



Precedents are chosen for certain qualities or aspects that will be analysed and incorporated in the design process. The aim of assessing precedents is to learn from existing projects.

The following aspects will be analysed:

- a) Material use
- b) Plan layout
- c) Movement through the space
- d) BRT prototypes
- e) Energy use
- f) Indoor climate regulation
- g) Site response

5.1 CURITIBA BRT STATION

ID:	BRT Station Prototype
Location	Curitiba, Parana State, Brazil
Architects:	Unknown
Client:	City Council of Curitiba
Date:	1990's
Area:	30 m ²
System:	

1974 – BRT system introduced
 Transport 1.6 million people per
 day
 Bi-articulated bus vehicles
 Single ticket for all routes
 [off board payment]
 Saves 27 million litres of fuel per
 year

[Goodman et al 2005:75].

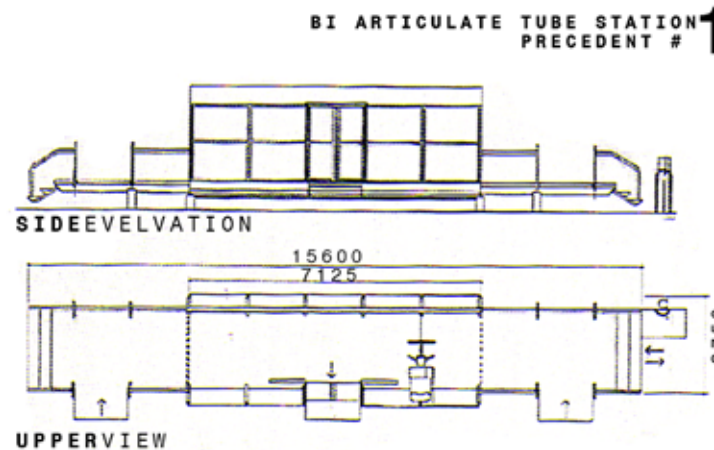
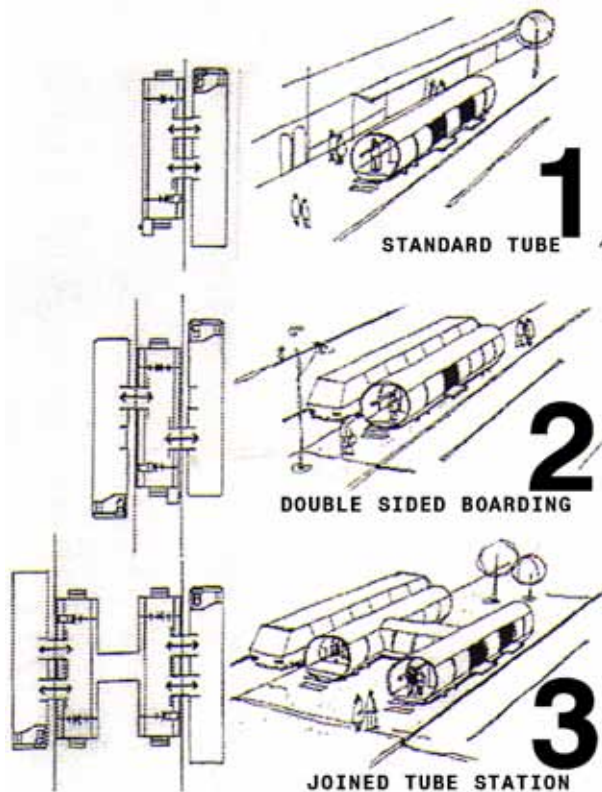


Figure 5-01: Adaptable stations [Ruano 1998, p.40]

Figure 5-02: Plan and section of station [Ruano 1998, p.40]

Location

Placed on the median or street curb side.

Plan/Form

The simple linear plan, is an iconic and legible object in urban space. The station allows only for one controlled entrance with turnstile. The use of polypropylene sheeting ensures a visually open structure. The prototypes can be adapted to accommodate different amounts of bus bays

Material use

Polypropylene, steel, steel mesh, concrete foundation and footing.

Ventilation& Services:

Station is naturally ventilated, edges are open or covered with screen mesh. Curitiba has a temperate coastal climate with a high humidity, making these stations comfortable except for high humidity levels.

Polypropylene walls allow for natural lighting, yet artificial light installed for night. Steel sheeting roof material allows for shading during the day.

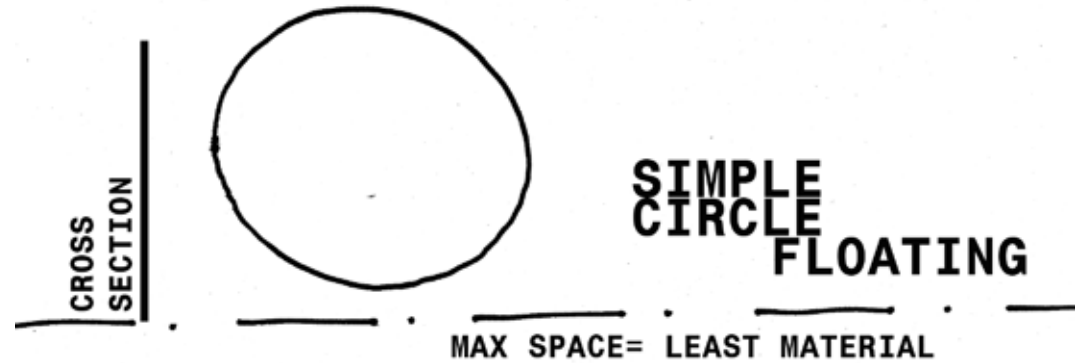


Figure 5-03: Conceptual section [Source: Author]

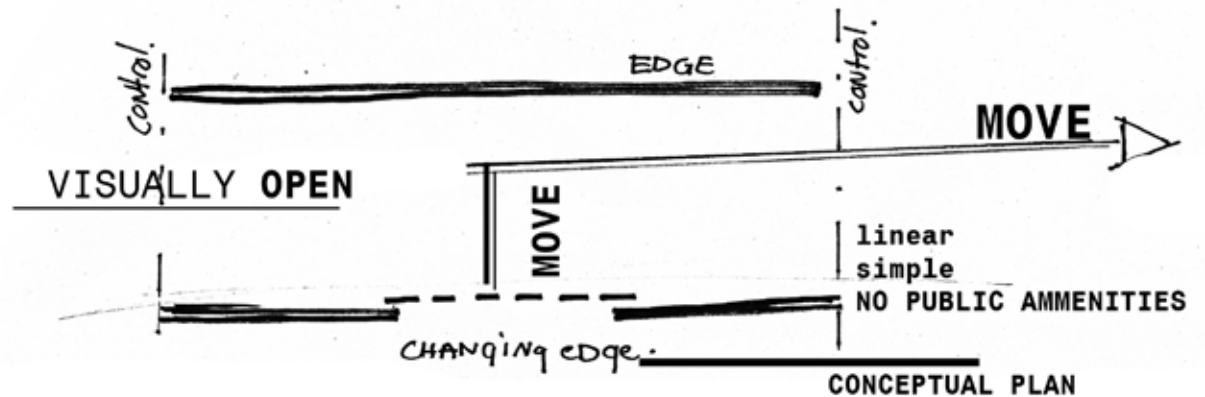


Figure 5-04: Movement and plan [Source: Author]

Embodied energy of material:

All structural material and cladding were analyzed:

- [Excluding foundation, handrails and service material, construction energy]
- [These number are according to Central Europe's materials source: Jones & Hammond 2008]
- [All steel is assumed to be recycled]
- [Only selected materials area analysed- this is not the full embodied energy of the prototype]

Concrete [Base +footing]	= 7.9 m ³	18 960 kg	= 30 716 MJ
Polypropelene[6mm]	= 0.18 m ³	162 kg	= 18 630 MJ
Steel Roofsheeting [3mm]	= 0.053 m ³	424 kg	= 12 483 MJ
Steel structure	= 0.76 m ³	6080 kg	= 178 995 MJ
[150 dia 5mm hollow round section]			
		Total	= 240 824 MJ
		Total	= 8 027 MJ/m ²

Critique

The prototypes are small enough to adapt to the urban environment and are human scaled. The use of a circular form allows for maximum space with minimum material use. A lot of natural light is allowed into the structure. These structures might overheat in a hot humid climate.

The use of large polypropylene sheeting makes these structures very safe as passive surveillance is easy. No proper seating is provided, yet transport system is very efficient. Commuters do not have to wait for long periods in these stations.

This is a very successful iconic prototype for the city.

Figure 5-05: Placing of station on street edge [source: www.greatbuildings.com, accessed 14 March 2010]





Figure 5-06: Photographs of Rea Vaya Prototype [Source: Author].

5.2 REA VAYA BRT STATIONS

ID:	Rea Vaya BRT stations
Location	Johannesburg, South Africa
Architects:	Ikemeleng Architects, Osmond Lange Architects & Planners
Client:	City Council of Johannesburg
Date:	2009
Area:	158 m ²
System:	2009 – BRT system introduced Bi-articulated bus vehicles Paper ticket payment system

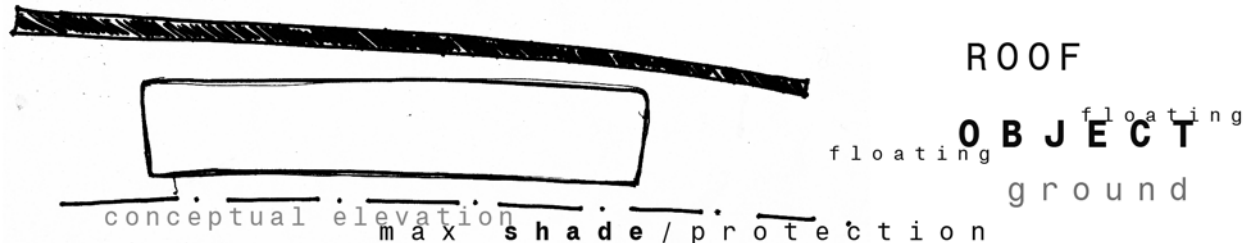


Figure 5-07: Conceptual elevation of BRT station [Source: Author]

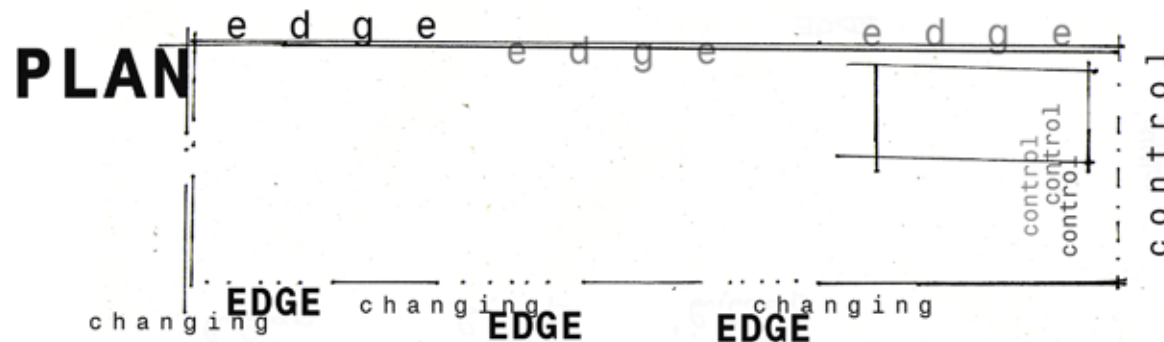


Figure 5-08: Conceptual plan layout [Source: Author]

Location

The prototypes are planned to be placed on the median, with single sided entrance station as well as double sided entrance stations. These stations are the same prototypes while the width of the two prototypes differs.

Plan/Form

The prototype is a simple linear plan with a single entrance. The single layered roof structure is elaborate and over scaled yet provides ample shade. There is also an office for the station master within the station.

Material use

Concrete, steel, glass and a stainless steel office, corrugated steel roof sheeting.

Ventilation& Services:

The structure is naturally ventilated station with artificial lighting. This ensures cool summer temperatures inside while winters in the Highveld can be very cold making the indoor temperatures very low.

Critique

The prototypes are over scaled and too large to easily fit within the urban network and road network. The use of natural ventilation ensures low energy use. The use of large glass sheeting ensures that the stations are safe while using passive surveillance. The large roof structure and overhangs provides sufficient shade on hot summer days.

Embodied energy of material:

All structural material and cladding were calculated :

[Excluding foundation, handrails and service material, construction energy]

[These number are according to Central Europe's materials source: Jones & Hammond 2008]

[All steel is assumed to be recycled]

[Only selected materials area analysed- this is not the full embodied energy of the prototype]

Concrete [Base +footing]	= 41.48 m ³	99 552 kg	= 161 275 MJ
Glass sheeting [6mm]	= 1.04m ³	2 496 kg	= 37 440 MJ
Steel Roofsheets [3mm]	= 0.507m ³	4 056 kg	= 119 246MJ
Steel structure	= 1.52 m ³	12 160 kg	= 357 990 MJ
[150 dia 5mm hollow round section]			
Stainless steel office	= 0.08	576 kg	= 32 492 MJ
		Total	= 708 443 MJ
		Total	= 4 484 MJ/m ²

5.3 CAMPUS OF THE UNIVERSITY OF VIGO

ID: Sports complex and entrance
into the campus
Location: Vigo, Spain
Architects: EMBT Architects
Client: Universidad de Vigo, Cidada,
Universitaris. S.A
Date: 1999-2003
Area: -

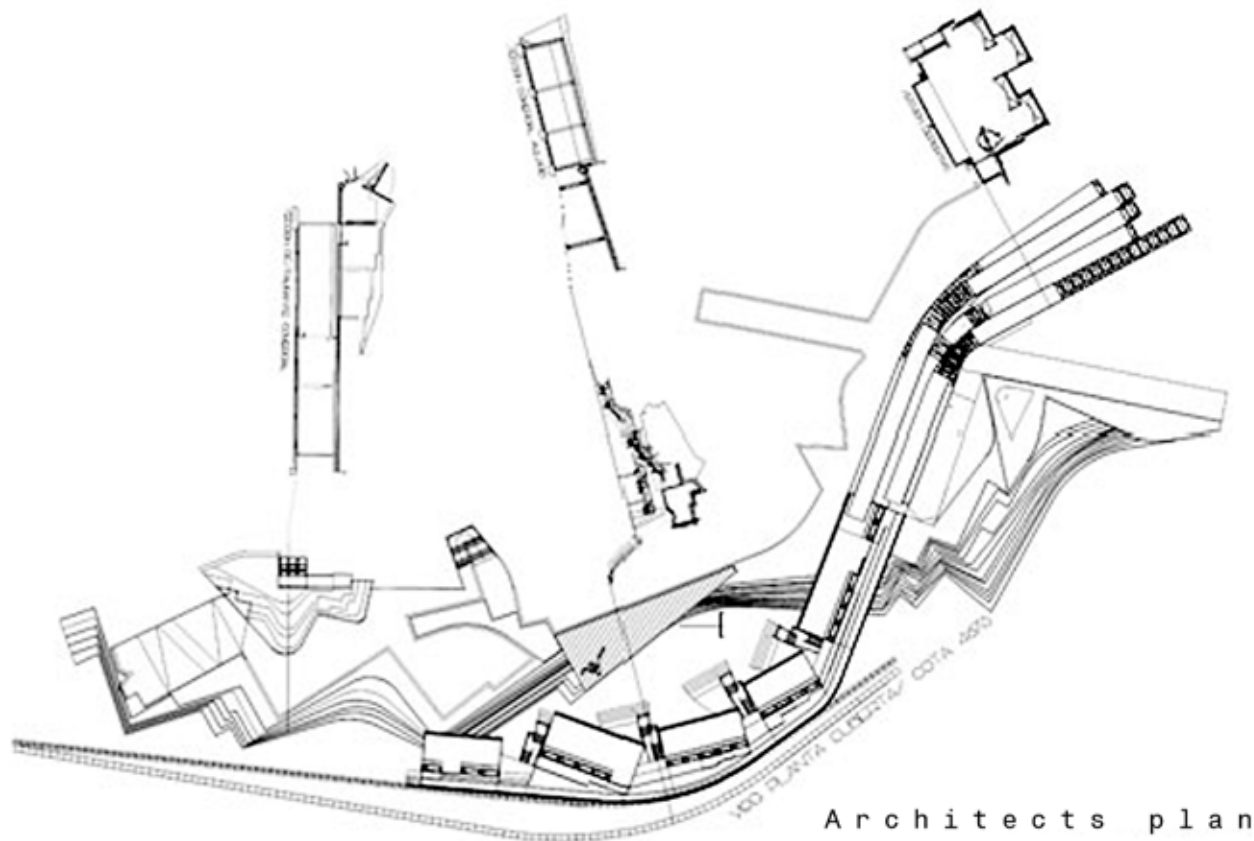


Figure 5-09: Plan and sections of intervention [Source: Architects' Website
- www.miralllestagliabue.com].

Design

The design addresses the spatial qualities that are required by the university's faculties as well as their future needs. The design incorporate between these different functions on site.

Functions:

- Ring road,
- Car parks,
- Extensions to each Faculty,
- Integrated services, reforestation, a
- Waste water collector.

The design joins the different functions into a single structure. Through joining these functions and adapting the structure to the landscape a spatial experience of movement and a changing landscape.

The immaterial aim/objective of the design: The students must experience the site, its stillness and the use there of [Mirrales 2010].

Plan form

The plan is elongated and linear that binds all the different functions together.

Threshold

The architect makes use of trees to form a threshold entrance into the building complex. The use of trees and reforestation makes deepens the threshold and enforcing the experience of change and separation.



Figure 5-10: Model of intervention, adapted to site [Source: Architects' Website - www.mirallestaglabue.com].

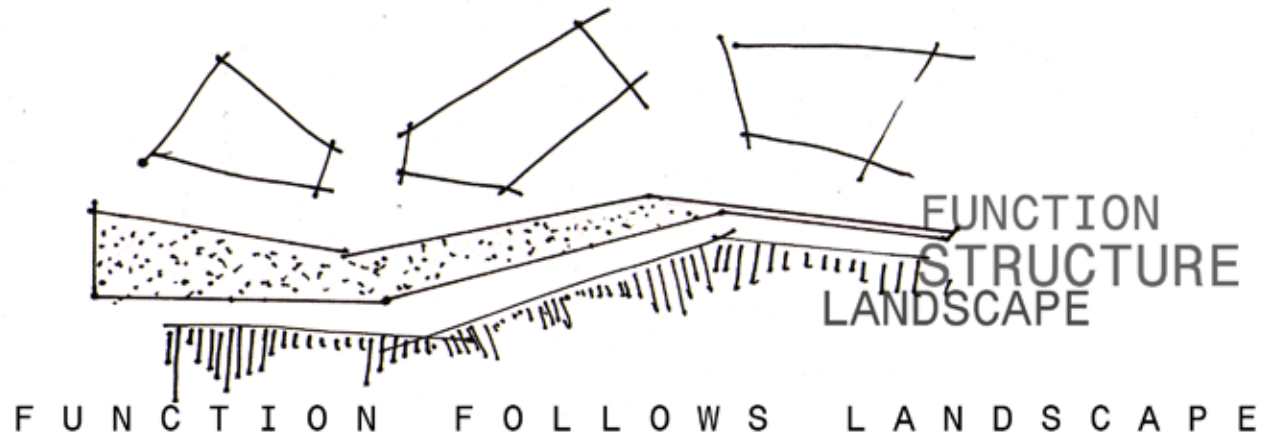


Figure 5-11: Plan adapted to landscape and linking functions [Source: Author]

Entrance and movement

The planted forest in front of the building's entrance acts as the first threshold into the structure. The plan opens up and draws the user into the building, with high overarching roofs.

The architect makes use of level changes and changing ceiling heights to enhance the spatial experience of movement and change.

The design is embedded in the existing landscape while adapting and folding itself to the landscape.

The entrance into the structure is a series of large very high roof structures. The height gives identity to the entrance and makes the complex more legible to first time users.

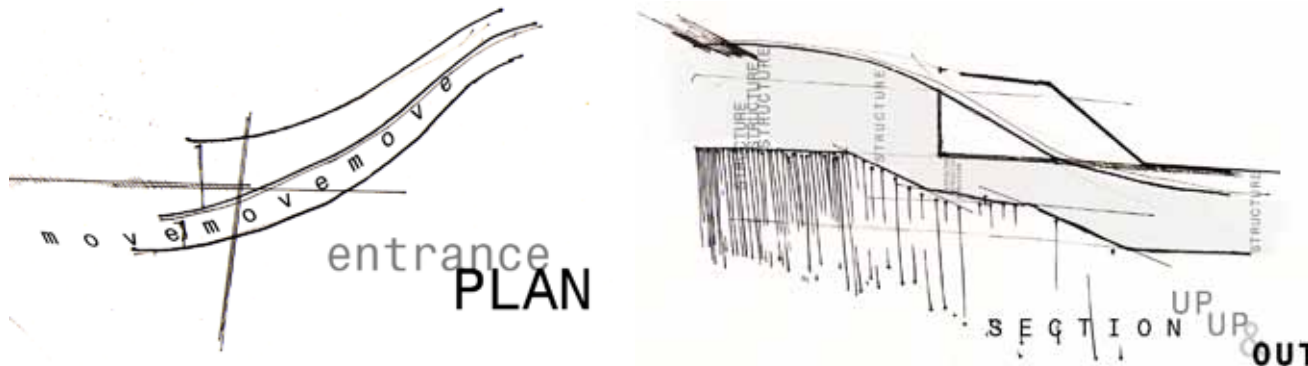


Figure 5-12: Conceptual plan and sections, structure conveying movement and change [Source: Author]

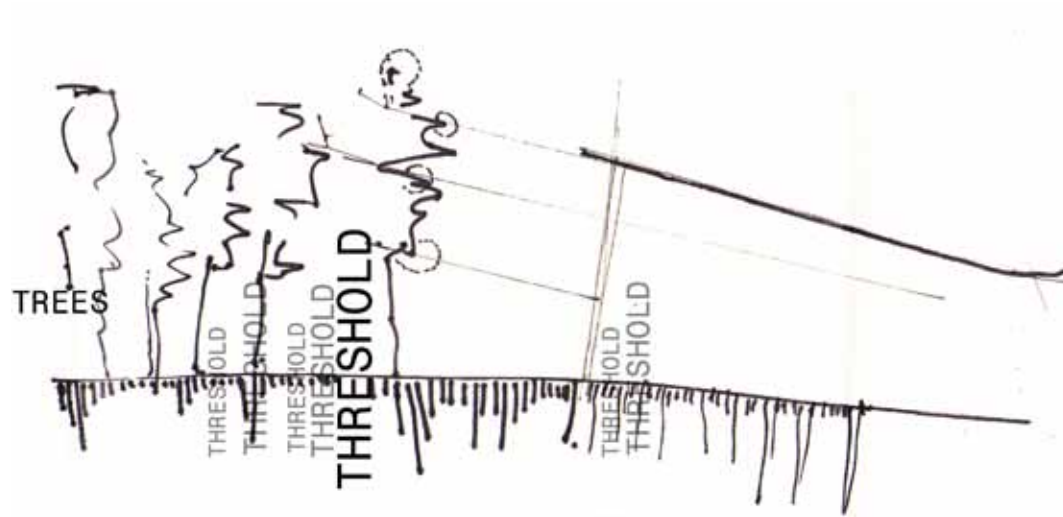


Figure 5-13: Threshold to entrance to building [Source: Author]

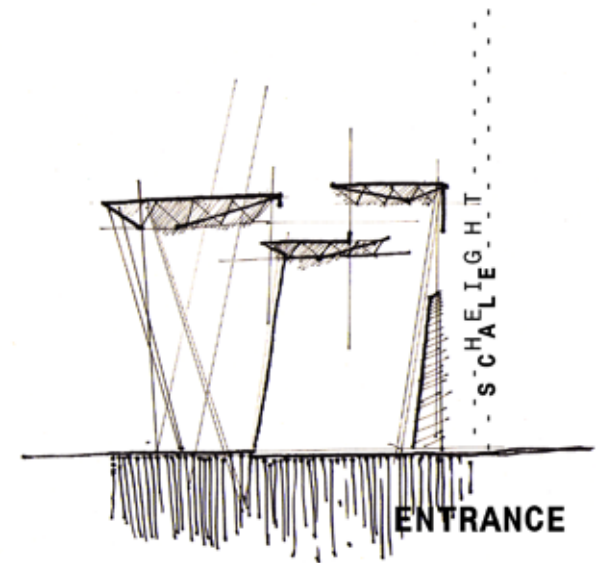


Figure 5-14: Entrance very large scale [Source: Author]

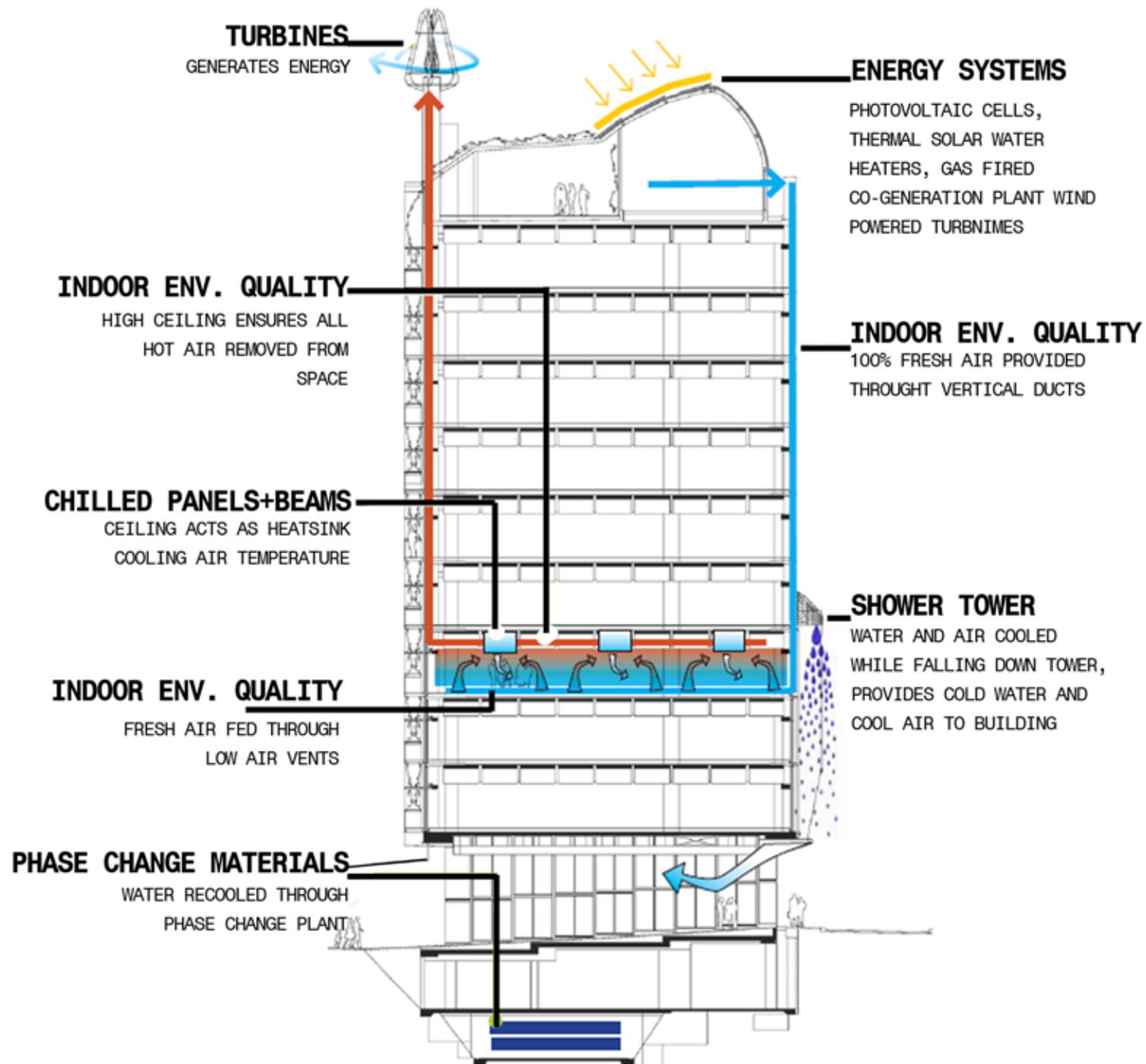


Figure 5-15: Ventilation and energy systems working in an integrated whole
 [Source Melbourne city council website: <http://www.melbourne.vic.gov.au/Environment/CH2/aboutch2/Pages/AboutCH2.aspx>].

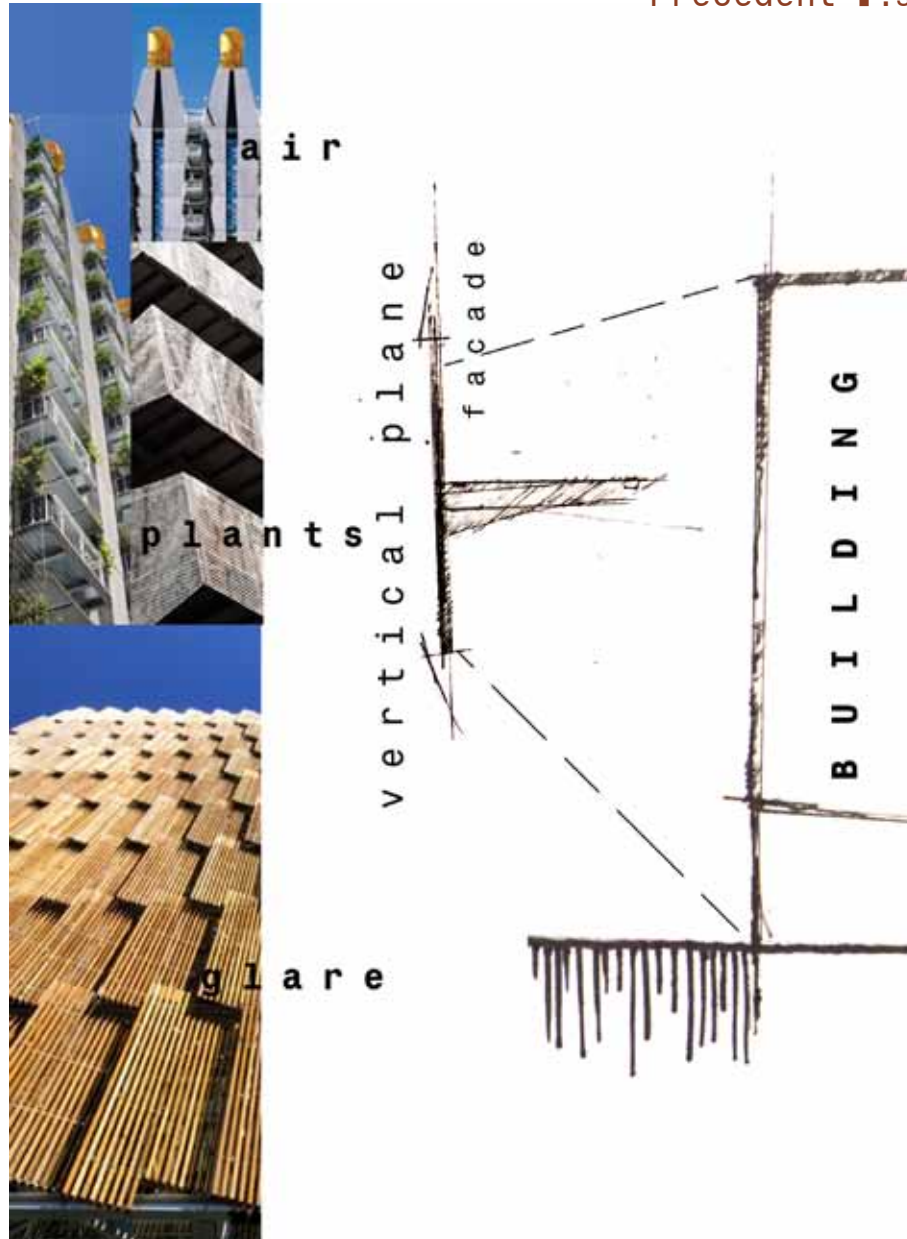


Figure 5-16: Facade detail [Source: Author]

5.4 CH2 BUILDING, MELBOURNE

ID: Multi Storey office building
 Location: Melbourne, Australia
 Architects: City council planners and Design Inc
 Client: City council of Melbourne
 Date: 2006
 Size: 10 storeys

Systems

All systems are integrated and works as an ecosystemic whole as indicated in Figure 5-15 [Design Inc 2010]. By making use of a series of different systems these systems can adapt to different times of the year to provide comfort throughout the different seasons [Melbourne 2010:1-4].

The vertical planes of the structure are utilised as planting and evaporative cooling elements as innovative facade manipulation in dense urban areas.

Ventilation:

During the summer period the structure makes use of evaporative cooling to ensure cool humidified air is circulated throughout the building. The building uses 100% ventilated fresh air. The hot air is extracted through a wind turbine on the northern elevation of the structure.

Cool fresh air is supplied through a displacement ventilation system with floor grills and heat extractors in the ceiling space. This minimises the energy use of the ventilation system.

Night cooling purges the structure from heat that built up during the day. This method also stores coolth within the structure that would absorb heat during the day. Cooling requirements are reduced with 20% by this method [Melbourne 2010:02].

Material use

Concrete beams are exposed in the structure to act as chilled beams. These beams are cooled with water that are used as phase changing materials and chilled in the basement. These beams act as heat sinks absorbing heat energy within the structure during the summer period.

Facade

The use of a double or smart facade that adapts, opens/closes and ventilates the structure. The systems and infrastructure of these systems [planting, louvers, ducts, and water pipes] can be seen as a second skin that envelops the structure. This in essence regulates the structure's indoor environment [Design Inc 2010].

Energy use

The building makes use of a hybrid approach to energy generation ranging from photovoltaic panels, solar thermal heaters, wind turbines to gas fired energy turbines. By reducing the building's energy consumption with 50% the use of alternative energy sources becomes a viable option.

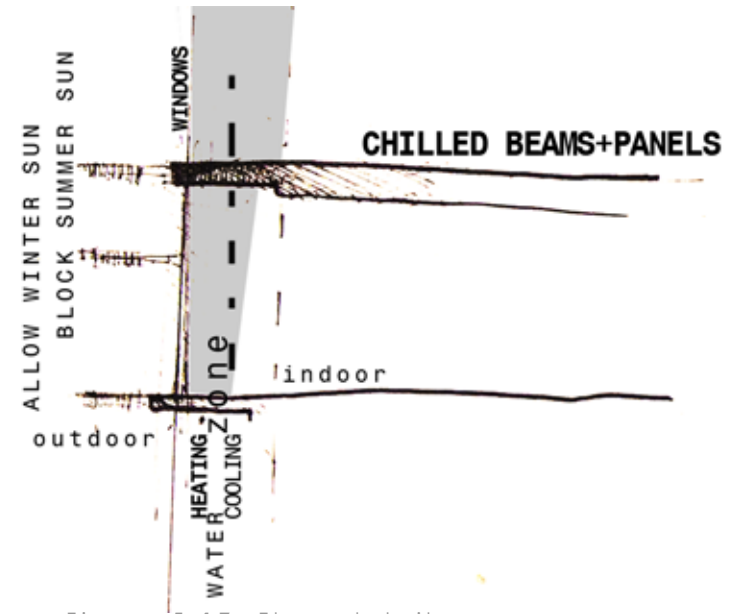


Figure 5-17: Floor detail
[Source: Author]

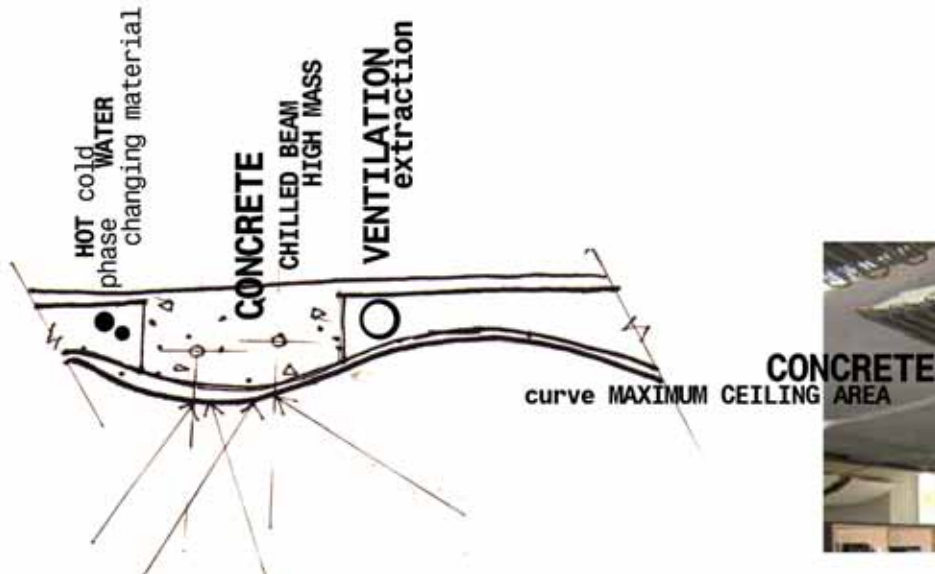


Figure 5-18: Ceiling detail
[Source: Author]

5.5 ORIENTE STATION

ID: Multi modal transport inter change
Location: Lisbon, Portugal
Architects: Calatrava Valls – Santiago
Client: City of Lisbon
Date: 1993-1999
Area: -



Context and aim

The context for the station is a very dense urban area. By piercing the existing embankment the architects aimed link two dislocated areas of the Olivias district. This area houses the working class and a light industrial area.

This station links different modes of transport:

- Long Distance trains
- Commuter Rails
- Metro Rail
- Cars
- Coaches

The station serves as a link between Lisbon, Portugal and Europe.

Figure 5-19: Dense urban context of station [Source: Google Earth]

Plan form

The site layout is planned along integrating transport routes. The coach and vehicle platform were orientated perpendicular to the train routes. The station becomes a gateway into the Expo grounds by connecting the ground level to the two edges of the site.

Levels and integration & Movement

The station is a multi level station with different forms of transport integrated on many levels [Spier 1998:43]. These levels are visually connected, enhancing the experience of movement through the building. The architect uses escalators with the double and triple volumes above these movement spines. Moving through the building becomes a travelling experience in itself.

All the transport systems are self contained in order to ensure that each transport system works efficiently, while the interchange between these transport is possible [Abache 2001].

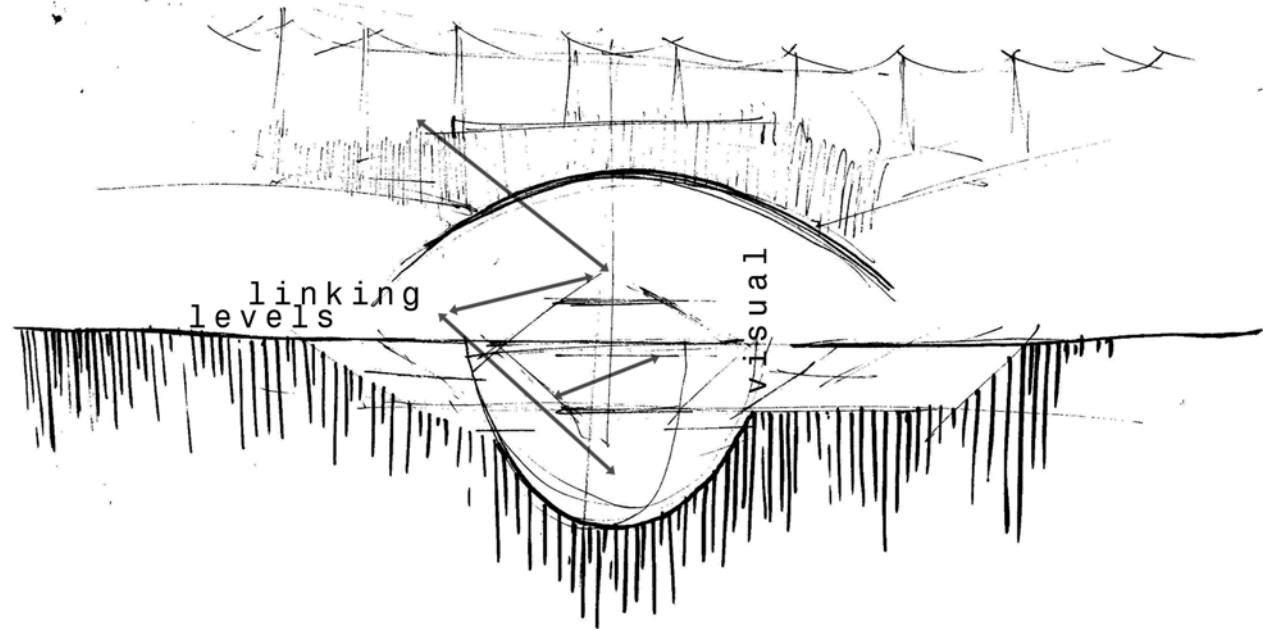


Figure 5-20: Movement between the levels of transport [Source: Author]

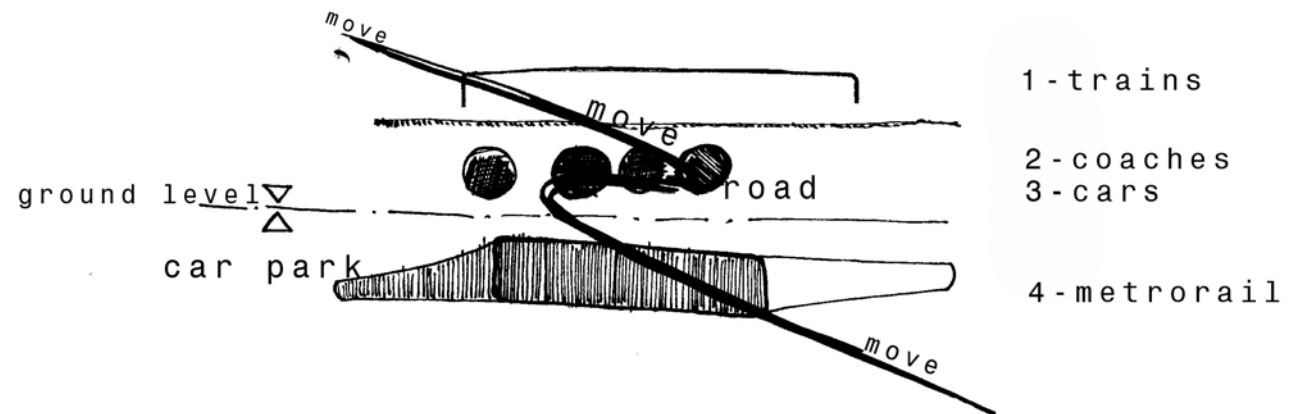


Figure 5-21: Conceptual section through the station building [Source: Author].

Material use

Roof canopy over the stations platforms [concourse] was designed according to a Gothic understanding of structure and light. The Gothic arches with the use of glass roofing and steel canopies give the potentially bulky roof a very light quality.

The sculptural use of concrete [floating bridges, lifts, bridge connections and elevators] gives the whole roof structure and main concourse a very light quality. In a way the lightness of the structures seems to disregard the load of the trains and transport systems.

The material use is concrete, steel and stonework paving.

Figure 5-22: Images of station structure and materiality [source: www.images.travelpod.com]



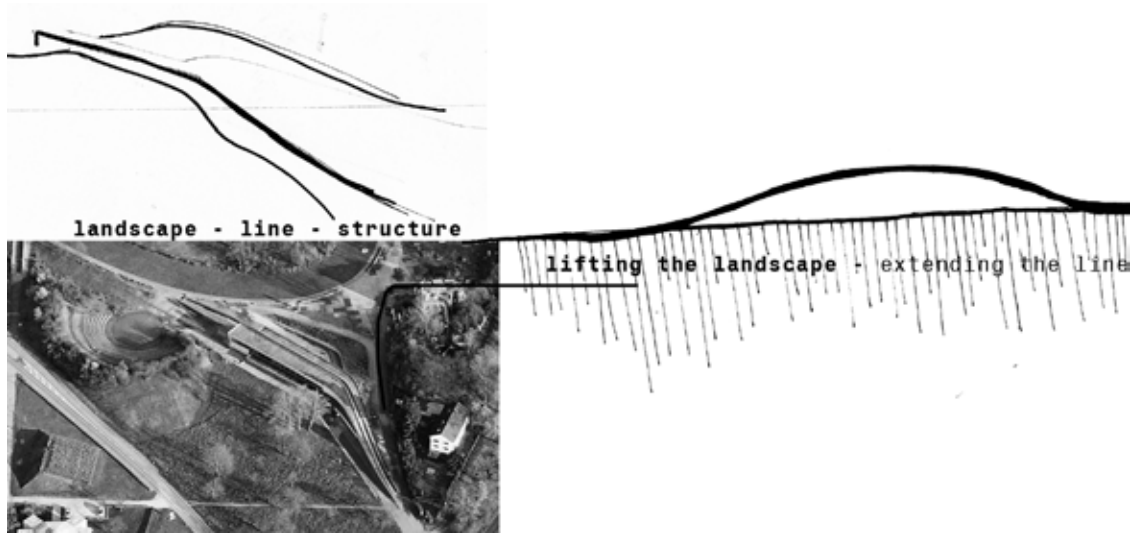


Figure 5-23: Intervention lifting the landscape and lining up with it [Source: Images from Architect's website, www.Zahahadid.com; drawing: Author]

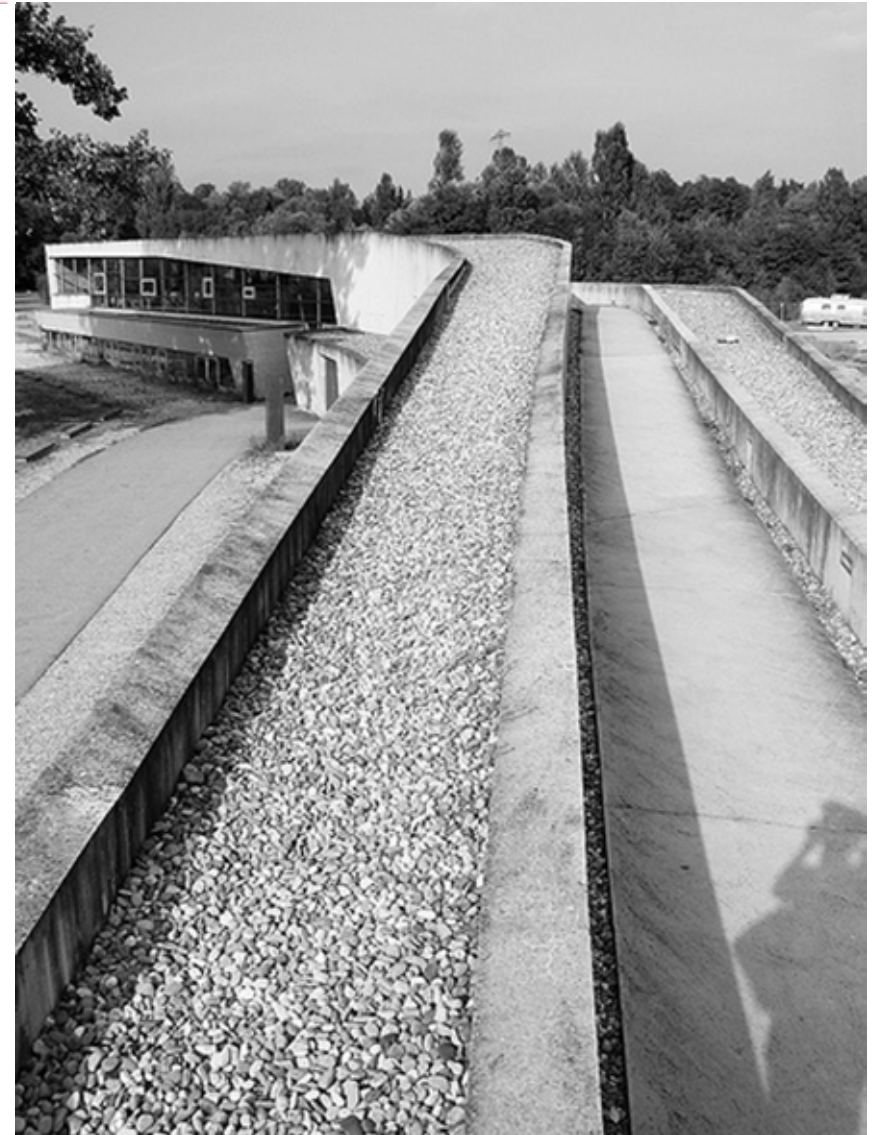


Figure 5-24: Image of Landscape Formation One, linearity achieved through careful detailing of the wall and handrail [Source: Image from Architect's website, www.Zahahadid.com]

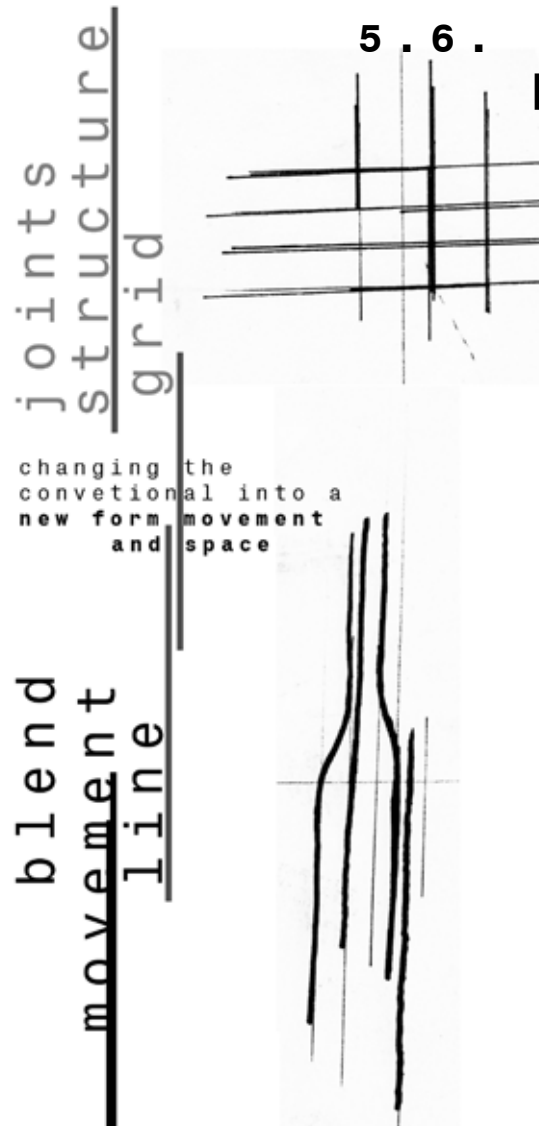


Figure 5-25: Adapting to movement through bending the lines [Sources Author]

5.6. [A] LANDSCAPE FORMATION ONE.
[B] MAXXI: NATIONAL MUSEUM OF XXI CENTURY ARTS

ID:	[a] Landscape intervention	[b] Museum
Location:	[a] Weil am Rhein, Germany	[b] Rome, Italy
Architects:	Zahah Hadid architects	
Client:	[a] -	[b] Italian Ministry of Culture
Date:	[a] 1999	[b] 2008 [design 1997]
Area:	[a] m2	[b] 30 000 m2

Design

The design of these two projects both convey a form generation through line and change of movement on a planning level. Both these projects achieve a sense of fluidity in spatial definition.

Generation form

[a] Landscape formation number One.

Develops a main threshold and movement spine that crosses over the structure itself, without one actually entering the structure.

It is developed out of the landscape itself, following existing footpaths. The building itself becomes more of a landscape than conventional building itself.

The form itself speaks of movement and adaptability.

A series of linear elements from the structure.

[b] MAXXI: NATIONAL MUSEUM OF XXI CENTURY

The Museum is planned as a continuous line that wraps around the site and the existing architecture.

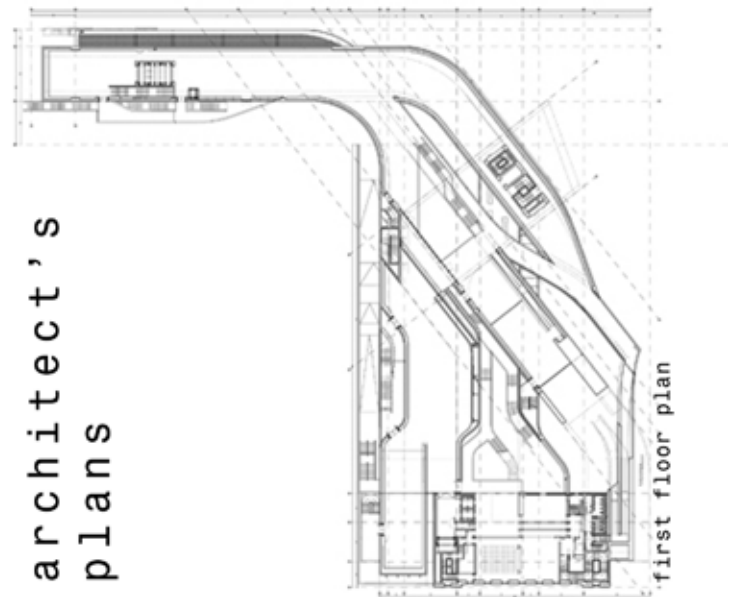
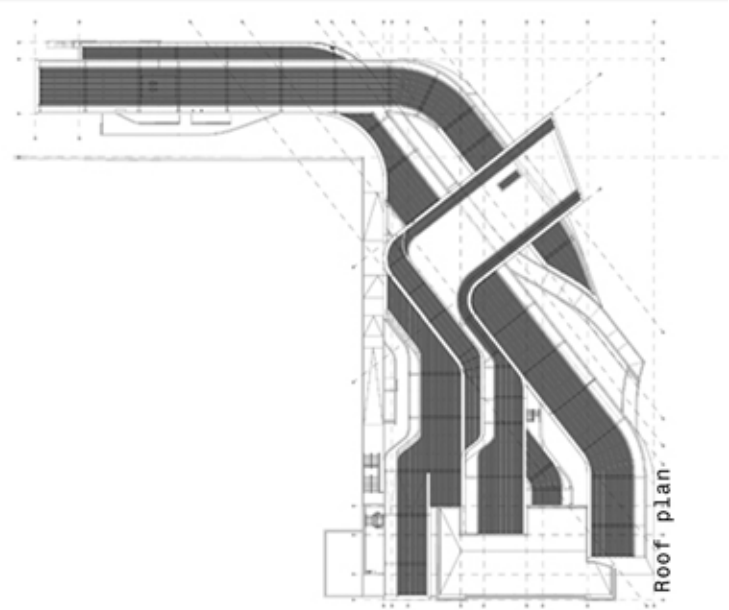
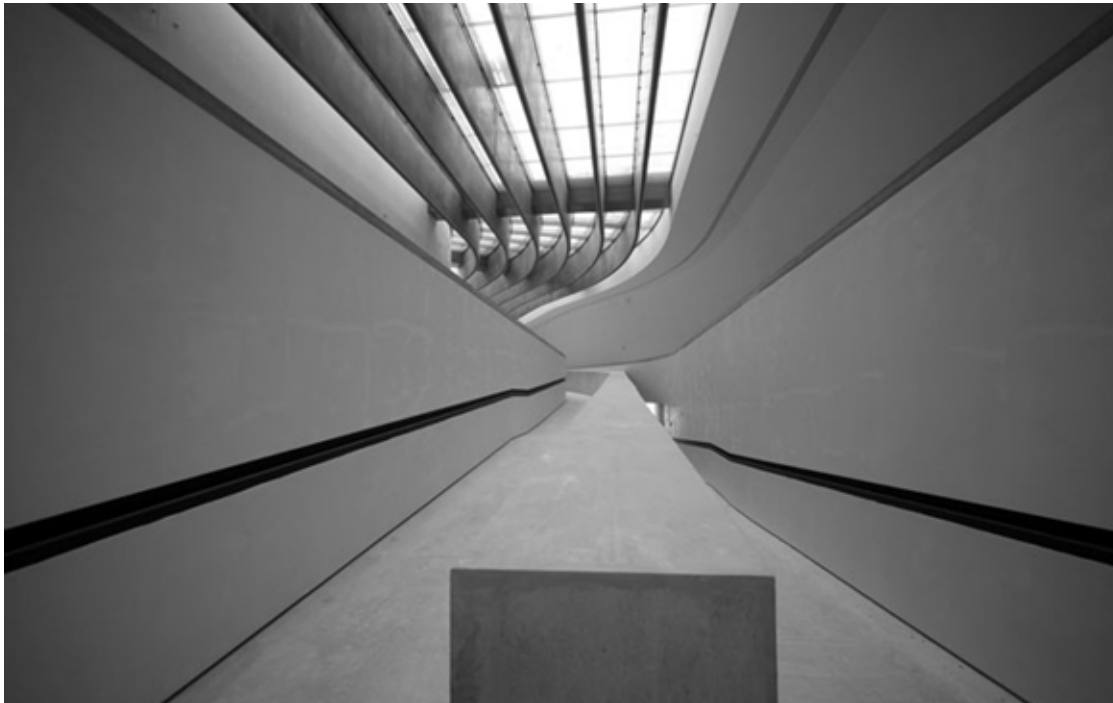
The main movement corridor, is generated of continues linear elements, that merge smoothly into the next element. In essence no corners are created and a continuation of space is achieved

The subtle change in the width of walkways/ corridors conveys the change in thresholds and space. The change in width starts to divide space more efficiently without creating a forced plan.

The building plan is reduced to only a few separate elements. Joints between these elements become very important to address. The joints become puncture points for windows or joints for doors and services.

A simplicity of form and space is achieved through the continuity of building elements

Figure 5-26: Interior perspective of MAXXI: Museum [Source: Architect's website www.zahahadid.com]
Figure 5-27: Plans of the MAXXI museum [Source: Architect's website www.zahahadid.com]



architect's plans

Structure, finish [fluidity]

In both examples the structure, wall material, lighting and floor patterns follow the line of movement and direction.

In many ways the wall is a simple vertical element, but fluidity is achieved, through the careful detailing of joints and manner by which shadow lines are created.

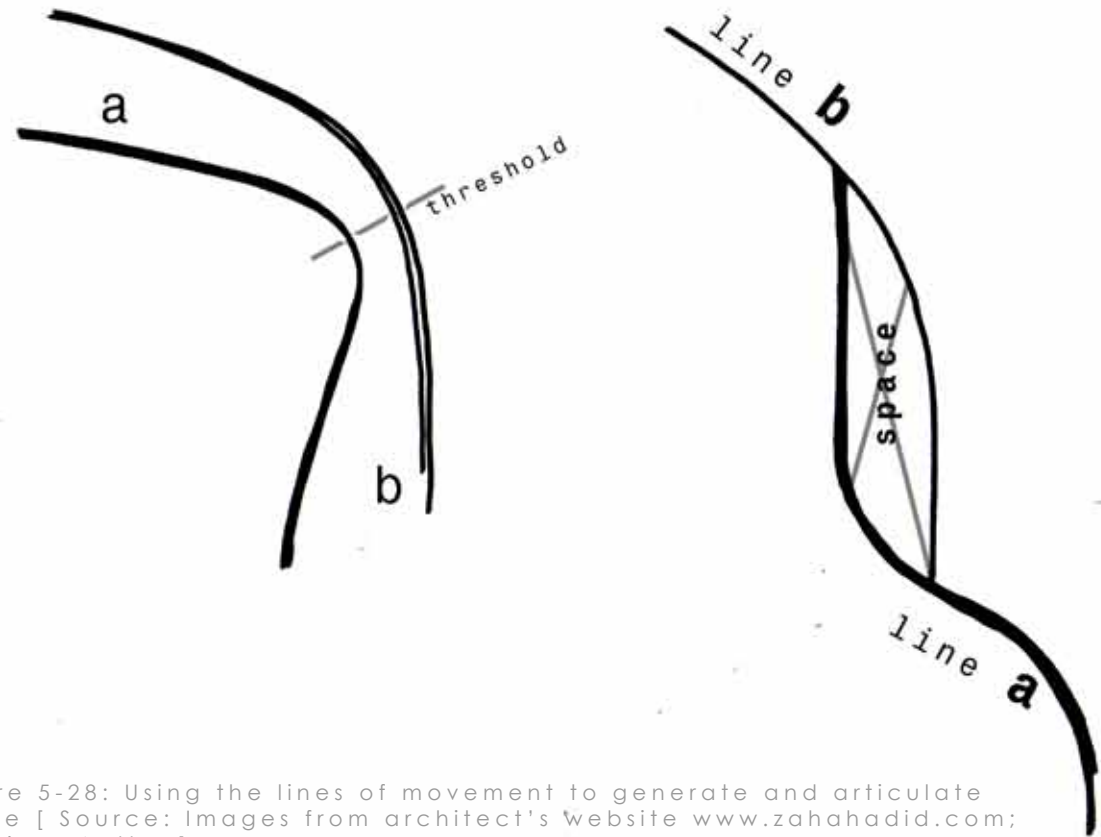


Figure 5-28: Using the lines of movement to generate and articulate space [Source: Images from architect's website www.zahahadid.com; drawing: Author]

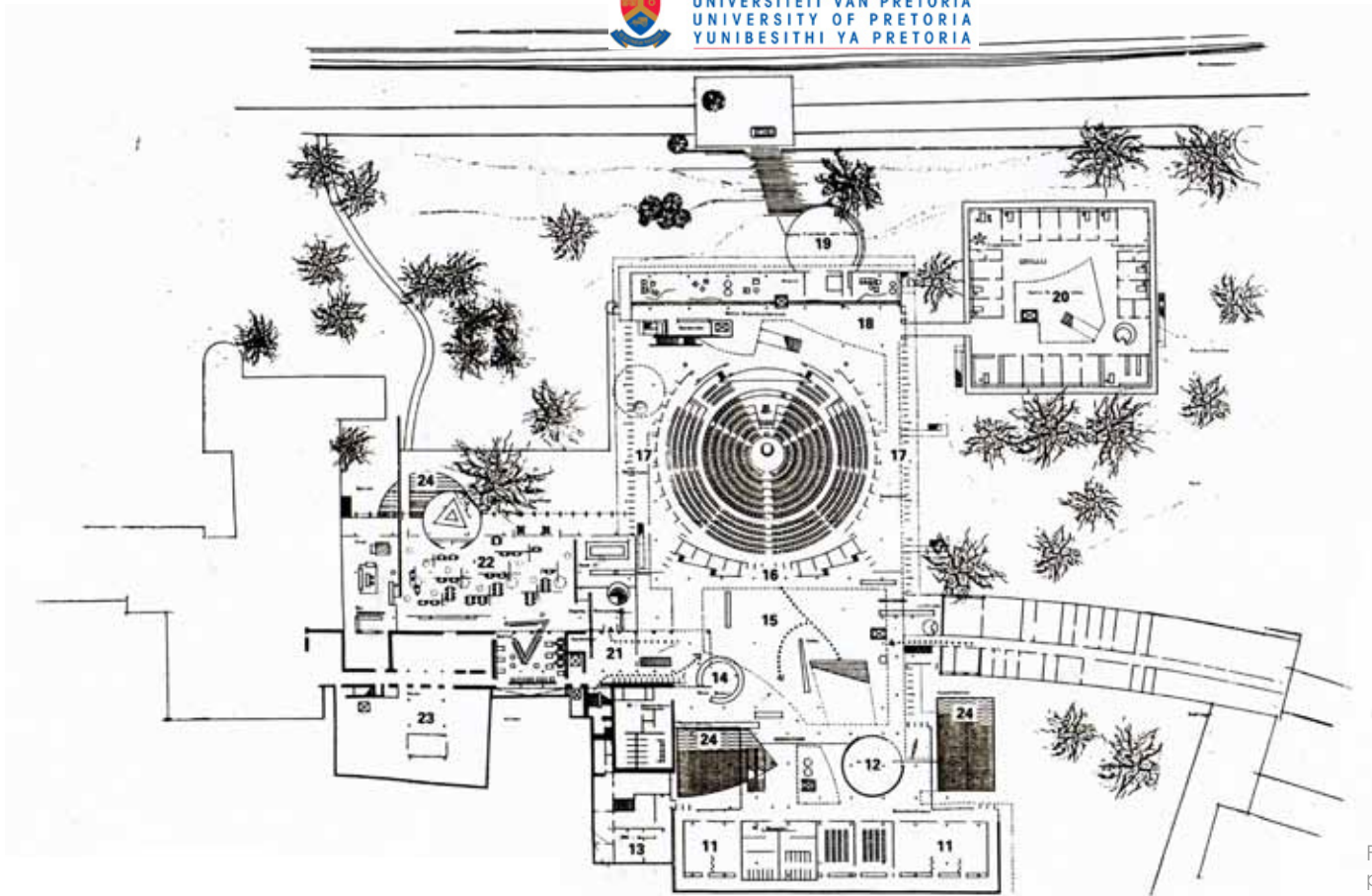


Figure 5-29: Groundfloor plan [Source: Architectural Review 1993, p 27]

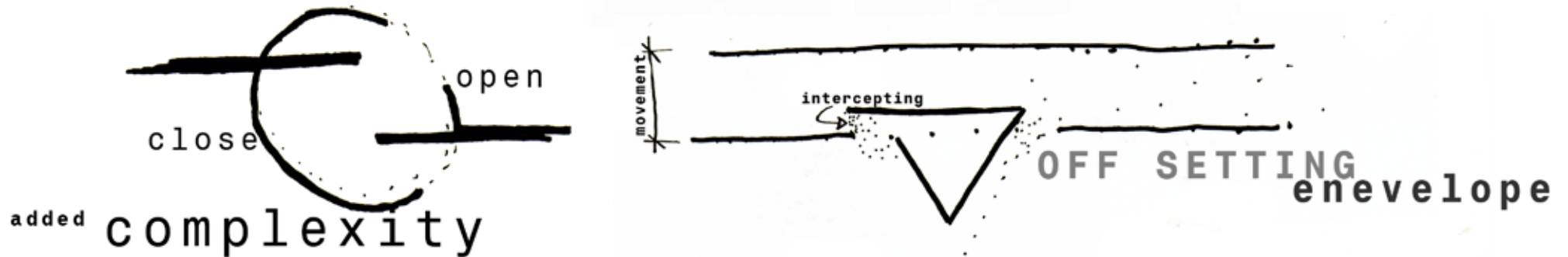


Figure 5-30: Forms adding complexity to the space and movement [Source: Author]

5.7 NEW PARLIAMENT BUILDING



Figure 5-31: Placing forms into space
[Source: Author]



Figure 5-32: Sloping to groundplane to movement and focus
[Source: Author]

ID:	Civic building
Location:	Bonn, Germany
Architects:	Behnisch Architekten
Client:	German government
Date:	1992
Area:	-

Design and movement

The Architect makes use of objects placed into space to manipulate movement. The slope of the floor and roof membrane inform the focal points within the space.

Use of geometric form within a contained space starts to convey and manipulate movement. While entrance into spaces are articulated with the offset of geometric shapes within spaces.

The subtle opening and closing of the geometric shapes start to articulate the space and reading of intended movement.