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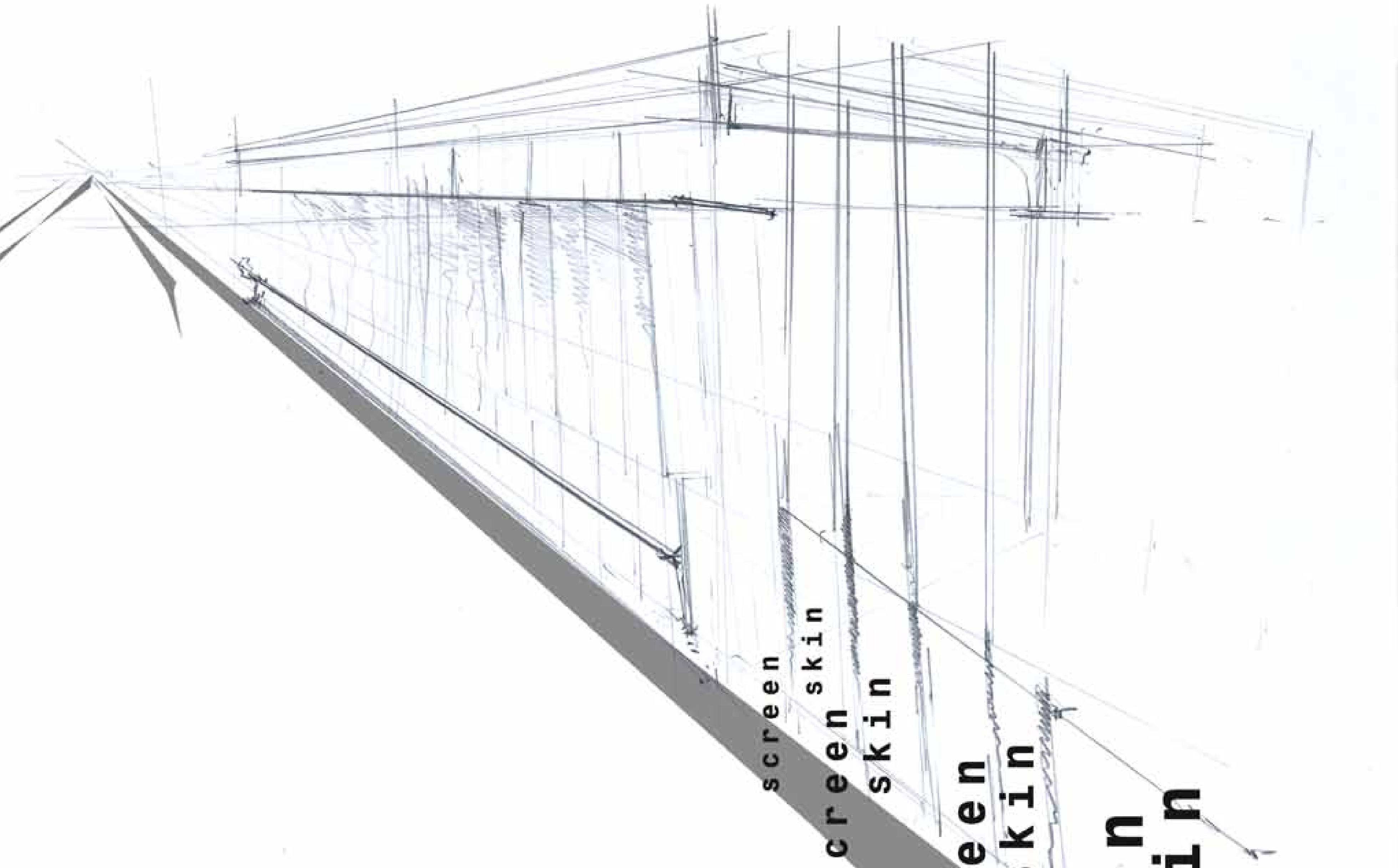
BRT PROTOTYPE_ DESIGN DEVELOPMENT

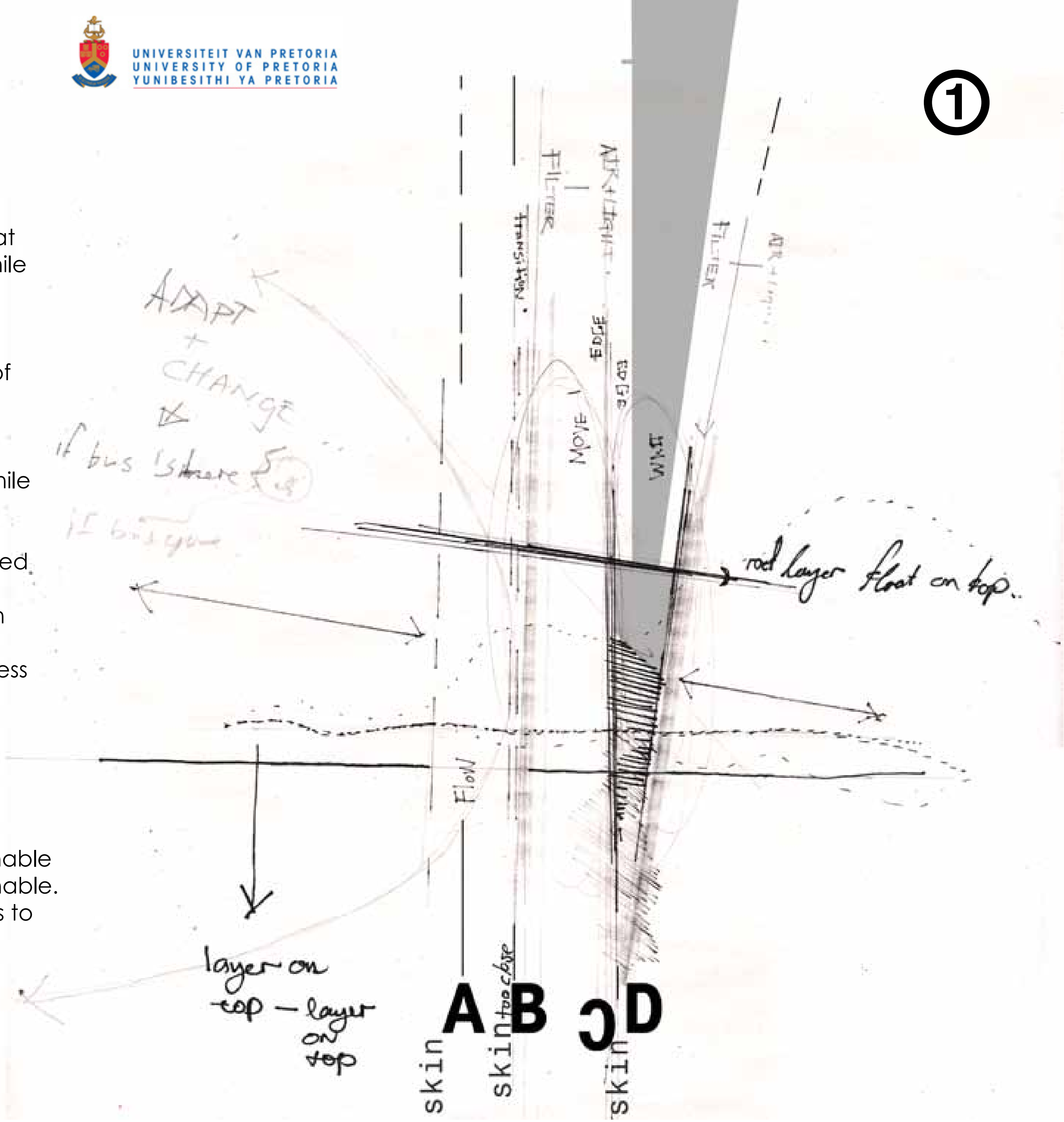


The BRT system in Tshwane needs to have an image that will be easily legible and ensure ease of orientation, while adaptable to the diverse contexts within Tshwane as a city. The station will act as an important nodal point within peri-urban areas, while at the same time be a low 'subdued" structure within the denser urban core of Tshwane

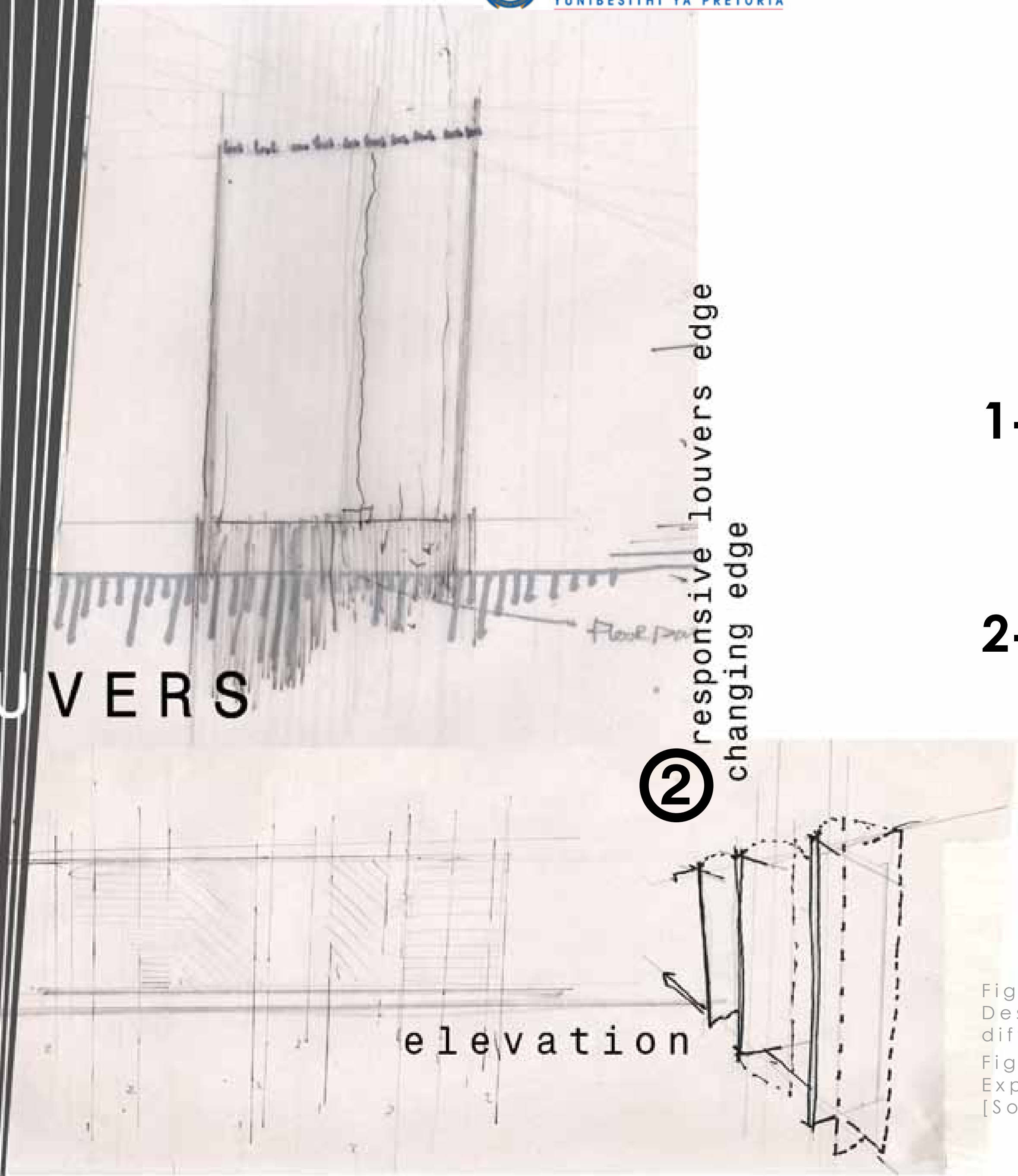
In a changing climate it will need to respond to the increasingly changing climate of the urban climate, while also mitigating it. The prototype will respond in the following manner:

a) Have a low embodied energy through selected material use.
b) Ensure the components of the BRT station can be manufactured easily and efficiently.
c) Make use of sustainable strategies to ensure less energy consumption.
d) Harvesting renewable energy to power the station.
e) Provide enough shading and protection from outdoor climate.

While the structure needs to be environmentally sustainable and responsive, the station must also be socially sustainable. The design needs to ensure that it is safe for commuters to use any time of the day.



LOUVERS



1- The initial design approach developed out of the concept of linking skins. A series of skins were identified – all responding differently to its specific edge condition.

2- The idea of a station covered with responsive louvers were explored- **Louvers closing during the day** / opening at night / **allowing air in**/ keeping rain out.

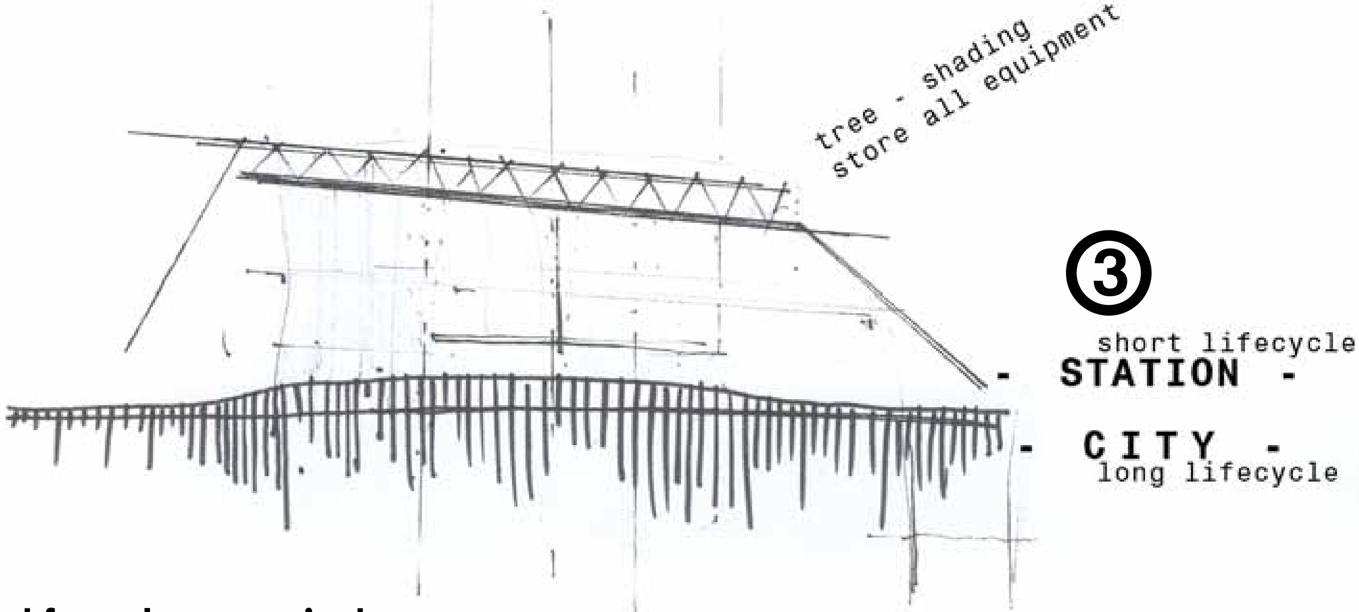
It was discarded as not being robust enough for an public building with high usage.

Figure 10-01: [Previous page] Design development 1: Identifying different skins[Source: Author]

Figure 10-02: Design development 2: Exploring louvers and systems [Source: Author]

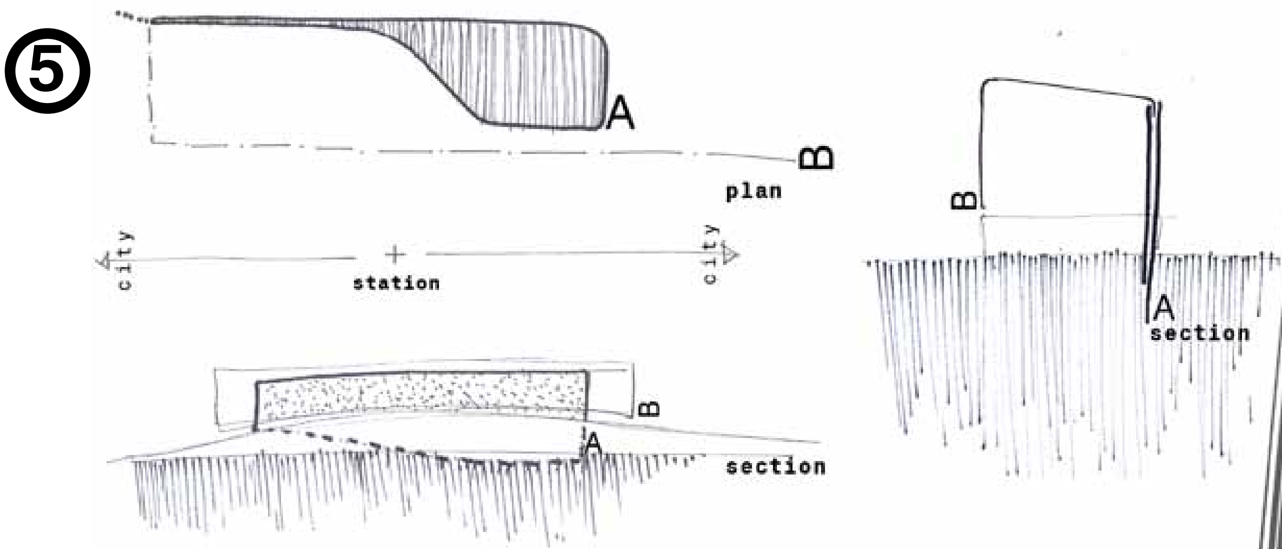
3- The idea of placing all services in the roofspace was explored
– a station city over the city _layer on top of layer.

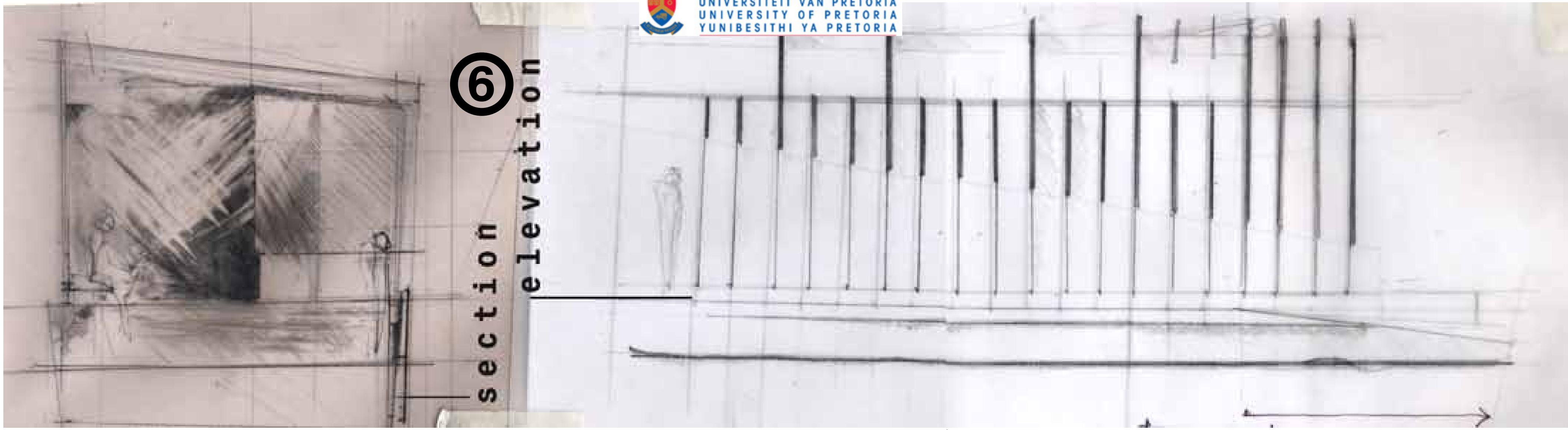
It was discarded as too much energy is invested in the station platform to not use it. Keeping the technical equipment in the platform kept the equipment safe and secure.



4- **Design process stopped for a long period – to finalise terminal building design**

5- Having worked on the Terminal building for a few months. The approach to the Prototype changed.
a) Two types of skins identified.
b) Utilising the kiosk as an object to direct movement.
Skin A links with the ground and city.
Skin B links with the movement of the BRT and people; floating above the ground .





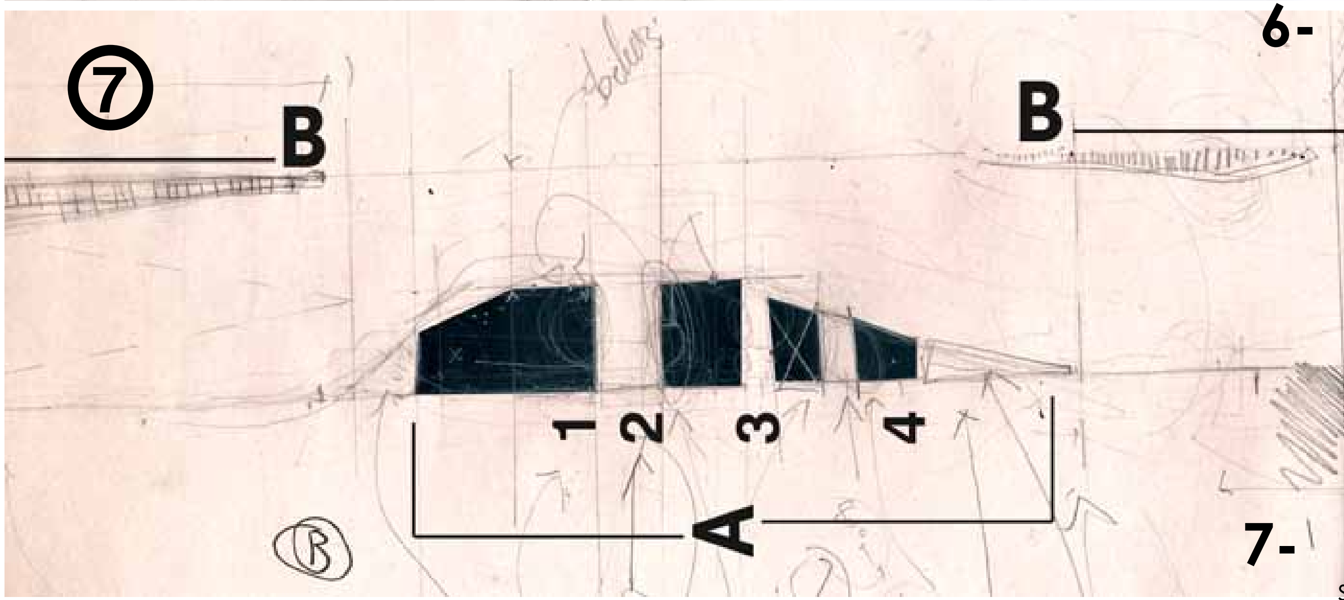


Figure 10-03: [previous design] Design development 3: Station over city [Source: Author]

Figure 10-04: [previous design] Design development 5: New approach: Skin A and B [Source: Author]

Figure 10-05: Design development 6: Solar screening skins [Source: Author]

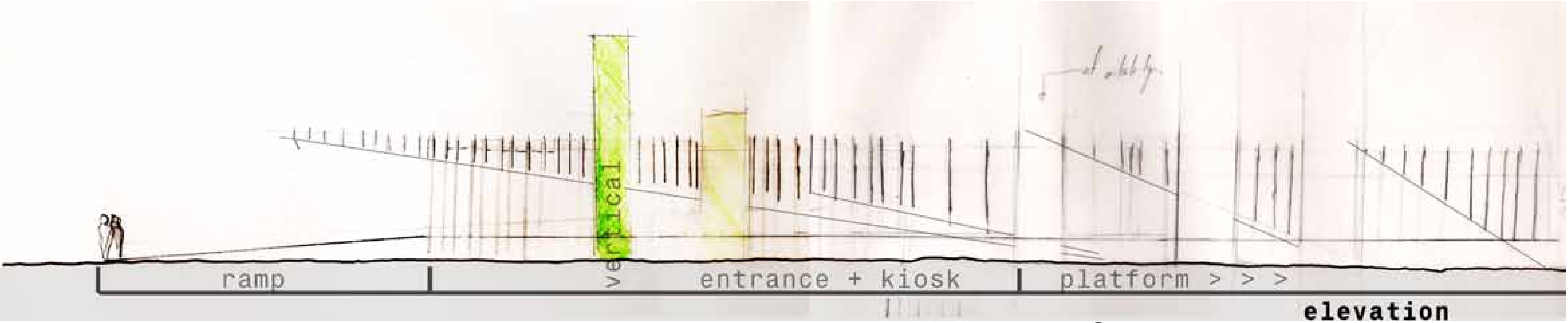
Figure 10-06: Design development 7:Kiosk components [Source: Author]

6- The architectural language was determined, it needs to respond to its immediate context, the city and the terminal building. It was decided to develop a lower scale structure that blends into the urban context – while still allowing for a nodal attachment to be added to the structure once it is being built in peri-urban spaces.

It was decided that the prototype will be developed for the first BRT line – linking Mabopane with the city. Having investigated the effect of the natural energies on the BRT station , vertical slatted screens were added to deal with solar glare – in most cases the station faces east-west.

7- The Kiosk is split into 4 sections – each housing a specific function – each section designed to be pre-manufactured independently.

This approach was discarded - for a more energy efficient construction process being concrete block construction.



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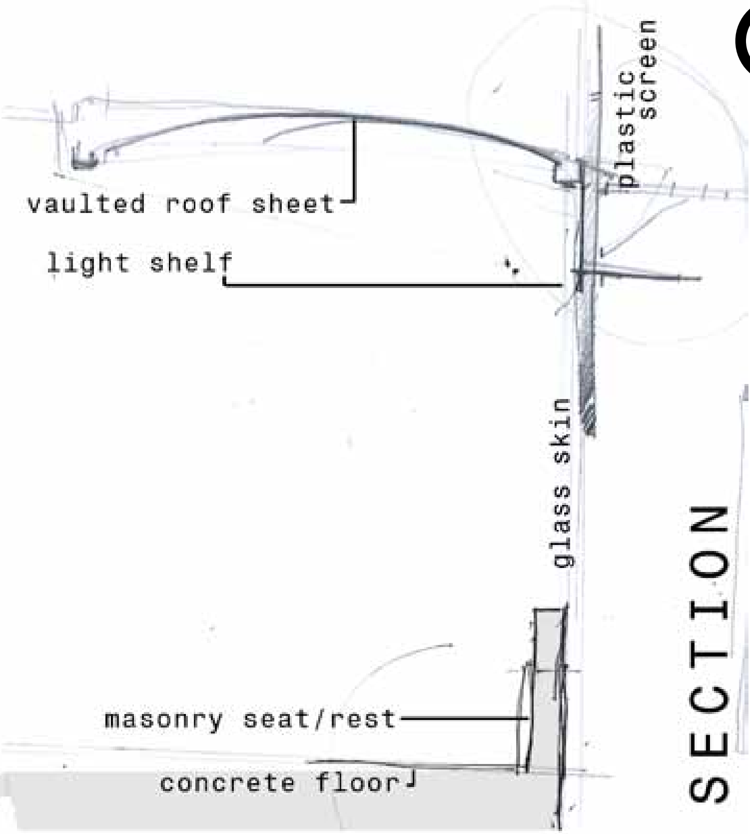


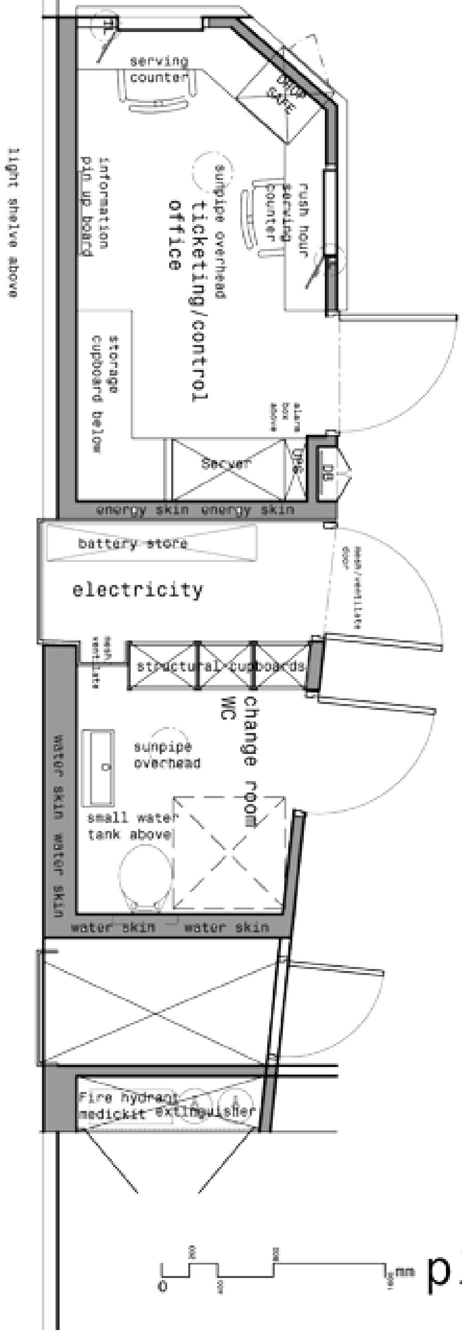
8- Section was adapted – adding a light shelf and vaulted roof.
Vertical elements added to ensure legibility of the BRT station and making it a reference point. Diagonal lines created with the vertical screens aiming to communicate a sense of speed and change.

Figure 10-07: Design development 8: Elevation exploration [Source: Author]

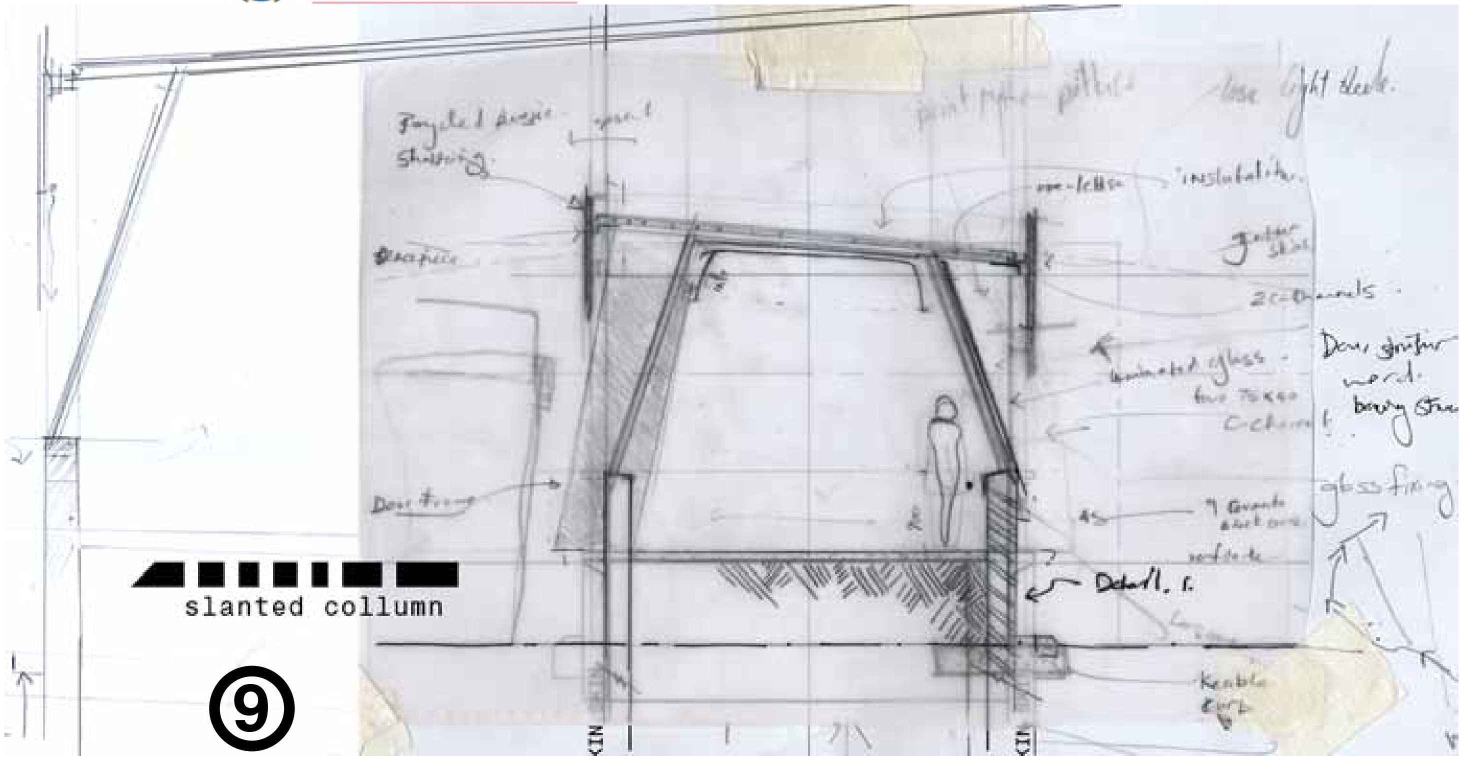
Figure 10-08: Design development 8: Section exploration [Source: Author]

Figure 10-09: [Next page]Design development 9: Kiosk design [Source: Author]

Figure 10-10: [Next page]Design development 9: Section: Columns adapted [Source: Author]



plan



9- Techniques of dematerialisation and material efficiency were investigated. **Columns were slanted to save 17% in steel use** _ Single gutter used to save on material. Glass fixed to column and slanted – to provide more protection from sun light.

Concrete block masonry units and ground filled concrete floor used- to lower carbon footprint and embodied energy.
Concrete block masonry adds to thermal mass of station – while reducing the use of stainless steel.

Water tank to be installed below to make station self sufficient. **The Kiosk layout developed to reduce space requirement and increase functional efficiency.**

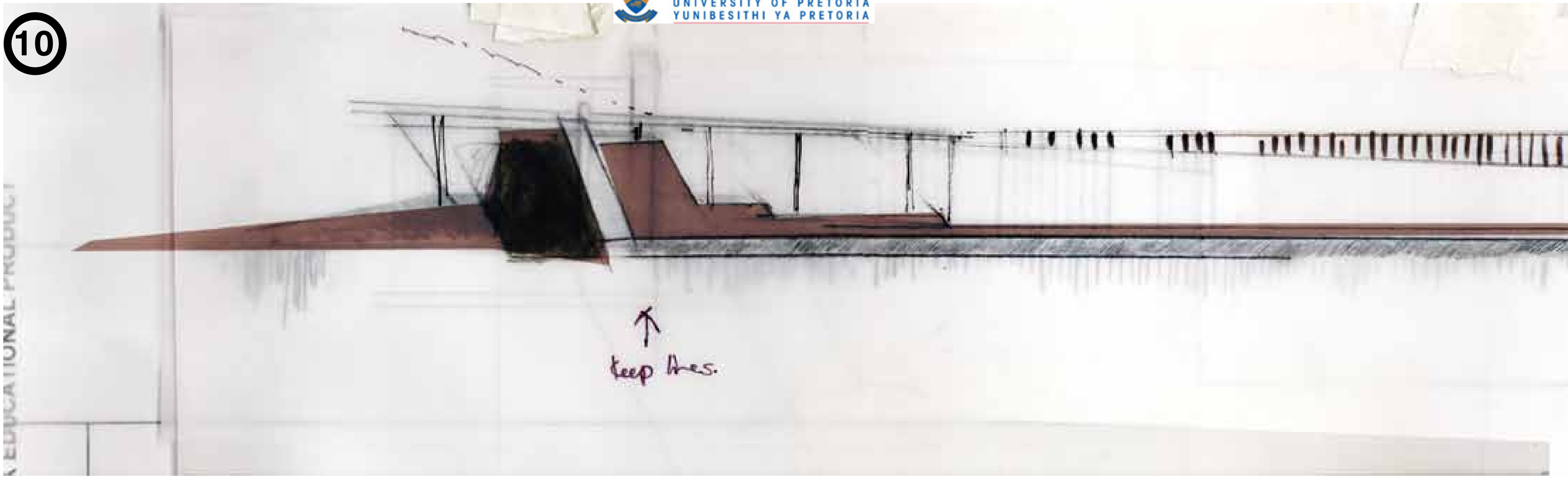
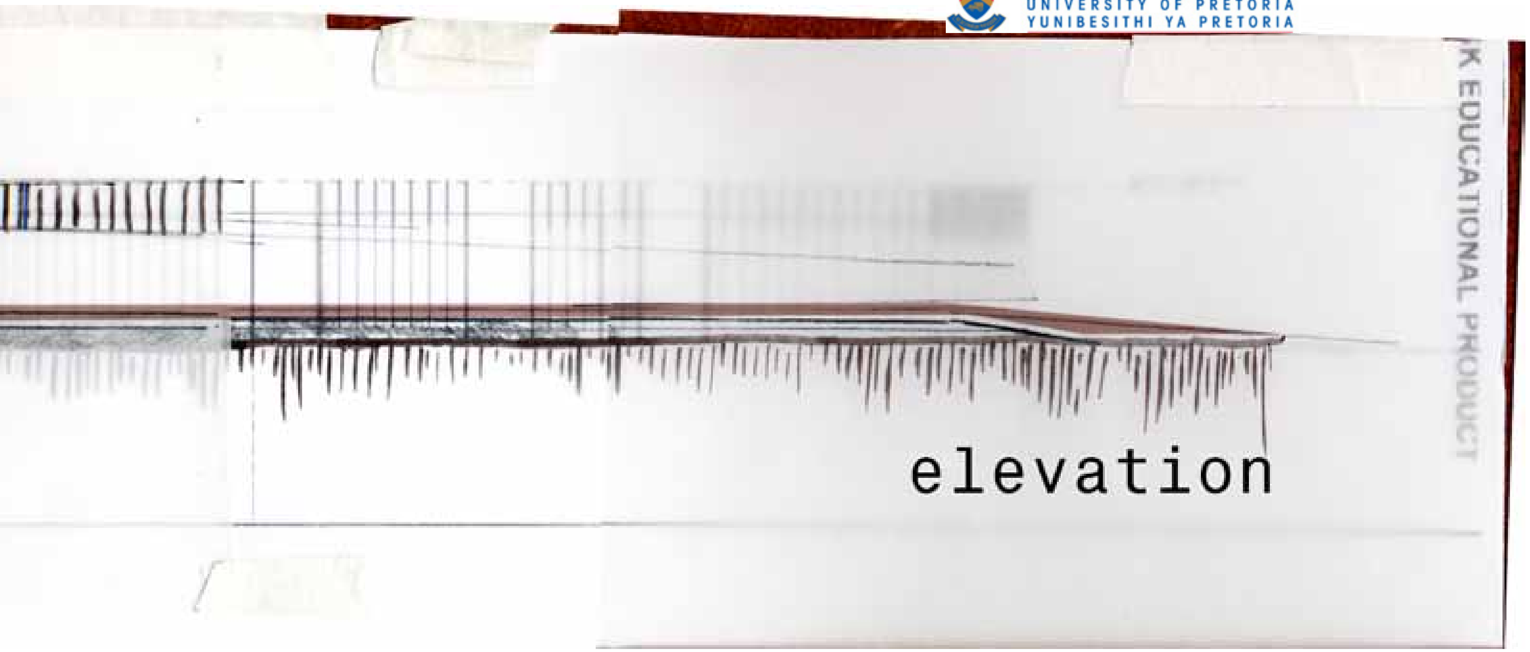
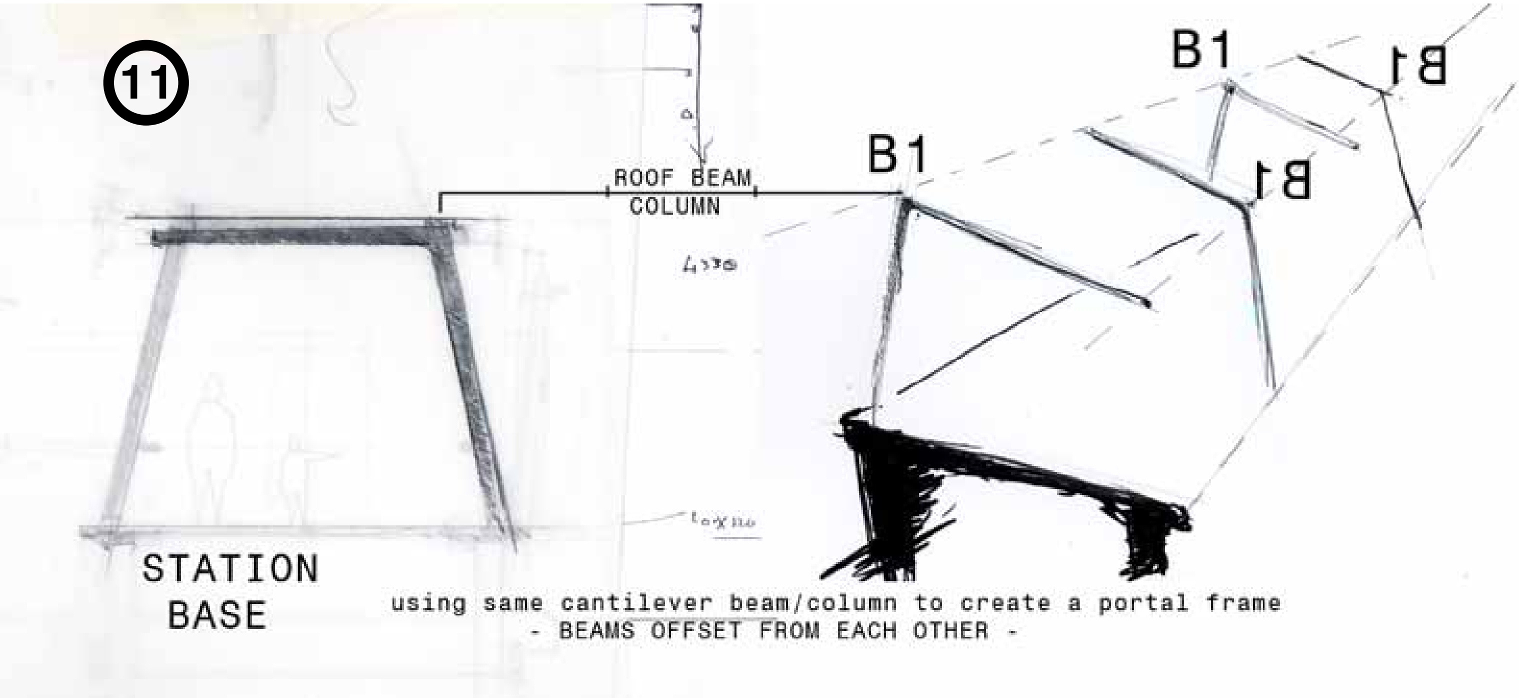


Figure 10-11: Design development 10: Facade investigation.[Source: Author]

10- Kiosk designed to be constructed with concrete blocks, station edge/plinth cast out of reinforced concrete and concrete block infill.

Diagonal lines kept to induce a sense of speed and movement on the facade





11- Cantilever roof beam and column structural system was developed. These cantilever steel sections allow for two different grid systems on each station edge.

The same roof beam/column is pre-manufactured and fixed facing each other to complete portal frame.

Figure 10-12: Design development 11: New portal frame system
[Source: Author]