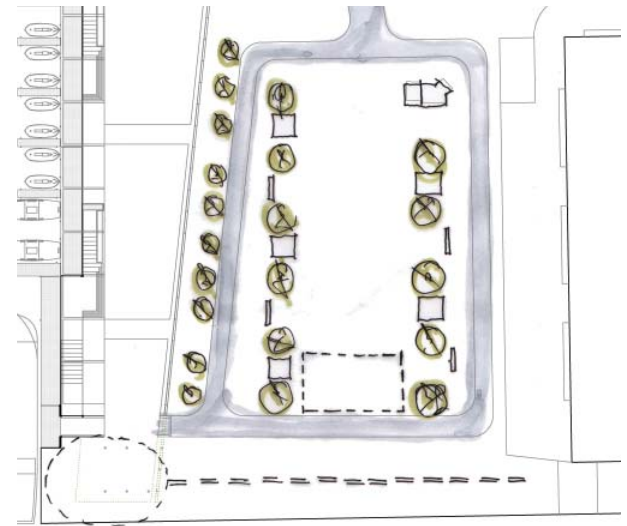
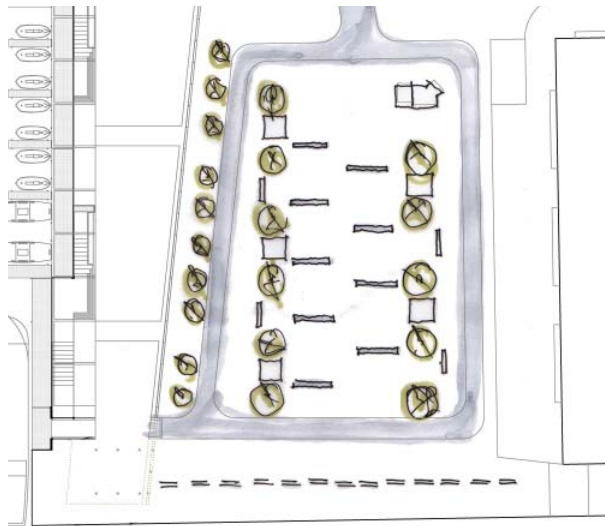
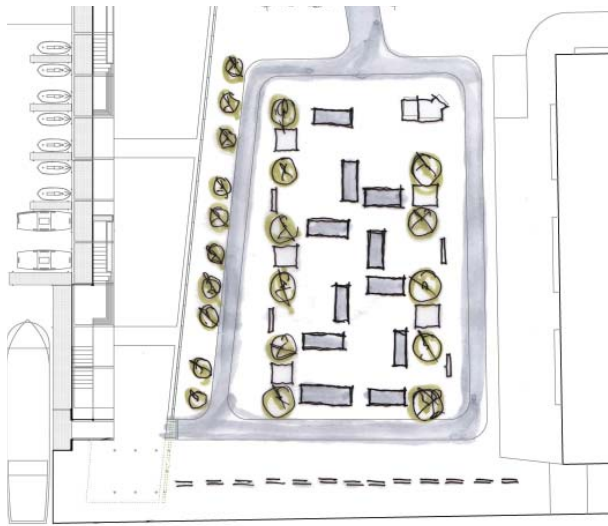


fig. 5.35_

5.8.3 Relationship of the Building to the Square

The square design development proposes a largely unprogrammed space. In an African context, large public spaces often function very successfully with minimal programming. A good example in Maputo is the street and public space along the beachfront at the city's outer limits. Very little by way of formal infrastructure exists. However, on weekends the space is packed with people.

The square is framed by the proposed Water Transport building on its western edge, with the newly proposed Fishing facility framing its eastern border. The pair of buildings define the public space between. On the southern side the square is open

to views across the bay, revealing passing ships and small boat activity, thus successfully bringing the city back into contact with the water. Avenida Samora Machel, culminating in Praca 25 de Junho borders the square on the north.

The large open space of the square could cater to a variety of uses and public events such as concerts, significant public holiday celebrations, markets, exhibitions, performances and other large group gatherings.

The edge treatment of the square is significant in order to catalyze the use of the space, encouraging the public to take ownership. Seating, planting and refreshment stands will anchor the public square as a destination.

Vehicular movement around the periphery of the square will be related directly to the waterborne transport facility, and service vehicles, with general public vehicles prohibited.

The southern edge of the square is landscaped to provide the public access right up to the interface with the sea. Seating is provided to allow for relaxed enjoyment of the space. The historic railway lines still present on the site are retained and celebrated as a reminder of the heritage of the area.

Although a predominantly hard urban space, the square will be softened with sectional planting and trees to provide shade from the heat and humidity.

5.8.4 Urban Square Design Development Opportunities

- 1_ Location of new Fish Facility forming the eastern boundary to the new Urban Square
- 2_ Hotel anchor building
- 3_ Direction of traffic flow in and around the site
- 4_ Vehicular access to site for boarding the ferry
- 5_ Vehicular access control and possible parking
- 6_ Crossing of vehicular access and pedestrian route to be dealt with through bollards guiding access for cars, and paving layout indicating pedestrians have right of way
- 7_ Entrance access to Water Transport Building connecting to street axis into the city
- 8_ Original Portuguese clock tower to be protected. Building to be reused as the square's anchor cafe and information centre.
- 9_ Open space allows for direct vistas to the sea. The unprogrammed space can be used for a variety of events, namely concerts, festivals, holiday celebrations, markets and exhibitions.
- 10_ Kiosks and cafes encourage public recreational use of the space
- 11_ Allowance for public outdoor exhibitions.
- 12_ Vehicular boarding of the ferry
- 13_ Historic railway tracks retained on the site.
- 14_ Public access to the water's edge
- 15_ Planting provides shade.
- 16_ Public walkway with views over the Fishing Harbour
- 17_ Praca 25 de Junho
- 18_ Culmination of Avenida Samora Machel

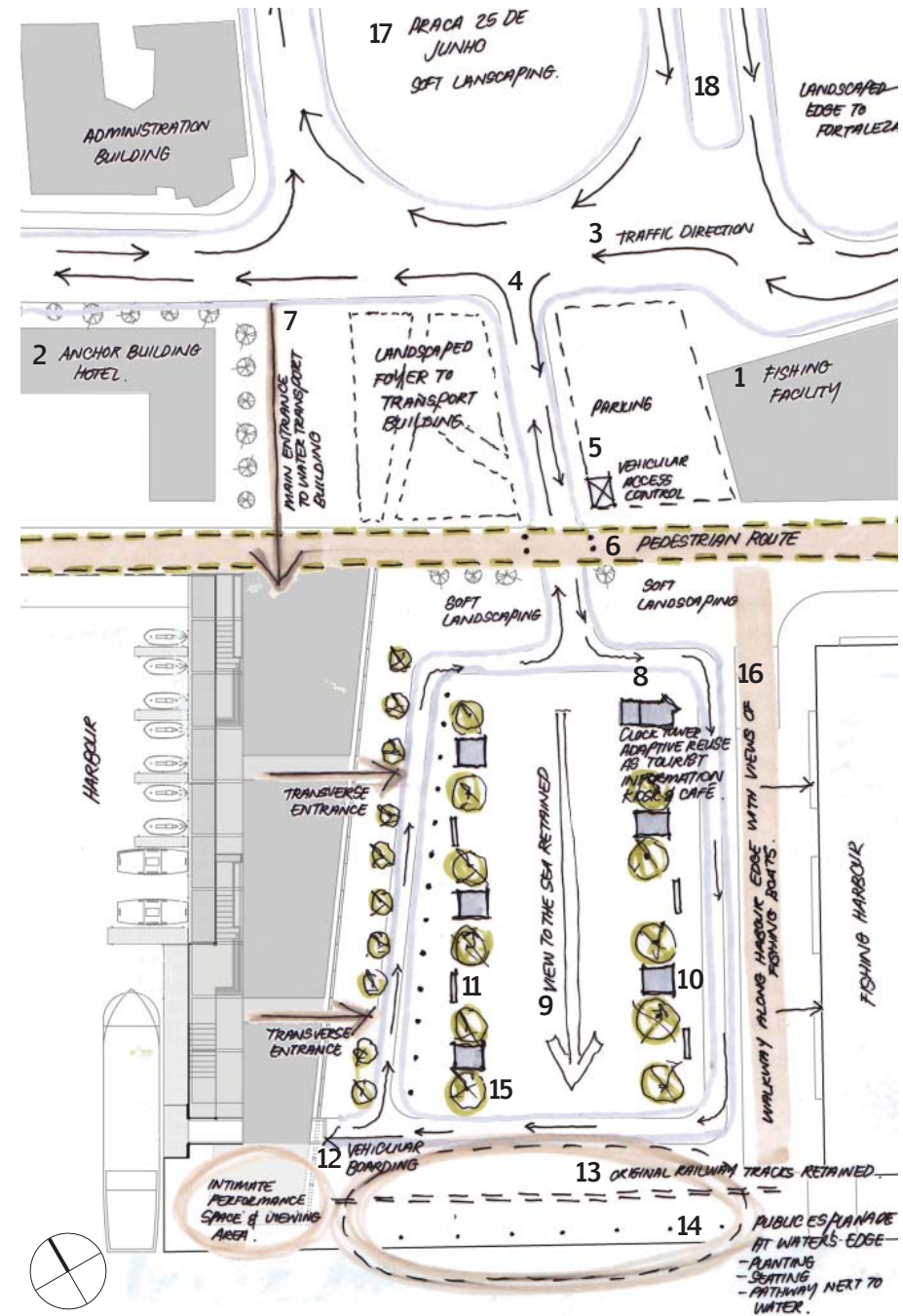


fig. 5.36_

fig. 5.36_ Detail development of Urban Square

fig. 5.37_
Conceptual
exploration
of column
condition at
entrances

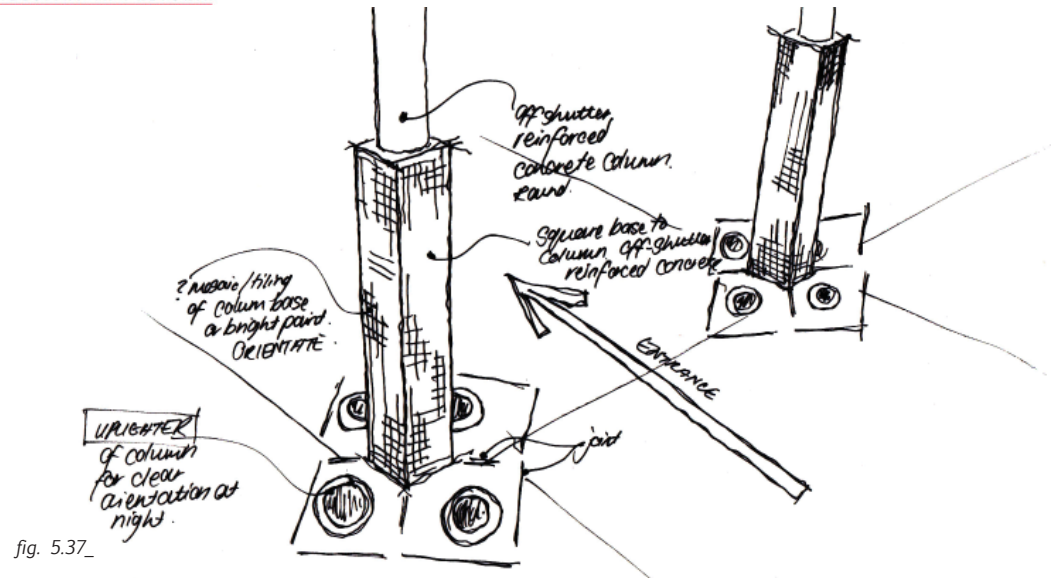


fig. 5.37_

5.9 ORIENTATION

Of design importance is that the building orientates its users, and provides opportunities for interaction. The building should be clearly navigable.

Movement routes define built fabric in relation to open space. Interaction between users begins to occur through the architectural blend of open spaces, both prescribed and unprescribed.

5.9.1 Orientation for users: ordering system

The building is ordered from very public at the northernmost end, gradually scaling down to less public and more destination-specific functions as one moves through the building. The linear plan ensures that users can easily orientate themselves in relation to the water and the ferries, which are visible from most parts of the building.

Orientation for users within the building is aided by the treatment of columns. Column conditions are used to define the main entrance and transverse entrances to the facility. Entrance columns become square columns when they meet the ground, mosaiced, to make them clearly recognizable.

5.9.2 Movement through the Building

Movement through the building is designed to allow for interaction between different users, and to maximise opportunities for traders to come into contact with potential customers.

Nodes such as restaurants are located at opposite ends to necessary amenities such as ablution facilities. This results in a connective movement spine between destination points where trade can take place.

Office space for Transmaritima ferry company and destination amenities are provided for on the first floor. Such amenities include services which transport users of the facility would find useful.

5.9.3 Ticketing

Formal issuing of tickets is positioned at the information kiosk and ticket counter at the main entrance to the building at its northern end. Vehicular and pedestrian tickets can be purchased from here. Allowance is made throughout the building for the informal sale of tickets via dedicated traders through a centralized system. The system will be administered in a similar fashion to mobile telephone airtime, ensuring that the number of tickets sold per ferry trip is regulated.

A line of security is implemented at the steps descending to the pontoons with regard to pedestrian

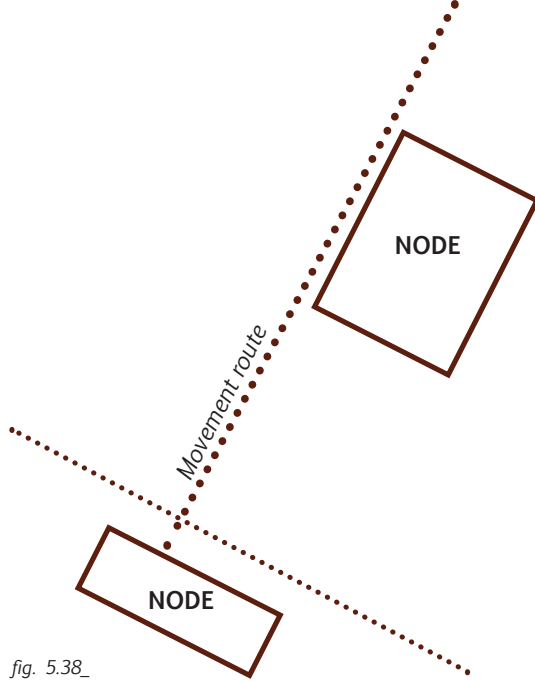


fig. 5.38_

boarding of the ferries. People not in possession of a ticket will not be permitted access to the pontoons, which are reserved for ferry commuters only. This ensures maximum safety for commuters as queuing and congestion will be limited on the pontoons.

Tickets for the vehicular ferry can be purchased beforehand at the main ticket counter of the building. Regulation of vehicles in possession of tickets will occur at the vehicular entrance to the square.

Vehicular orientation and flow is important regarding the loading and disembarking of vehicles from the ferry. Thus a ring road is designed around the square to ensure that queueing vehicles do not interfere with disembarking vehicles at peak times.

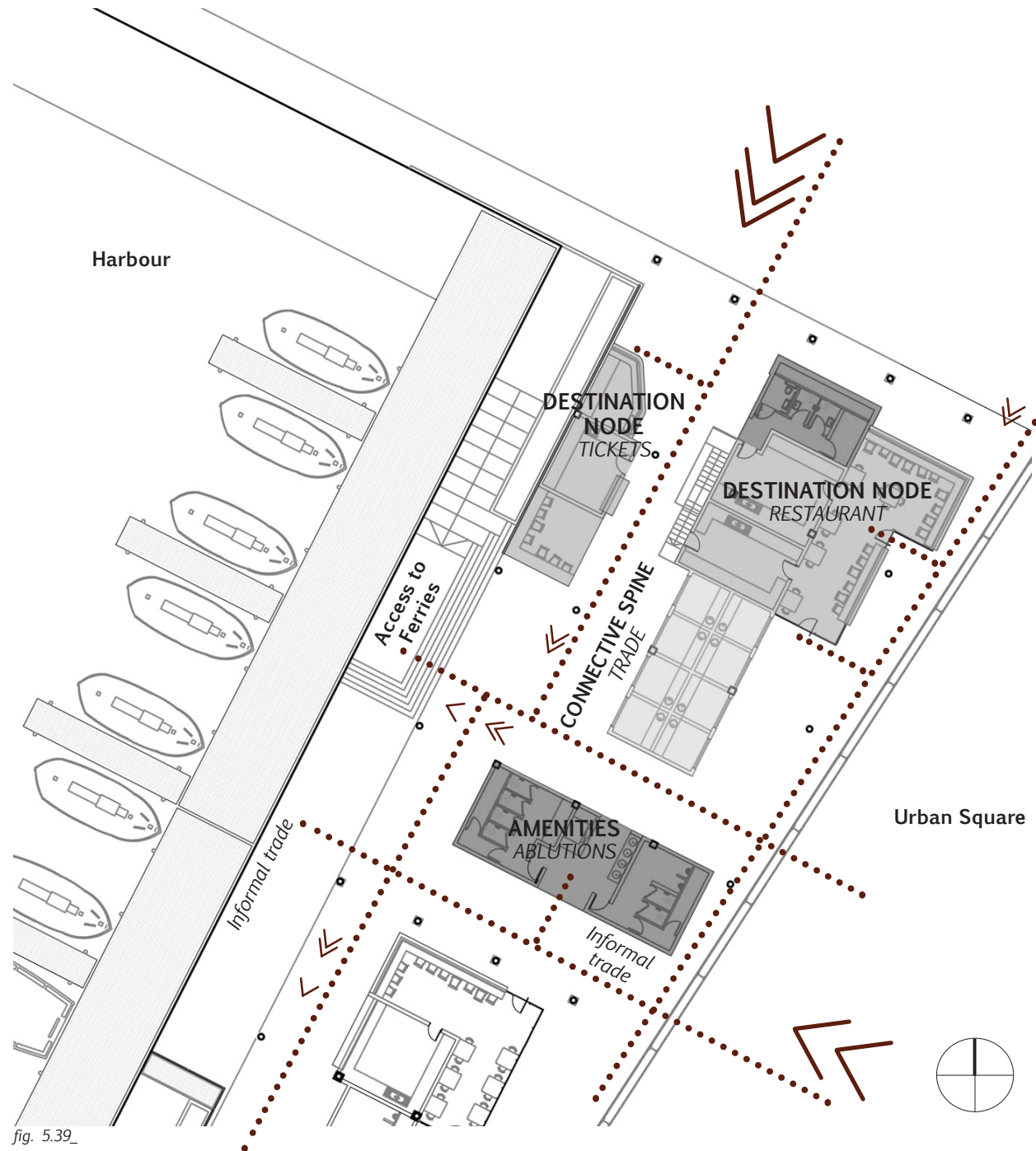


fig. 5.39_

fig. 5.38_ Graphic depicting conceptual movement through the building, echoing the parti diagram

fig. 5.39_ Plan detail showing how movement through the building informed program placements

fig. 5.40_
Conceptual
sketch showing
thresholds
and blurring
of boundaries
under one
unifying roof

“...an architecture that has the ability to evolve and is capable of reproducing itself through use and everyday life; its obsession shifts from appearance and form to implementation and social strategies that create conditions and surfaces for human activity.”

_ Lootsma (1999:264)

5.10 MEDIATE

Mediation between different users and different means of trade is an important design investigation. This aspect of the design development involved interrogation of the program to ensure adequate spaces were provided for all user groups.

The design allows for necessary infrastructural needs, as well as formal retail and ancillary functions. Unprogrammed space is deliberately provided for the informal sector to appropriate. Thus the building was not designed with finite boundaries, but rather inside, outside, formal and informal is all housed under a consolidating roof.

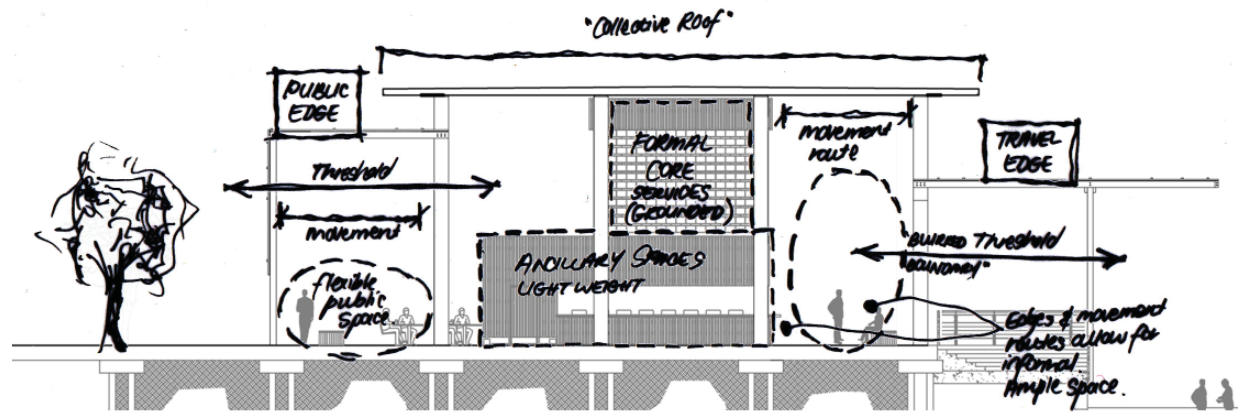


fig. 5.40_

	TRANSPORT USER			RECREATION USER			DESTINATION USER										
	Daily commuter	Long distance commuter	Tourist_Infrequent traveller	Vehicular transporter	Recreational destination user	Passer-by	Transmaritima Office Workers	Transmaritima Ferry Skippers	Transmaritima Ticket Sellers	Formal Shop Tenants	Trading Stall Vendors	Informal Traders	General Administration_Security	General Administration_Maintenance	Restaurant Kitchen Staff	Resaturant Waitrons	Restaurant Management
PUBLIC	Ablutions	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Ferry Platform (pontoon)	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●
	Movement Space	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
SEMI-PUBLIC	Tchova Storage	●									●						
	Traders Stalls	●	●	●	●	●	●	●		●		●	●				
	Formal Shops	●	●	●		●	●		●								
	Restaurant		●	●		●	●			●					●	●	●
PRIVATE	Other Eateries	●	●	●	●	●	●		●								
	Office Space	●					●										
	Kitchens														●	●	●

fig. 5.41_ Matrix depicting users and program, revealing potential for interaction of different user groups



fig. 5.42_



fig. 5.43_

fig. 5.42_
Image of
Caldada
Portuguesa
(Portuguese
pavement)

fig. 5.43_
Image of
brickwork
warehouses in
the waterfront
precinct

5.11 CONTEXTUALISM

To ensure an architecture of fit, contextualism is an important consideration. In particular the design takes note of the historical, social, and environmental contexts. Design decisions were tested against their contextual fit.

5.11.1 Historic

The waterfront context in which the building sits is industrial in character. Buildings in the vicinity are single storey portal framed warehouses with brick infill and corrugated roofs. These warehouses have cultural significance, thus the use of similar bricks in the new Water Transport facility references the context.

The majority of the area features an exposed concrete slab, however the historic wharf edge retains the original railway tracks and brick paving

from its industrial past. In addition, *Calçada Portuguesa* (Portuguese pavements) is evident in the Baixa precinct. The paving is a decorative style of contrasting black and white paving stones laid in various patterns. The paving method is prevalent in Portugal, and is evident in Maputo as a reminder of its colonial heritage. Thus the use of this method is appropriate to the site.

5.11.2 Social

From a social perspective, the optimal functioning of the transport service was a design driver, ensuring that the service was efficient and beneficial to all users, namely commuters, recreational and destination users. This optimal functioning is in the context of a blend of formal and informal characteristics of an African city like Maputo.

Informal trade is very apparent in Maputo, particularly concentrated around high pedestrian areas and transport nodes. It can be assumed that the informal sector will also develop around this node. This is acknowledged, encouraged and provided for. Examples are the provision for preparation facilities with public water points provided, additionally secure overnight storage space for tchovas and other trade goods are provided.

Office space and destination amenities such as provision of services are allocated to the first floor. Restaurants and taverns are provided for recreational purposes, providing for a diverse mix of users.

The ground plane is thus designed to be accessible and public, with formal amenities dividing space, with provision for informal appropriation.

“In its widest sense, the term ‘context’ refers to all the issues and circumstances that surround a design of which the nature of the setting is the most tangible. As the derivation of the word means ‘weave together’, the spirit of its meaning denotes an interdependence - ‘weaving’ or ‘knitting’ designs into existing site conditions and the striving for a sense of fit.”

– Porter (2004:31)

5.11.3 Environmental considerations

The context and program of the building are not conducive to high-tech sustainability solutions. The sustainable focus of the building is primarily from a social and urban perspective

Resource efficient design was the driver behind the sustainable features of the building, with passive technology being the preferred option. The simplicity of the building lent itself to passive energy conscious solutions. The existing harbour wall and required proximity of the building to the water resulted in it having a general north to south orientation, rotated slightly northwest to southeast.

Climatic Responses

Maputo’s tropical climate is pivotal in design decisions. Shade and air flow are essential to provide

relief from the heat and humidity. Orientation of the building generally responded to the north south axis, maximizing northern sun exposure whilst limiting harsh western sun penetration through large overhangs and the implementation of a pergola.

The openness of the building lends itself to enjoying the cool balmy evenings along the waterfront, activating the area into the evening.

The building’s orientation further benefits from prevailing winds occurring from the east. The breezes off the sea can cool the building as no obstructions or other buildings occur between the water and the transport facility. The narrow oblong plan ensures maximum possible cross ventilation.

Shading devices employed use the principles of vertical shading to the east and west, with horizontal

shading to the north. A shading technique widely employed in Maputo is brise soleil, which reduces heat and solar glare on the sunside facade of a building. The technique involves a shading screen that prevents high-angle summer sun penetrating the building, but can be designed to allow low-angle winter sun to provide some passive solar heating. The technique is employed on the southeastern facade of the building, facing onto the public square.

Thus the passive design responses integrated into the design can be summarised as:

- shading
- air flow utilising prevailing winds
- optimum orientation along north south axis
- openness
- cross ventilation
- brise soleil

5.12 DESIGN REFINEMENT THREE DIMENSIONAL EXPLORATION

fig. 5.44_
Three
dimensional
image depicting
steps accessing
the pontoon

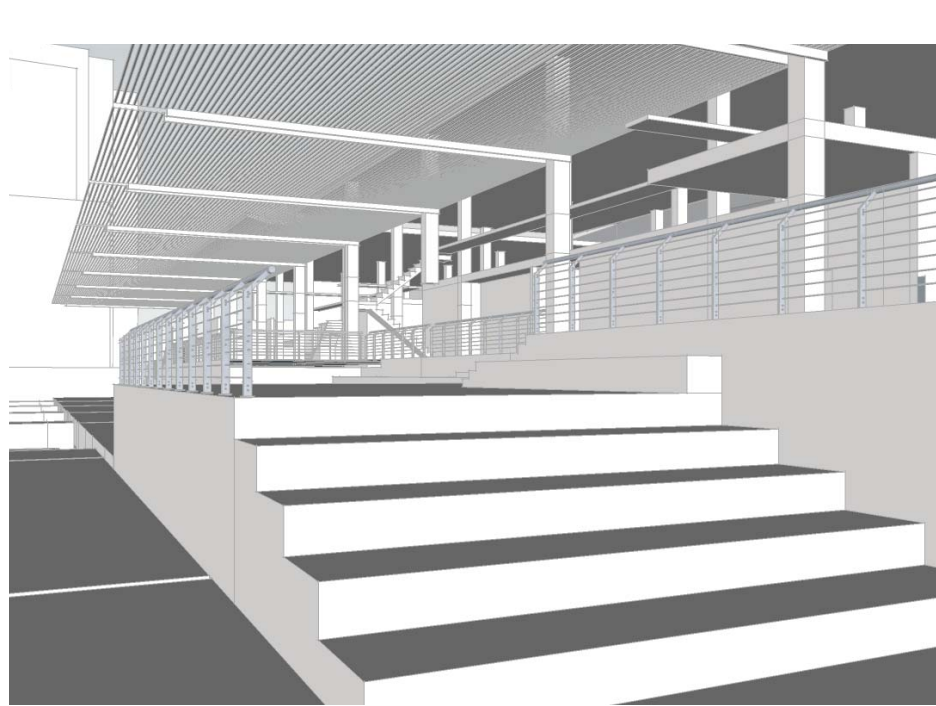


fig. 5.44_

fig. 5.45_
Three
dimensional
image depicting
Travel Edge

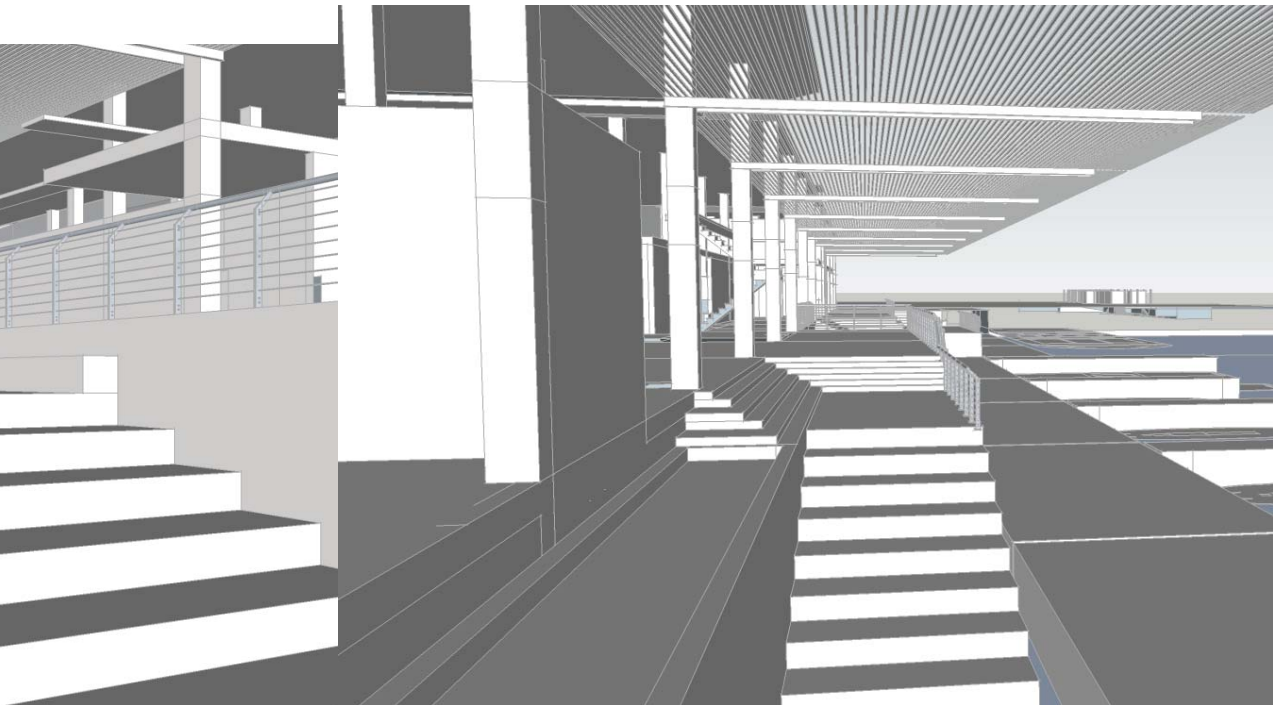


fig. 5.45_

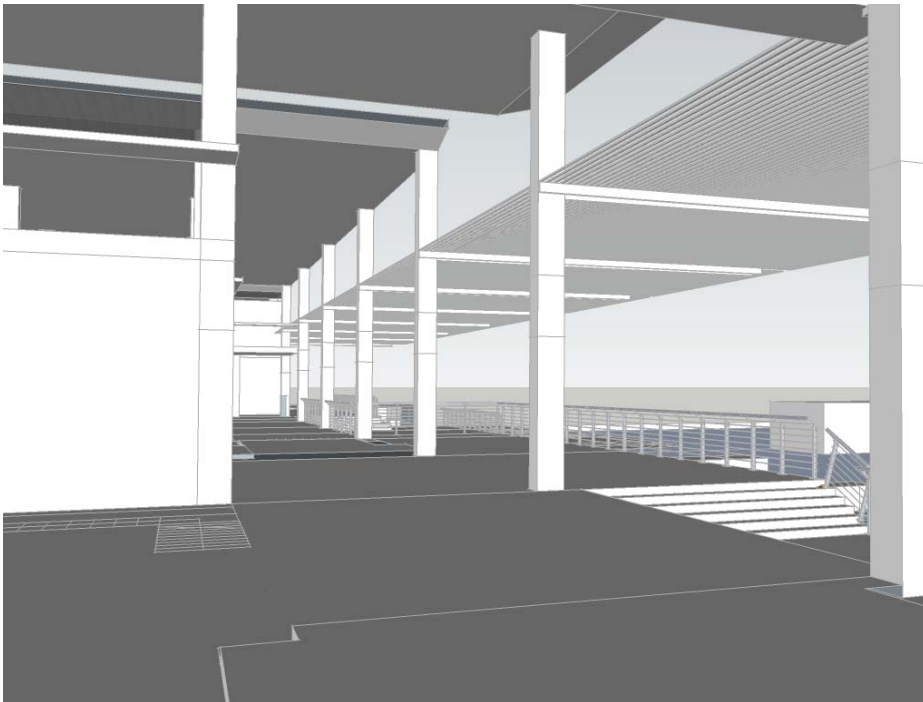


fig. 5.46_

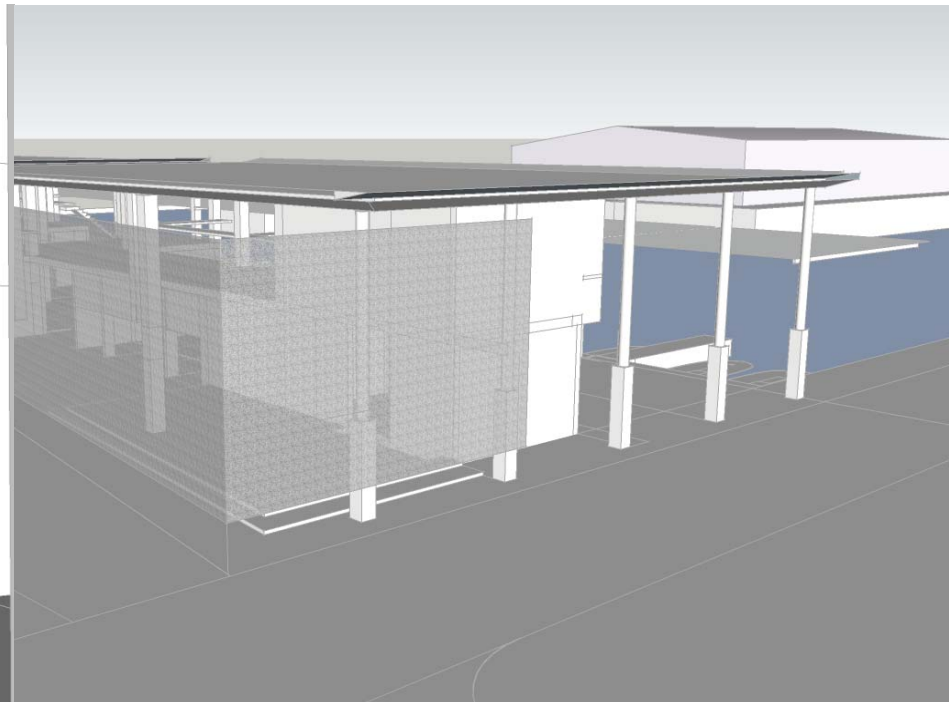


fig. 5.47_

fig. 5.46_
Three
dimensional
image depicting
movement
route from
main entrance
of public
pedestrian
throughfare

fig. 5.47_
Graphic
representation
of Urban
Edge from the
northeastern
perspective

fig. 5.48_
Image depicting
structural
composition of
the building

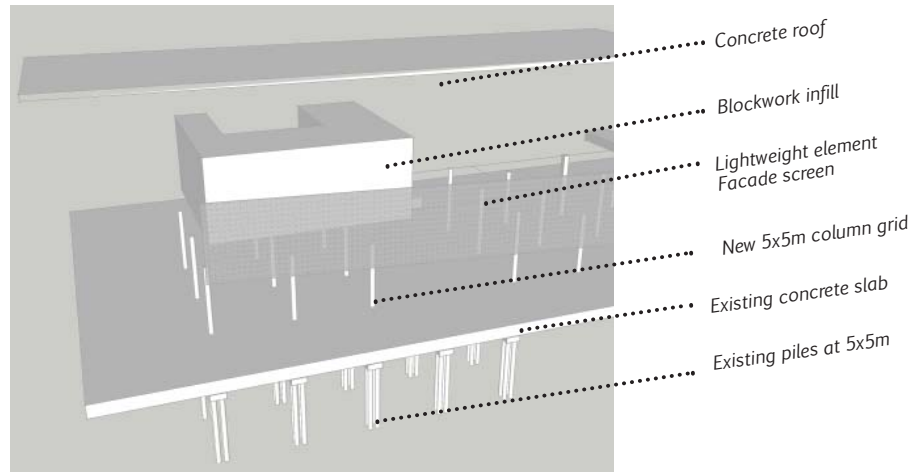


fig. 5.48_

5.13 STRUCTURE AND CONSTRUCTION

The choice of site for the waterborne transport terminal is located on an existing wharf consisting of a slab supported by concrete piles at 5 metre by 5 metre spacing. The column grid of the new intervention thus responds to the existing structural conditions, by adopting the 5 x 5 grid spacing.

Sea water extends approximately 25 metres underneath the wharf. Thus in order to accommodate the proposed new harbour the existing harbour wall is adjusted to ensure maximum stability for the new waterborne transport structure, as indicated in figure 5.49 and 5.50.

The structure is a frame and infill building. Concrete columns and slab form the frame with block infill containing infrastructural service cores which define formal boundaries, facilitating movement space around them.

The buildings facades respond to contrasting edge conditions to southeastern and northeastern orientation. Edge conditions are informed by programmatic needs and respond to climatic requirements. Structural steel, timber and concrete louvered and glazed facades and screens clip onto the rational frame, creating threshold spaces, blurring the boundary between inside and outside.

The construction of the building is intended to be labour intensive, enabling job creation to local workers. The incorporation of contextual blockwork within the building ensures employment for artisans. The locally manufactured masonry units consist of large blocks, dimensions 425 x 340 x 250, and small blocks, dimensions 425 x 85 x 250. The masonry units are manufactured to be precinct context sensitive, and are intended as part of a job creation project. Units strength and durability should comply with minimum applicable standards.

In addition, allowance for mosaic detailing and other artworks throughout the building encourages participation from local artists and craftsmen, instilling a sense of ownership of the building within the local population.

fig. 5.49_
Image
indicating
existing harbour
wall location
in red

fig. 5.50_
Image
indicating
proposed
new harbour
adjusted to
ensure stability
to the site.



fig. 5.49_



fig. 5.50_

5.14 BUILDING CLIMATE

The program and context of the building resulted in the designer adopting passive technology rather than high tech solutions to occupant comfort.

Narrow plan form allows for maximum cross ventilation with the building orientated towards prevailing southeasterly winds. Large overhangs and shading considerations, explored in detail design as indicated in the following chapter, offer relief from the heat and humidity.

fig. 5.51_
Graph
indicating
average
monthly rainfall
days in Maputo

fig. 5.52_
Graph
indicating
average
monthly
precipitation
in metres, in
Maputo

fig. 5.53_
Image key
indicating
classification
of roof sections
into A, B and C.

5.15 RAINWATER HARVESTING

Rainwater harvested from the roof is used to supplement the municipal supply required for ablution facilities throughout the building. Storage tanks occur above the first floor slab, as indicated in the long section found in the following chapter.

Rainwater calculations were tested against an indicative monthly demand to reveal the size and quantity of rainwater tanks required for each section of roof according to collection potential of each roof area. Roof section A requires 17 x 900 litre storage tanks, section B requires 16 x 900 litre tanks, and section C requires 12 x 900 litre tanks.

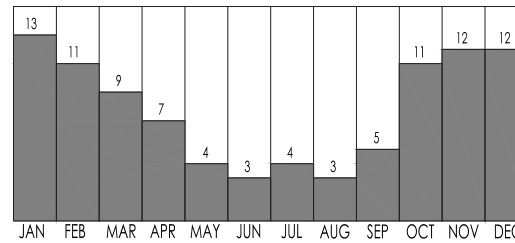


fig. 5.51_

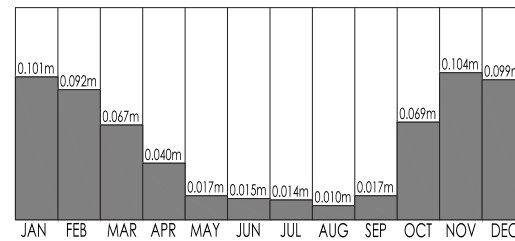


fig. 5.52_

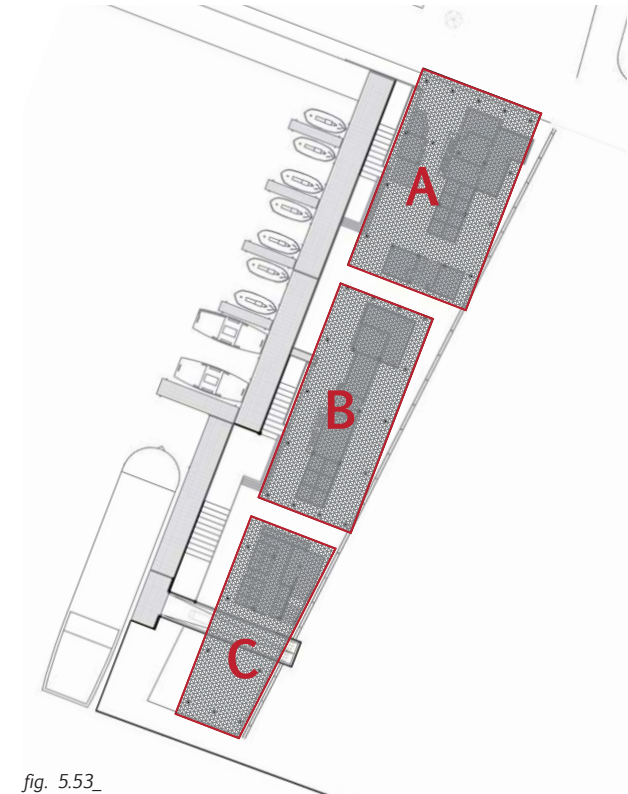
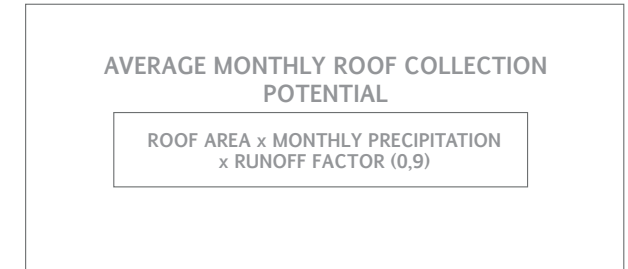


fig. 5.53_

ROOF A Collection Potential

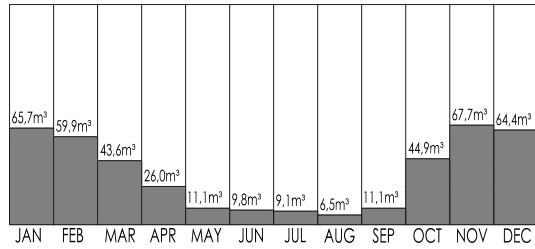


fig. 5.54_

ROOF B Collection Potential

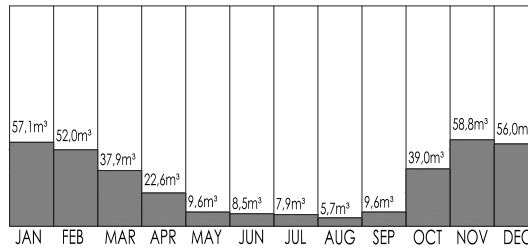


fig. 5.55_

ROOF C Collection Potential

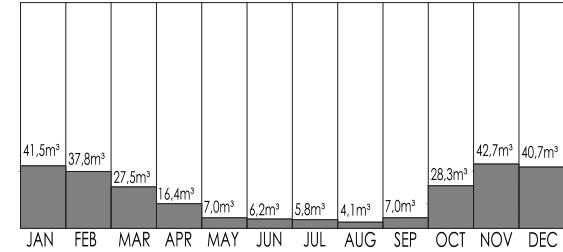


fig. 5.56_

fig. 5.54_ Graph indicating average monthly collection potential of roof A

fig. 5.55_ Graph indicating average monthly collection potential of roof B

fig. 5.56_ Graph indicating average monthly collection potential of roof C

ILLUSTRATIVE TYPICAL MONTHLY DEMAND: ROOF A JANUARY

16 TOILETS	6 LITRES PER FLUSH	6 FLUSHES HOUR AVERAGE
2 URINALS	2 LITRES PER USE	6 USES PER HOUR AVERAGE
6 WASHAND BASINS	2 LITRES PER USE	12 USES PER HOUR AVERAGE
8 TRADERS SINKS	2 LITRES PER USE	12 USES PER HOUR AVERAGE
3 KITCHEN SINKS	2 LITRES PER USE	12 USES PER HOUR AVERAGE

DAILY ASSUMPTIONS:

TOILET FLUSHES	72
NUMBER OF TOILETS	10
LITRES PER FLUSH	6

THEREFORE: 4320 LITRES REQUIRED PER DAY =4,3 CUBIC METERS PER DAY

=126 CUBIC METERS MONTHLY

SUPPLY: 65,7 CUBIC METERS

DEMAND OUTWEIGHS SUPPLY IN THE MONTH OF JANUARY WITH MAXIMUM RAINFALL

PROVISION IS MADE IN THE BUILDING FOR STORAGE OF WEEKLY QUANTITIES OF RAINFALL TO SUPPLEMENT MUNICIPAL SUPPLY

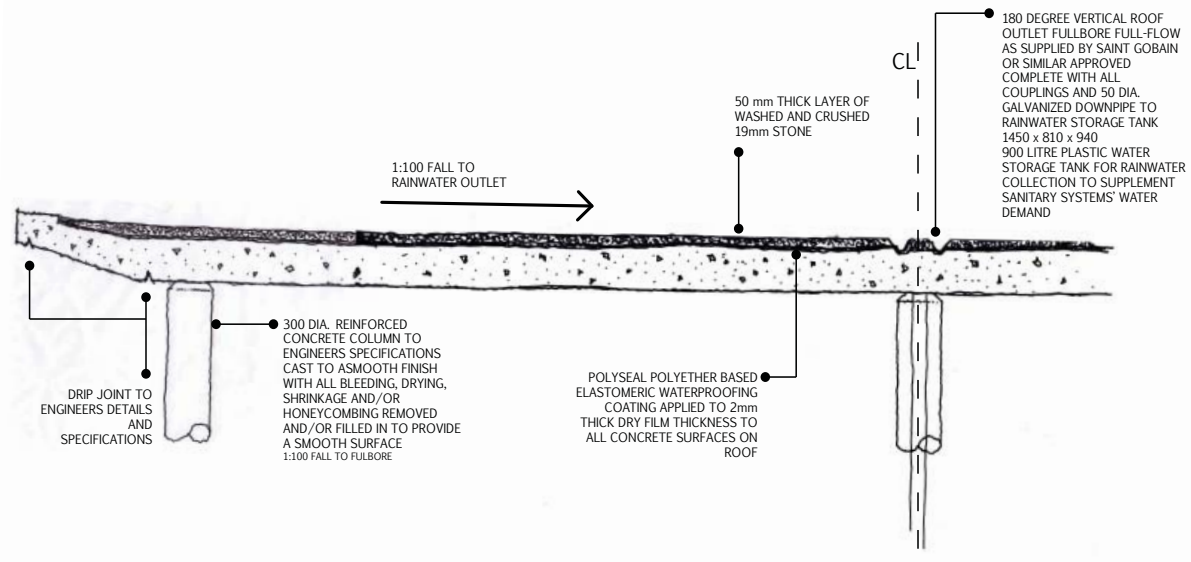


fig. 5.57_

fig. 5.57_ Roof section detail sketch showing rainwater outlet to water storage tanks

5.16 MATERIAL CHOICE

Material choices was informed by various site and context factors. The first main consideration is the marine environment of the site which necessitates anti-corrosive measures. The second consideration is that it is a public transport building and the materials needed to be robust and long lasting.

Additionally, material choices were made taking clues from the existing context. Materials that were evident in the area hinted at the success of such materials.

5.16.1 Concrete

Concrete was chosen as a construction material due to its robustness in high trafficked areas, and also for

its hardness in harsh marine environments.

Contextually, the use of fair faced concrete is extensive in Maputo City, often to sculptural effect.

5.16.2 Brick/Blockwork

The blockwork used in the building is chosen to coincide with the blockwork and bond method prevalent in the waterfront area and responds specifically to the warehouses at the water's edge.

5.16.3 Timber

The use of timber is due to its strong performance and durability in marine environments. Timber is a significant export of Mozambique, and is readily available.

5.16.4 Stainless steel

Stainless steel is the choice material for balustrades and other detail work. Although expensive, it is highly corrosive resistant and thus good in harsh marine environments.

Stainless steel detailing will be prepared off-site as far as possible and fitted on site via bolting, to limit on site welding.

5.16.5 Galvanized steel

Galvanized steel will be used for structural steelwork. Zinc coating can be successfully overcoated with paint to provide a Duplex system. Duplex systems are used in aggressive environments such as this one, where the zinc alone cannot adequately protect the steel.

5.16.6 Cor-Ten steel

Cor-ten steel is used in the shading facade on the eastern side of the building. It is suitable due to its improved atmospheric corrosion resistance.

5.16.7 Natural materials

Being a tropical country, coconut palms are prevalent around Maputo. The intention with the eastern facade screen is to allow for portions of natural material within a patterned 'weave' facade, in reference to the African craft of weaving. The material of choice is the coconut husk, which as an organic material has already proven itself hardy as a rope product and in netting applications.

The coconut weave accent panels will be accompanied by metal weave patterns of varying densities to create a textured shading facade.

5.16.8 Planting

It is intended to introduce greenery to a previously harsh harbour environment. As mentioned earlier, on the northwestern facade shaded pergolas will be planted with *Senecio Tamoides* (Canary creeper). The plant is indigenous to East Africa and is suitable for full sun

Along the southeastern facade, trees will be planted along the shared street interface with the square, of the Acacia species. This is in reference to Maputo being informally called the Acacia city, in reference to the prevalence of the species.

5.16.9 Other

The detail design specifications for the floating pontoons adjacent to the building will be as in accordance with naval architect practices. However, it is necessary that the material required will be slip-resistant and fire-resistant, preferably of timber surface where applicable.

5.17 CONSOLIDATION

The design development for the facility required a constant balance between the nature of Maputo as a fast paced business centre, and the informal nature of the capital city of a developing country. The blending of a transport imperative with the revitalization of the precinct was the fundamental challenge in the design development.