# 07. Technical Development

# Technology Concept

The technology concept is defined by the same four tensions that informed the design concept.

## 1. Passive | Active

In order for the building envelope to function in a sustainable manner, it has to be able to respond to its local context and work with external and internal conditions to achieve optimum environments within and around the building. In order to achieve optimum conditions on an on going basis, the building envelope is dynamic and adapts to changing conditions.

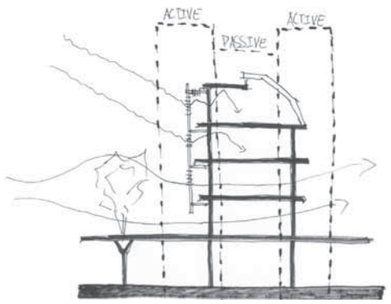



Figure 7.1. The active building envelope and the passive load-bearing structure (Author, 2010)

## 2. Park | City

Green roofs provide a solution to the conflict between the built and natural environments. Resolving this conflict requires the construction of buildings that enhance rather than deplete the natural environment. The primary objective of creating a green roof is to create a living habitat in an otherwise barren environment.

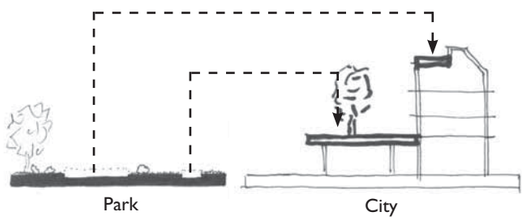



Figure 7.2. Green roofs replacing barren space (Author, 2010)

## 3. Old | New

The existing old Berrals building provides a stage for the new intervention and allows for the reinterpretation of the tectonic. To establish a new identity for the Berrals building the new intervention emphasises the difference between the new and the existing. This is achieved through the tectonic of the new intervention. and the manner in which it links to the Berrals building.

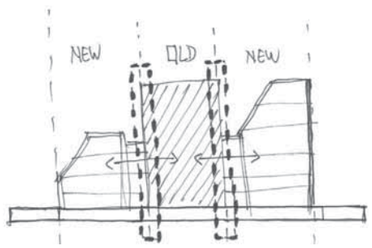



Figure 7.3. The tectonic emphasising the difference between new and old (Author, 2010)

## 3. Centre | Edge

The urban island is situated at a prominent intersection within the city yet the edges around the urban island are ill-defined. Thresholds need to be established in order to define the intersections of pathways and boundaries. To create such transitions changes in topology, light and surface occur along transition points.

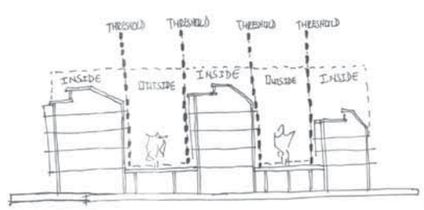
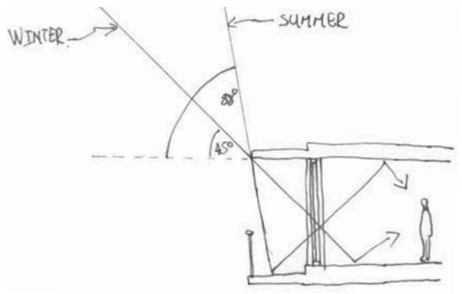



Figure 7.4. Thresholds between outside and inside (Author, 2010)



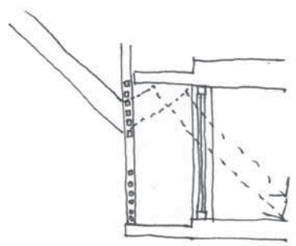



Figure 7.5. An active building envelope (Author, 2010)

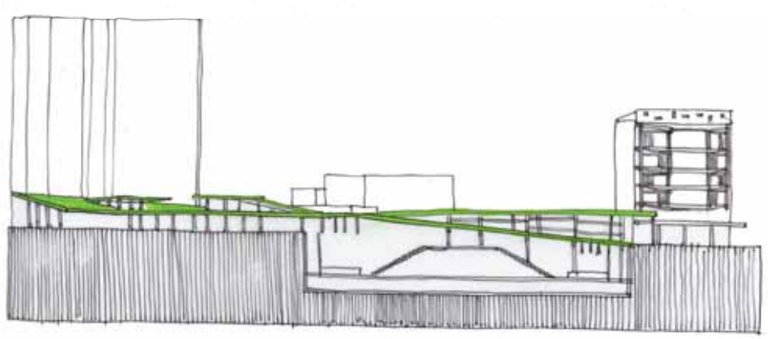
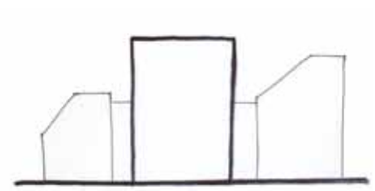


Figure 7.6. Roof as an urban park (Author, 2010)



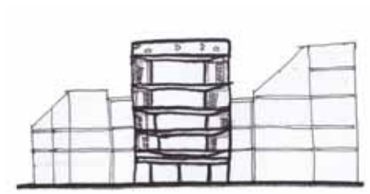


Figure 7.7. Lightness of the new contrasted with the solidity of the old (Author, 2010)

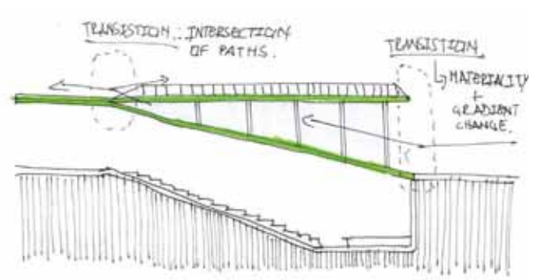
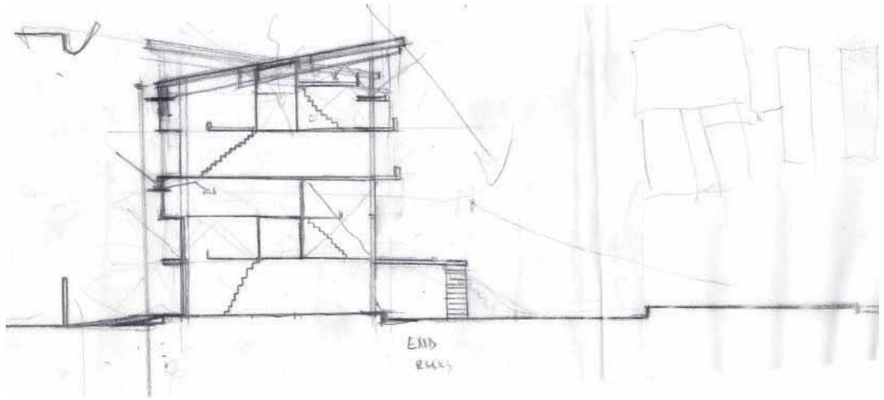
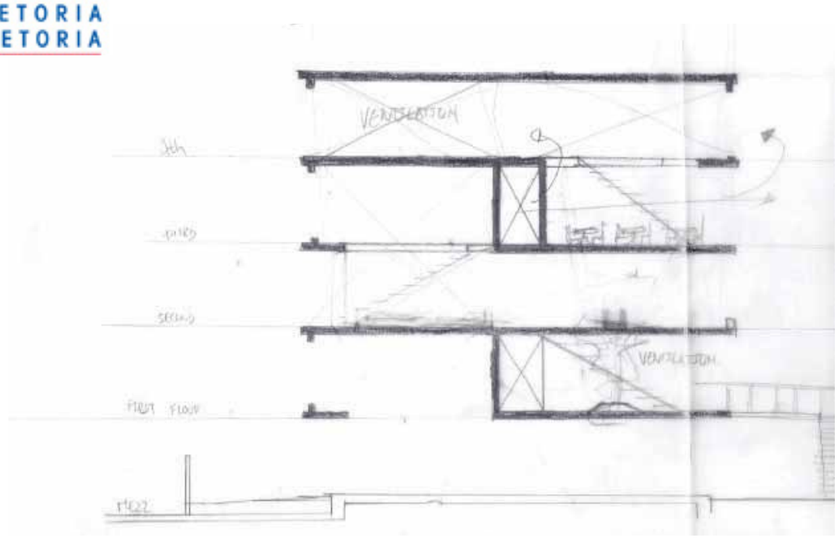


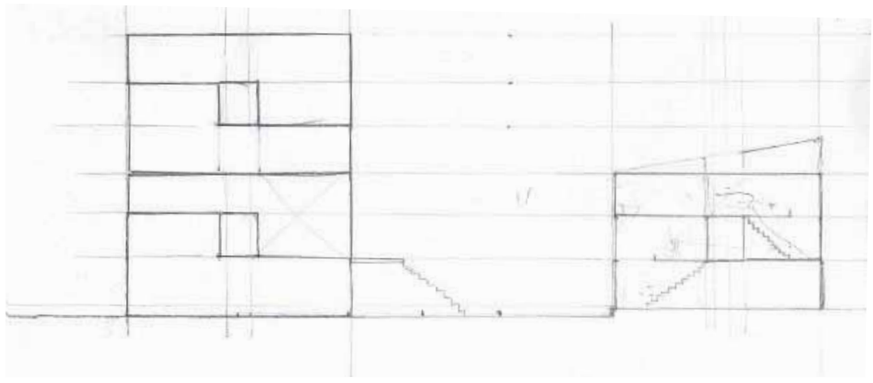

Figure 7.8. Thresholds along paths (Author, 2010)

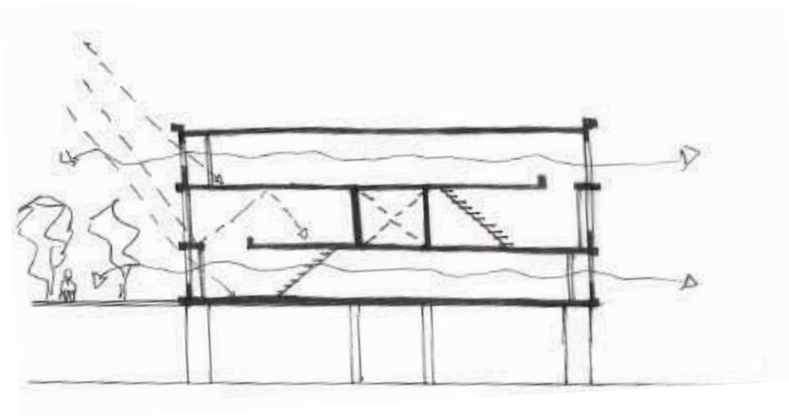
## Technical Development

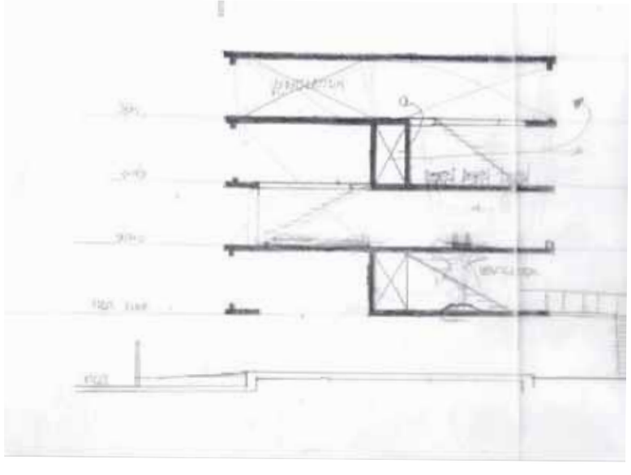
Fig. 7.8 - 9.4. Sketches demonstrating technical investigation (Author, 2010)

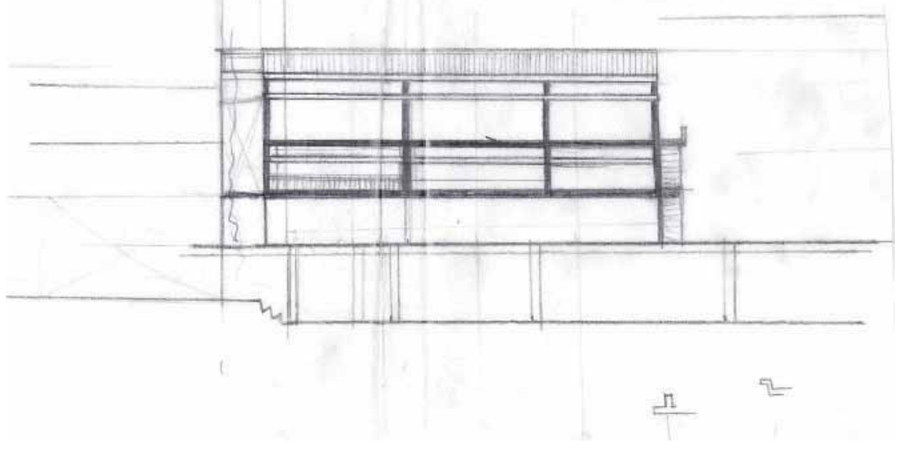


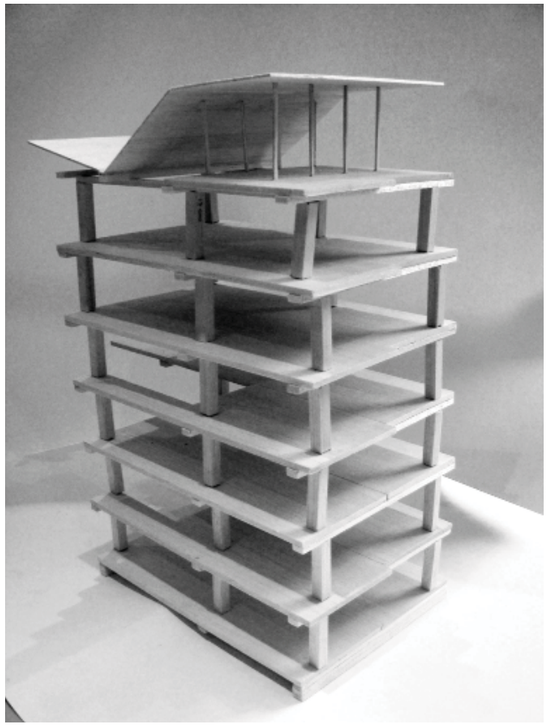


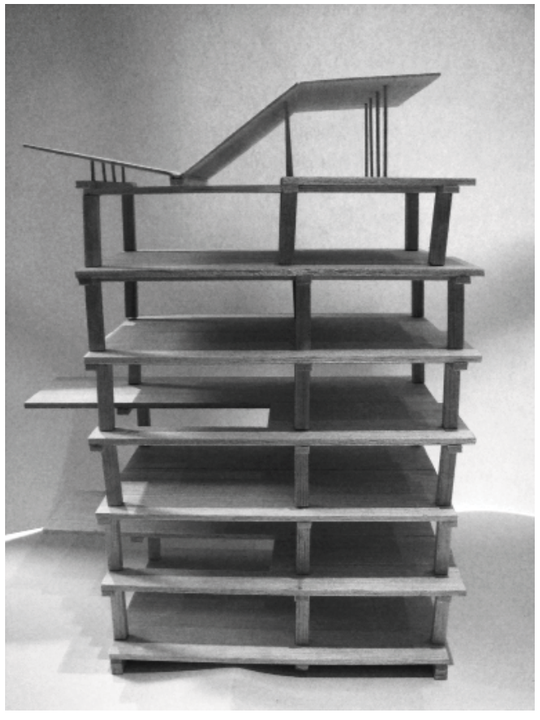


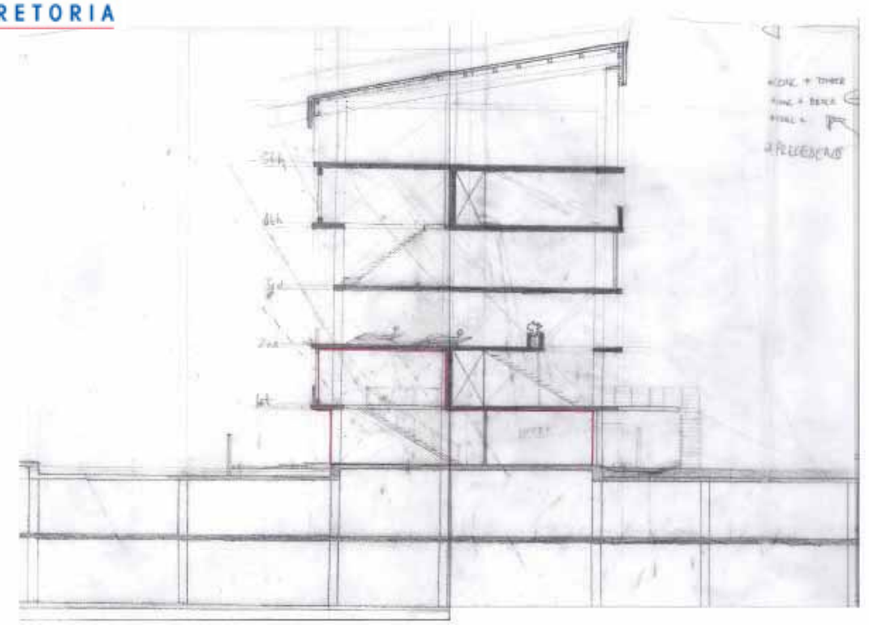


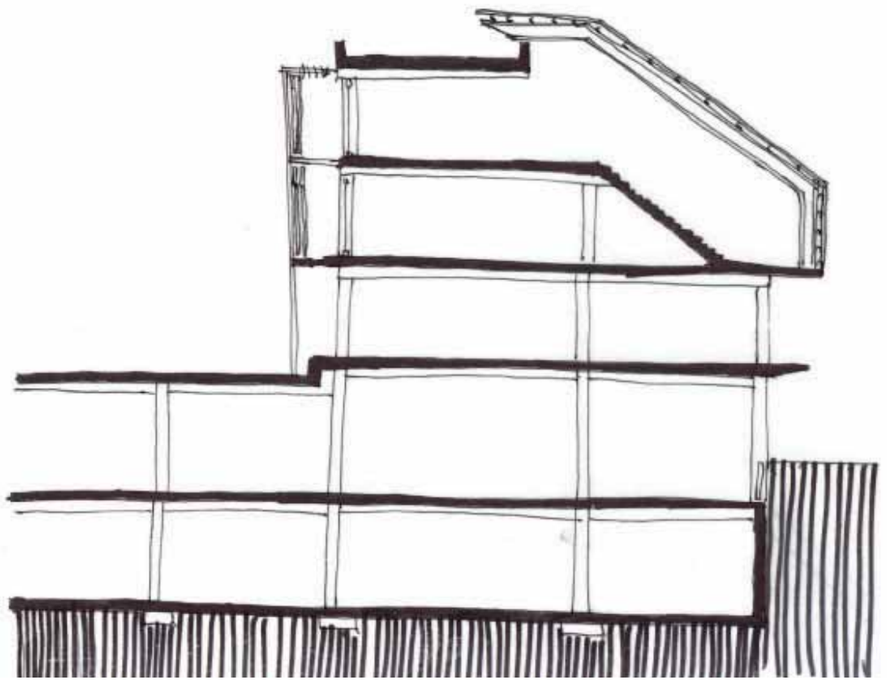


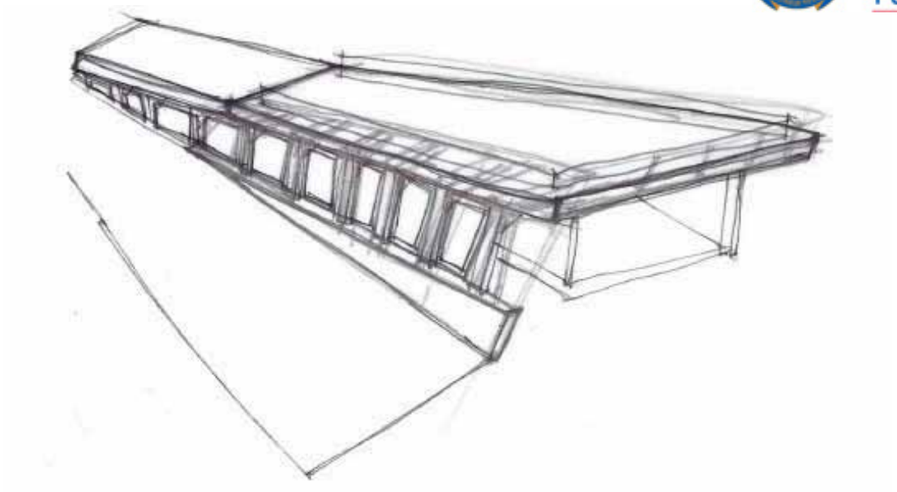


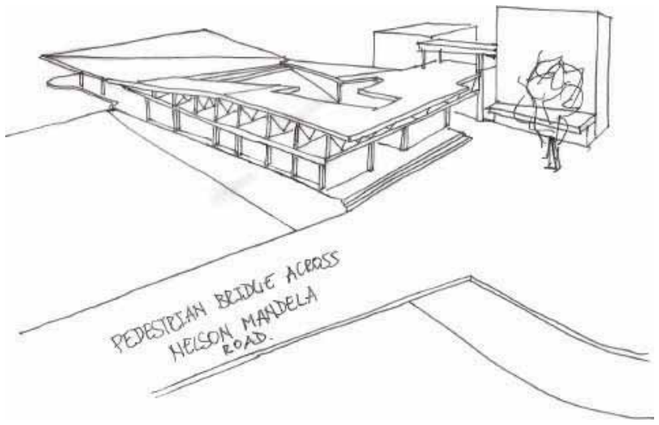


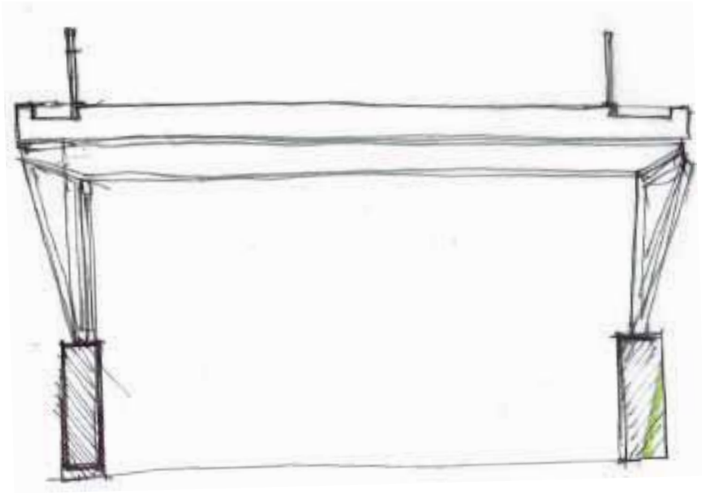


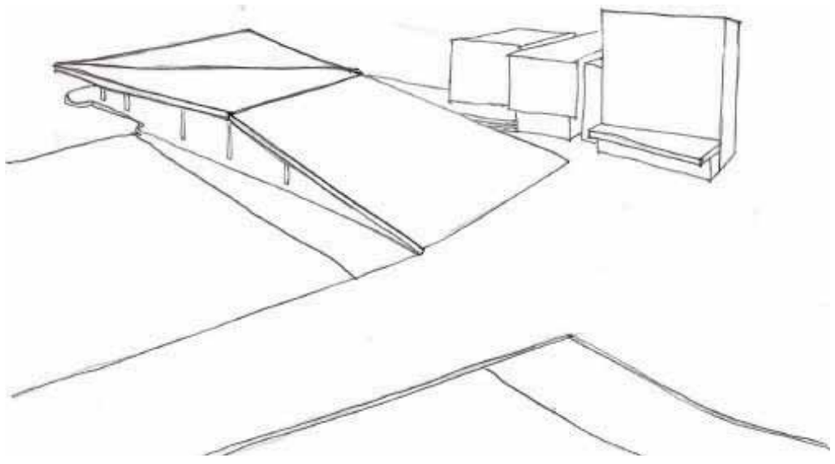






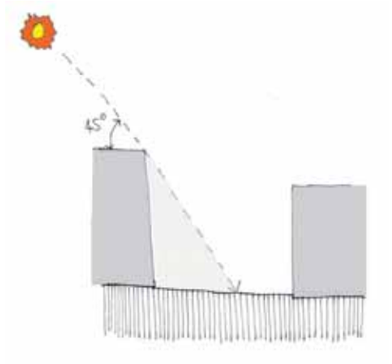

PEDESTRIAN BRIDGE ACROSS
NELSON MANDELA
ROAD.



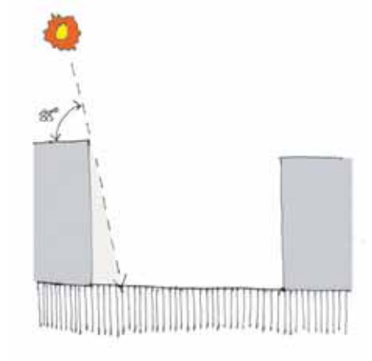


## Shadow Study

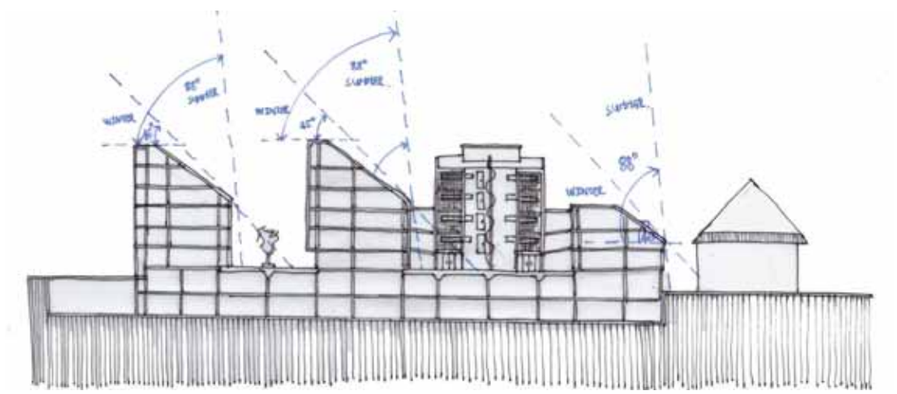
A shadow study was performed to determine whether the 3 blocks of residential and office units will receive enough northern sunlight in the winter and whether the courtyard spaces in between these block forms will receive enough sunlight to become a space that provides refuge from the bustling city for the residents of the new development. The altitude at which the sun moves from the winter to the summer months ranges from 45 degrees in winter to 88 degrees in summer. Solar simulation diagrams have been used to illustrate the amount of direct sunlight the courtyards and northern facades receive.




Solar angle diagram - Winter (Author 2010)




Solar angle diagram - Winter (Author 2010)



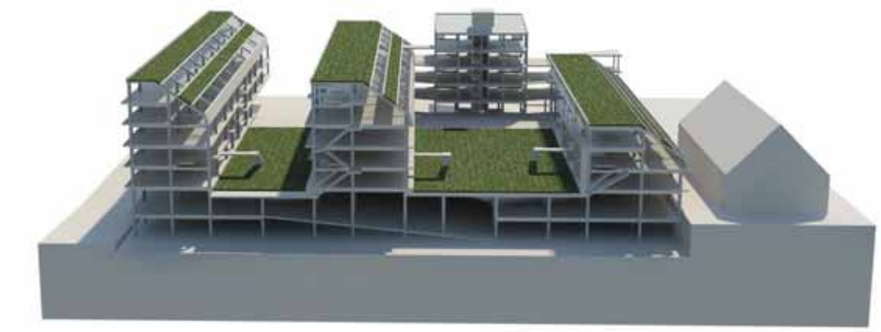
Sketch showing solar angles (Author 2010).



21 June - Winter Solstice : 10h00 (Author 2010)

21 June - Winter Solstice : 13h00 (Author 2010)

21 June - Winter Solstice : 16h00 (Author 2010)



21 December - Summer Solstice : 10h00 (Author 2010)

21 September - Equinox : 10h00 (Author 2010)

21 December - Summer Solstice : 13h00 (Author 2010)

21 September - Equinox : 13h00 (Author 2010)

21 December - Summer Solstice : 16h00 (Author 2010)

21 September - Equinox : 16h00 (Author 2010)

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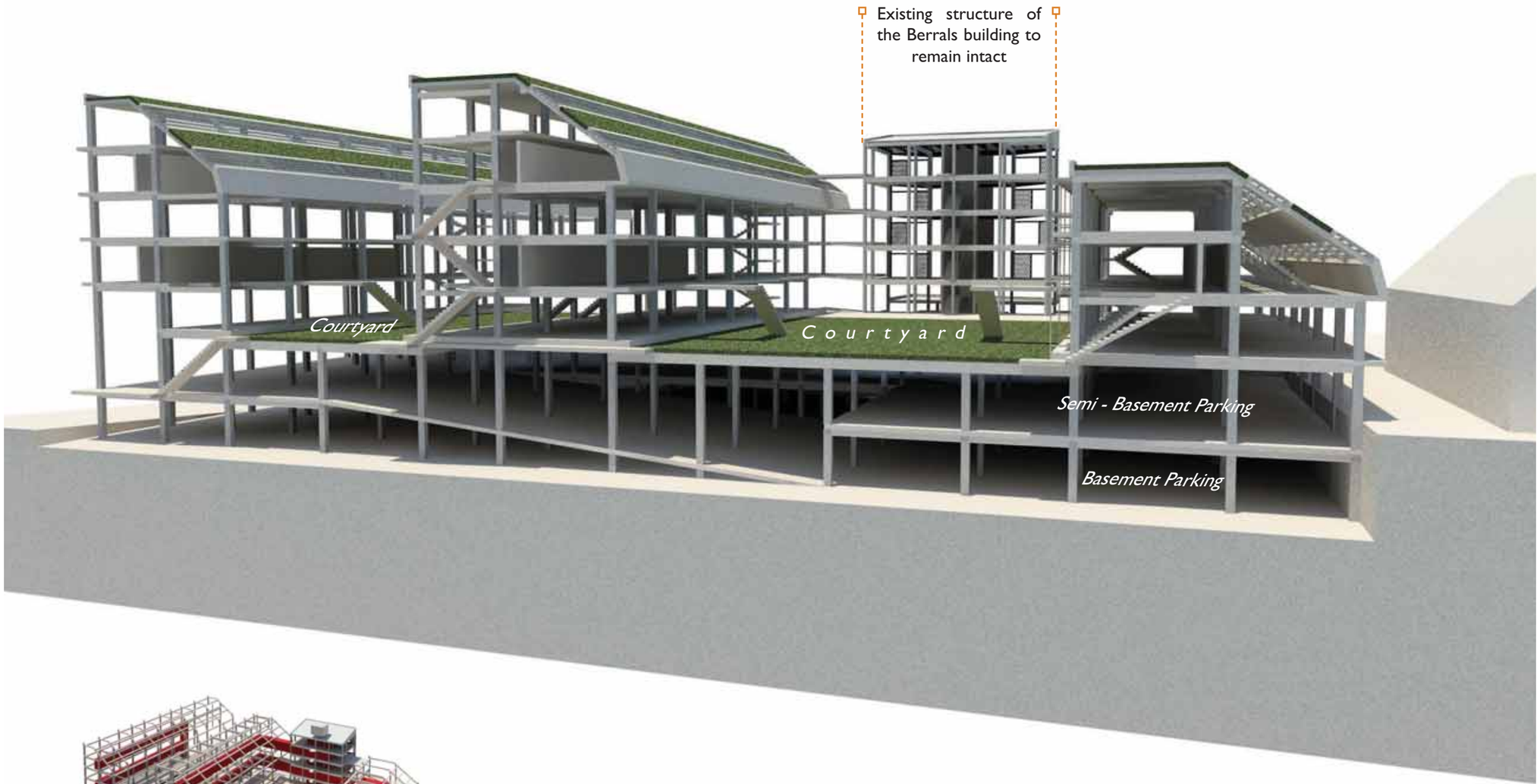
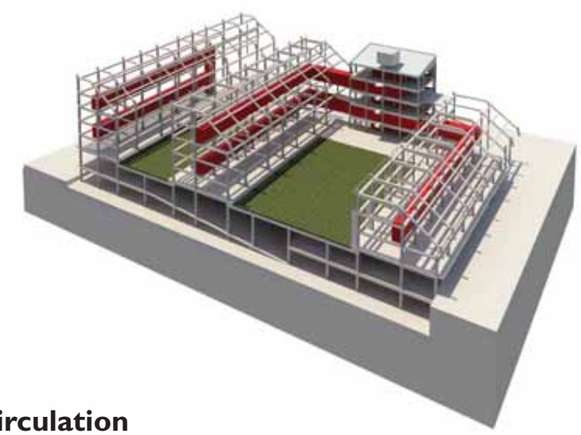
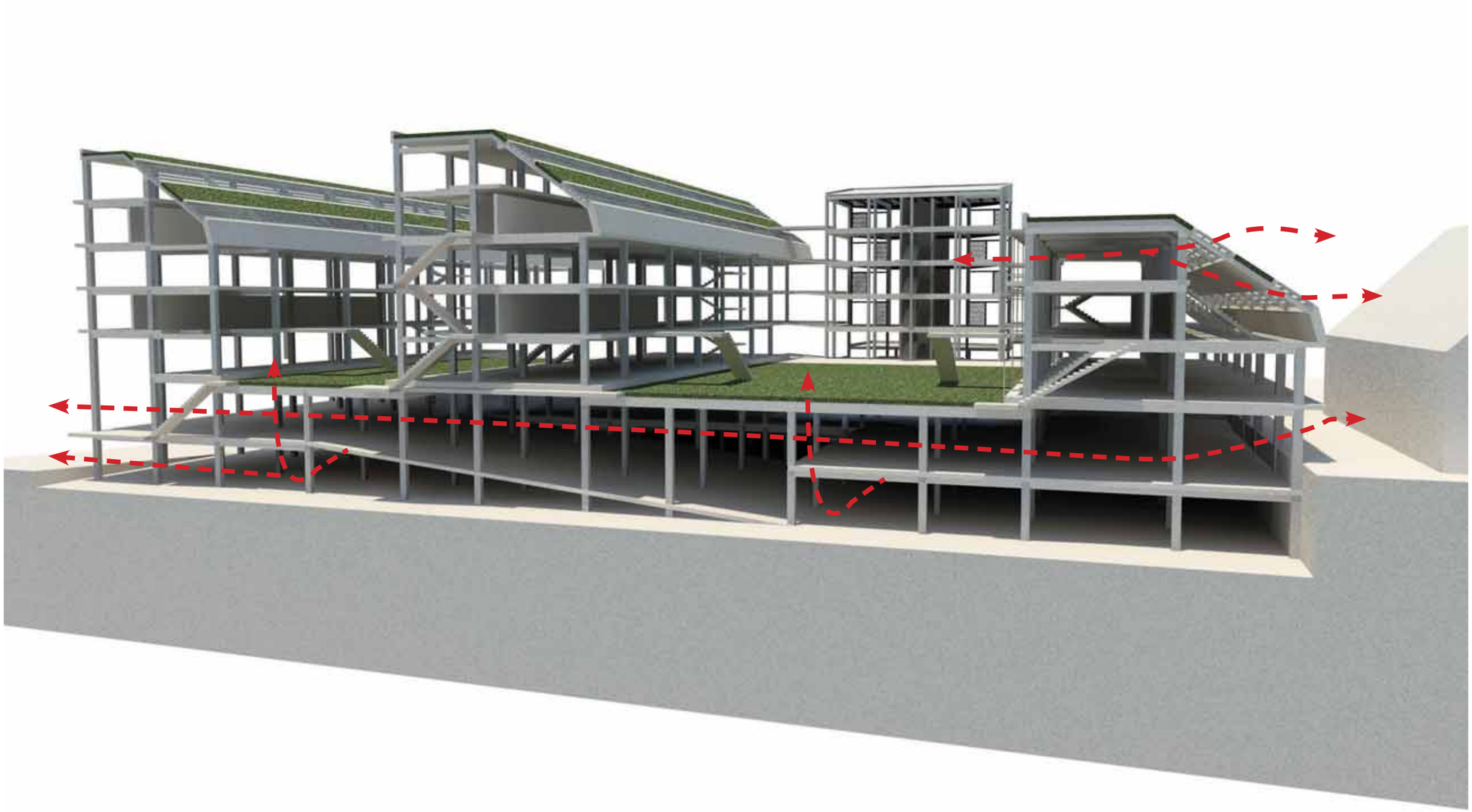
## Structure

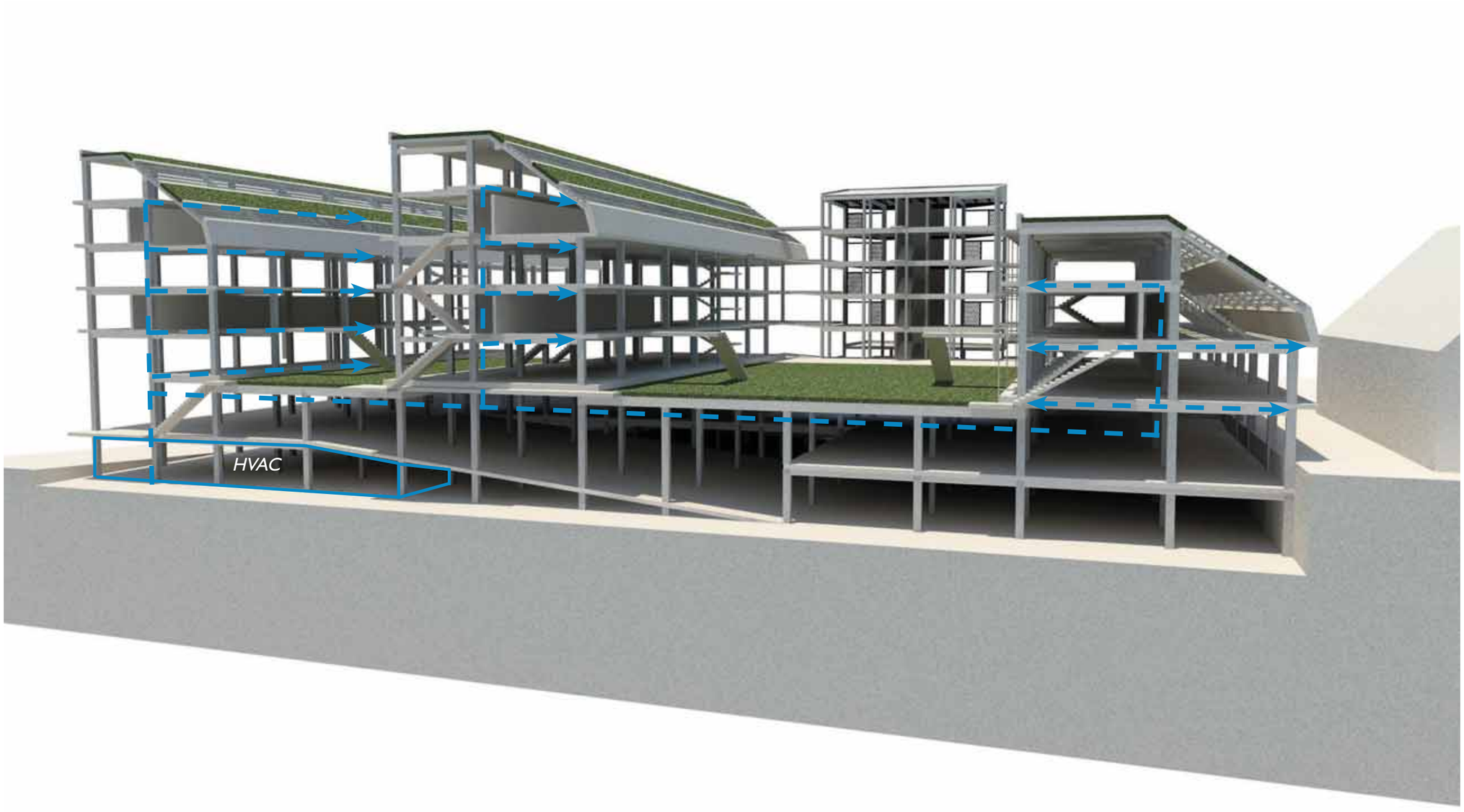
The primary structure of the 3 residential/office blocks consists of concrete floor slabs and beams that sit on concrete columns.

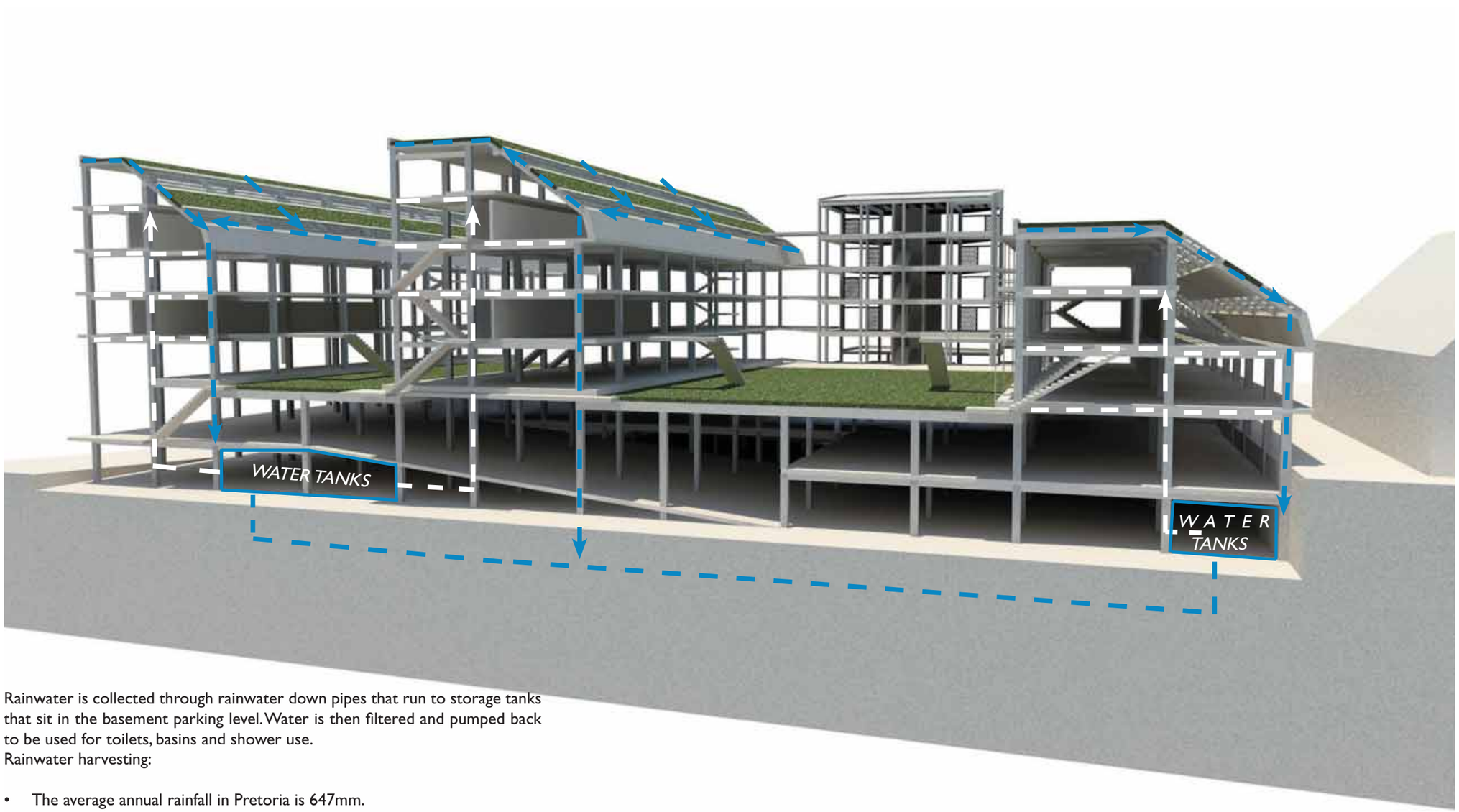


## Circulation




HVAC




Rainwater is collected through rainwater down pipes that run to storage tanks that sit in the basement parking level. Water is then filtered and pumped back to be used for toilets, basins and shower use.
Rainwater harvesting:

- The average annual rainfall in Pretoria is 647mm.
- Total roof area : 2530 sqm

2530 sqm x 0.647 = 1637 Kl is the is the amount of water available for harvesting. Only 73 % of this water will be harvested owing to evaporation.

Size of rainwater tank size is based on the amount of water consumed per day.
Average water consumption:

- Hand basin : 5 litres
- Kitchen sink (per wash-up) : 6 litres
- Dishwasher : 14 litres
- 1 person + household : 120 litres
- Toilet: 8 litres per flush
- Showers: 36 litres per person



Estimated water consumption = 2 x120 litres (2 people + household) x 48 apartments
= 11520 litres

Sizing of rainwater harvesting system : Total consumption (L) x number of months with low or no rainfall. There are four months were there is little or no rain in Pretoria.

11520 (L) x 4 = 46 080 litres is the capacity that the storage tanks need to accommodate.
So three 15 000 litre rain water tanks are sufficient to store the necessary daily amount of water that will be used. Enough water will be stored in the water tanks to last through the winter months were there is little rainfall. This is due to the large roof span that allows for a large amount of water to be harvested.

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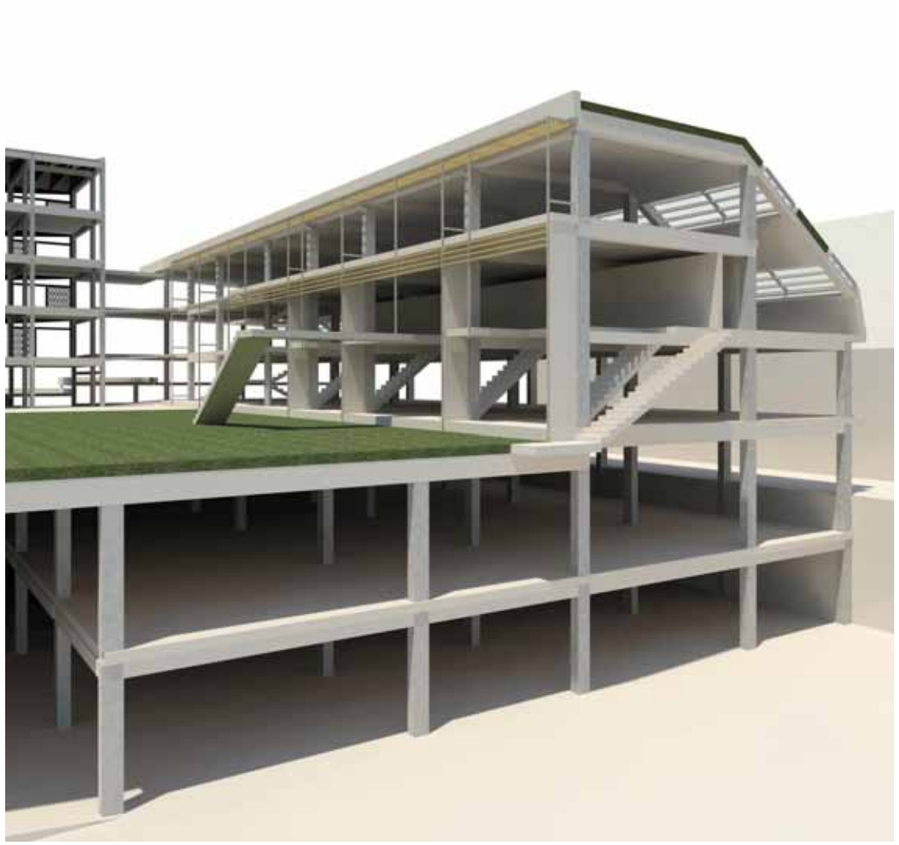
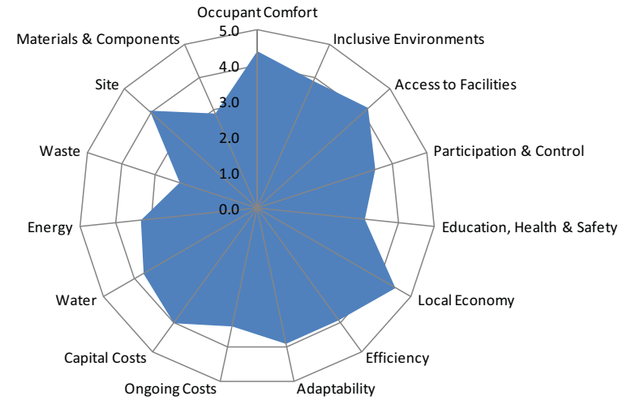
## ing tool



The northern facades of the office/residential blocks are exposed to direct northern sunlight the entire day and therefore solar gain will occur within the residential apartments and offices. Solar protection is needed in the form of louvres in order to diffuse the direct solar energy. The louvres will provide not only sun protection but will provide privacy screens for the residents and it will create a dynamic facade that is not monotonous.

The Sustainable Building Assessment Tool provides an indication of the performance of the design of a building in terms of its sustainability. Three aspects of sustainability are assessed: Social, Economic and Environmental.




Overall 3.7

| Classification | 0-1 Very Poor | 1-2 Poor | 2-3 Average | 3-4 Good | 4-5 Excellent |
|---|---|---|---|---|---|