TECHNOLOGY AND MATERIALS 07

Cooling,Ventilation

- Due to the fact that building has a deep floor plan and there are a lot of spaces that need to be closed off,the building makes use of mechanical ventilation as its primary means of cooling. The system is aided by means of a rock storage system in the basement. This is filled with Rubble from the demolition of the SITA building which should have up to 70 percent similar mass properties of granite.
- Fresh air well ne mechanically sucked in from above the building where vehicle emissions are at a minimum and drawn in a long distance and over the rubble in the rock store in order to cool the air a few degrees before passing through the hvac system. This will cut down considerably on mechanical running costs.
- The system will be specified by an engineer however ample space has been allocated to provide for this facility
- For the restaurant square below ground, there is an evaporative cooling pond with trees around it to aid localized cooling.

Fig. 7.1 Basement plan showing cooling and ventilation

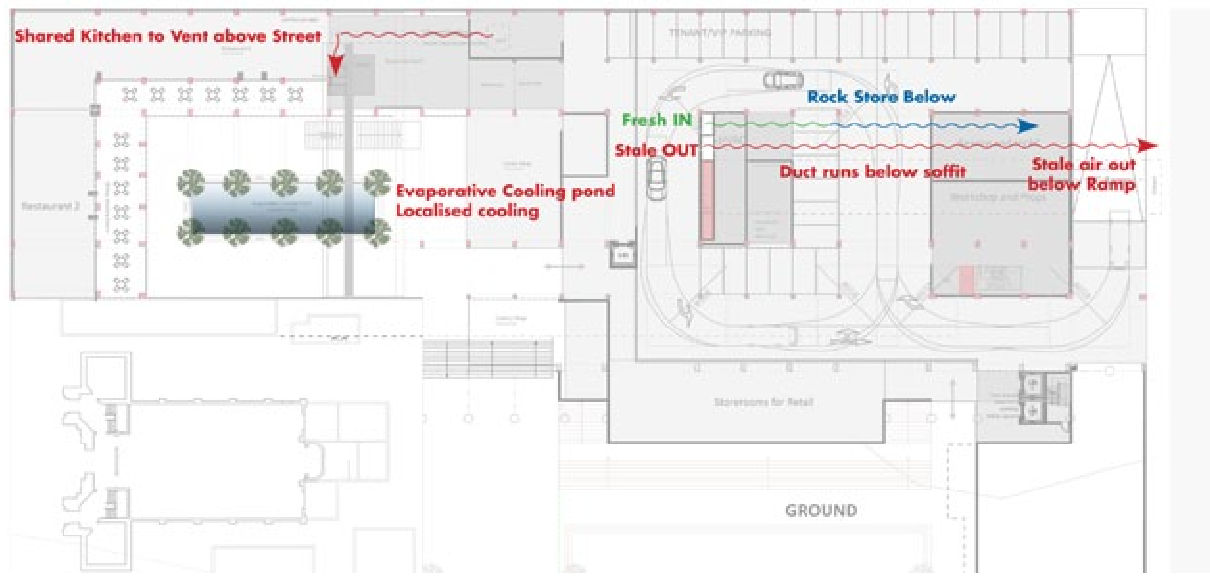
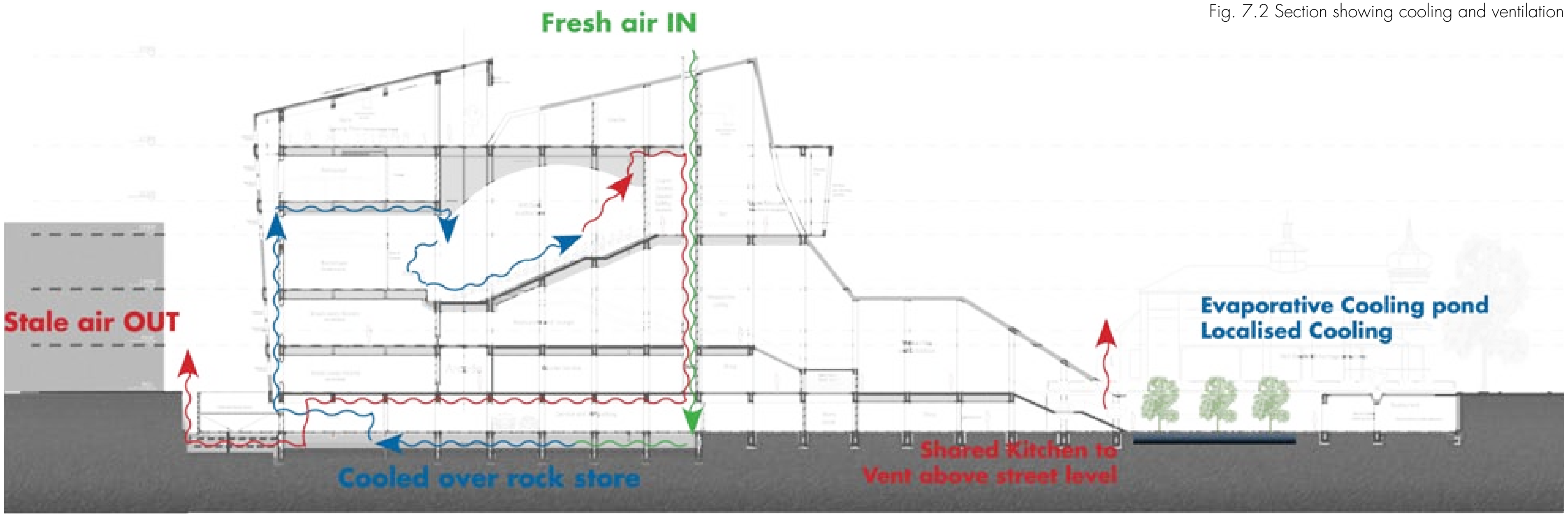


Fig. 7.2 Section showing cooling and ventilation



Rainwater Collection

The total run-off capacity that can be harvest from both roof structures is 53000L which will be stored in 5000l Tanks as indicated. There are 61 w/c's and 26 Urinal's which would justify the collection and re-use of rainwater through these wet services. According to the calculations (appendix A) with the storage capacity there will only be four months of the year where the building will have to make use of municipal water to supplement the system.

Fig. 7.3 Roof plan showing water harvesting capacity

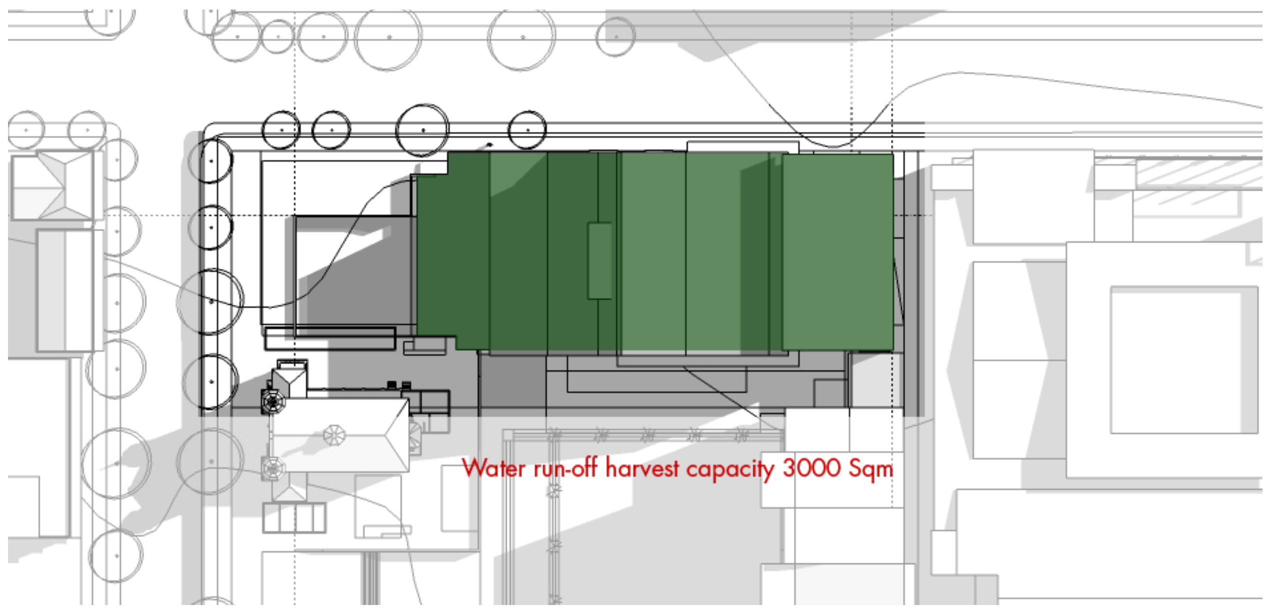
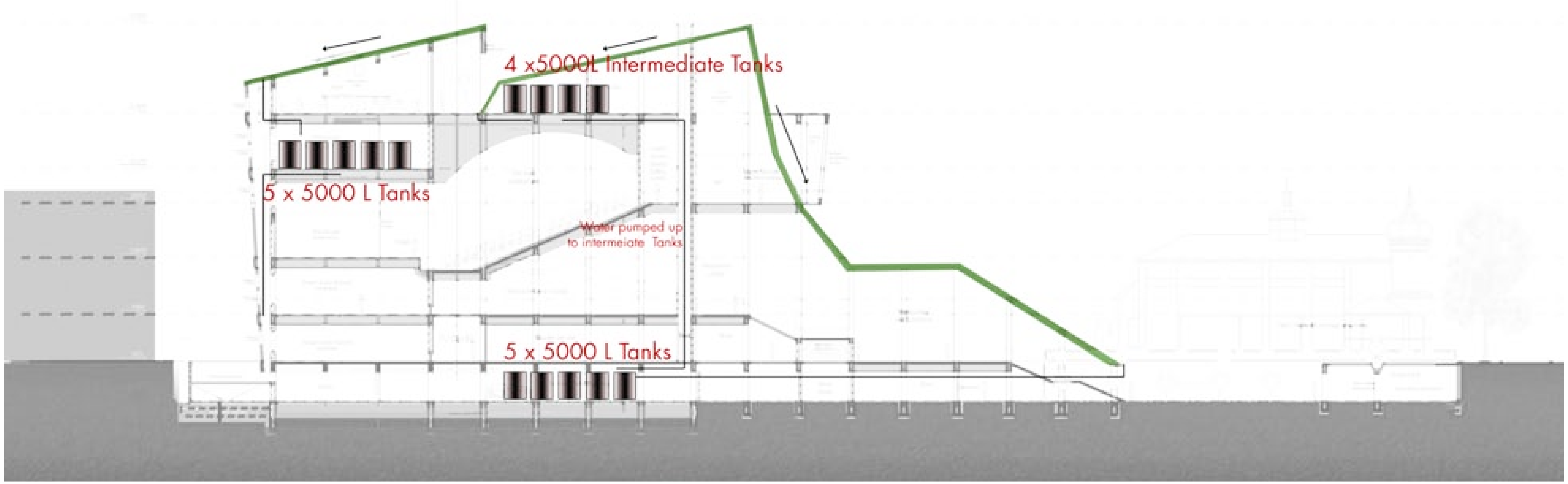


Fig. 7.4 Section showing storage tanks



Fire Safety and Evacuation

Provision of Fire hose reels has been made on every level each servicing a maximum of 30m radius. Due to the large open volumes and the possibility of fire jumping between floors, it is proposed that a sprinkler system be installed. There is also Provision for evacuation by means of fire stairs at every level. The exit of these stairs is close to the buildings exit on Ground Floor

Fig. 7.5 Plan showing the maximum range of the proposed fire hose reels

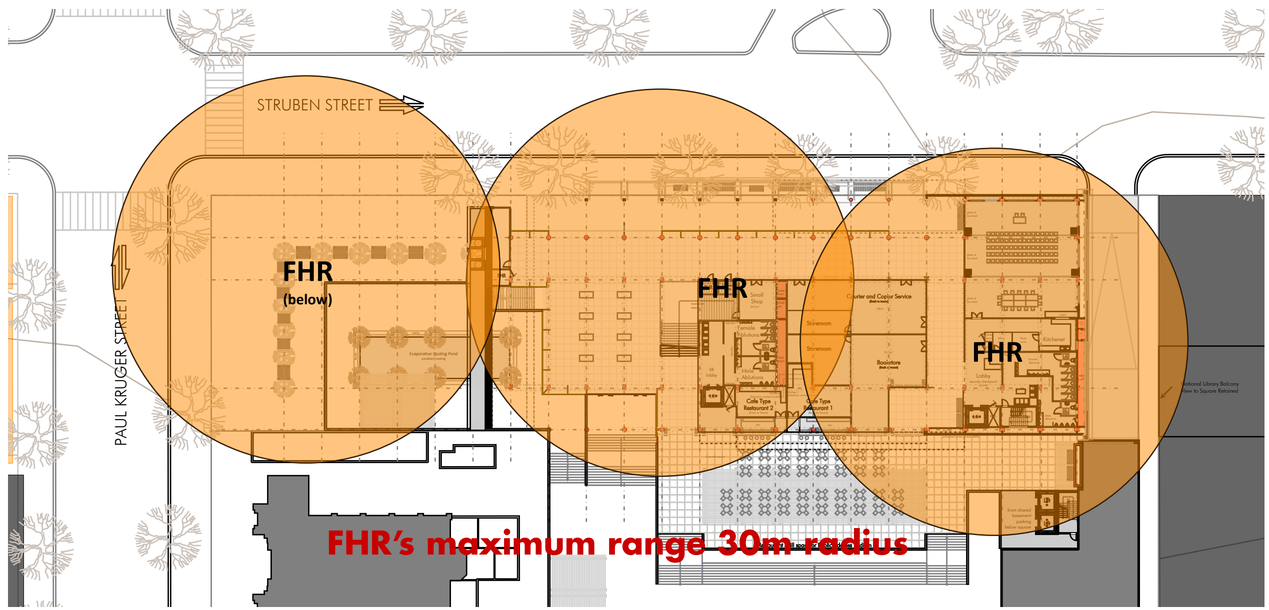


Fig. 7.6 Perspective showing auditorium lobby space with view to square and Synagogue.

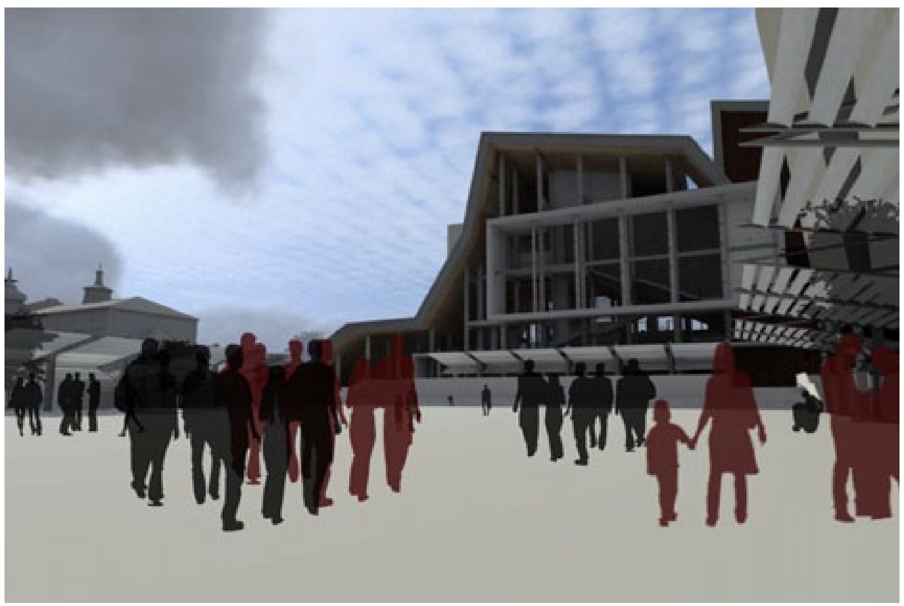


Fig. 7.7 Perspective showing public square and the connection to the intervention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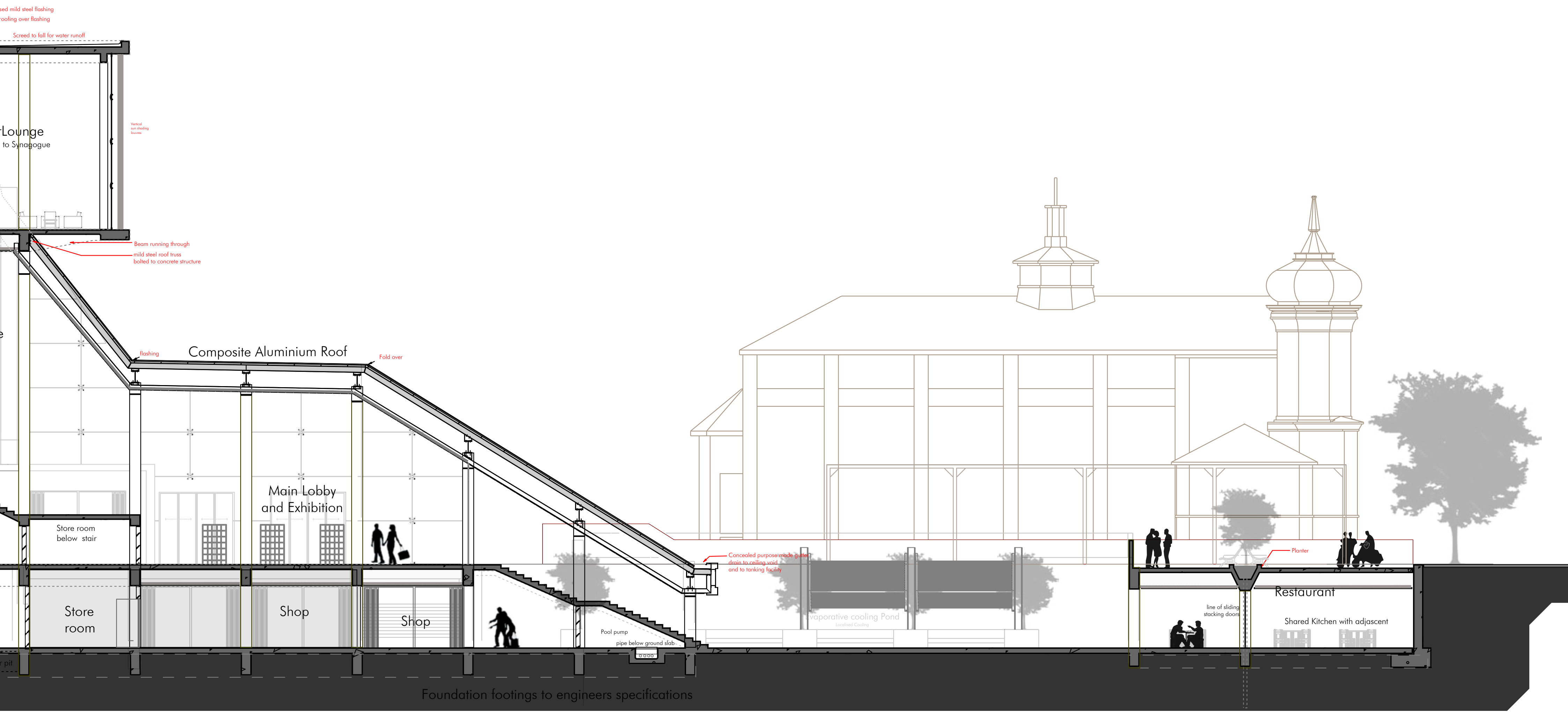
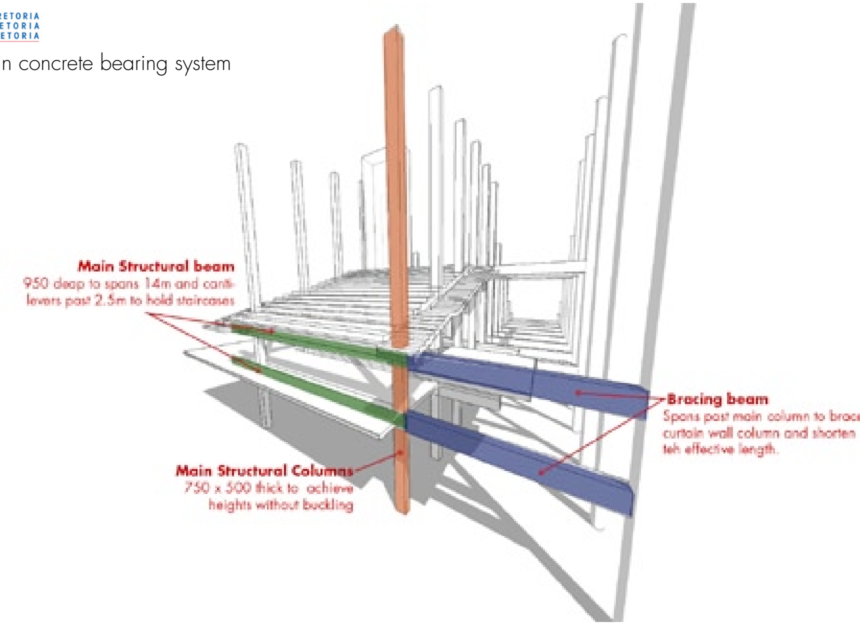
32300
23800
18500
15000
9800
4500
NGL
-3750
Detail Section AA/1
Detail Section AA/2
Concrete Roof
Gym
(Sprung Floor Absorbs Impact Sound)
Rehearsal
Passage
Openings cast in Concrete
Ceiling
Dressing rooms and wardrobe
in Room Adjacent
Backstage
Double Volume
(Access Sprung Floor Absorbs Impact Sound)
Line of
Curtain
Stage
Creche
Absorbtion/Isolation Material
400 Seat
Auditorium
Seating on Access Flooring
Upper Access
Sound Lobby
(Isolation)
Storeroom
Bar
Upper
View deck
Mezzanine
Lobby
Break away Rooms
sub-dividable
Restuarant and Lounge
kitchen
Arcade
Safety Glazing
at low level
Courier Service
Duct
Shop
Storeroom
gutter out of 3mm mild steel
diverts water around projection
Flashing
heat extraction
to duct
Vehicular Ramp Down
Exhaust outlet below ramp
HVAC
Service and VIP parking
Retaining wall
Space provision for rock store
filled with building rubble from demolised SITA
(details and maintenance to specialist)
Foundation footings to engineers specifications



Section AA Scale 1:250

Fig. 7.9 Showing main concrete bearing system

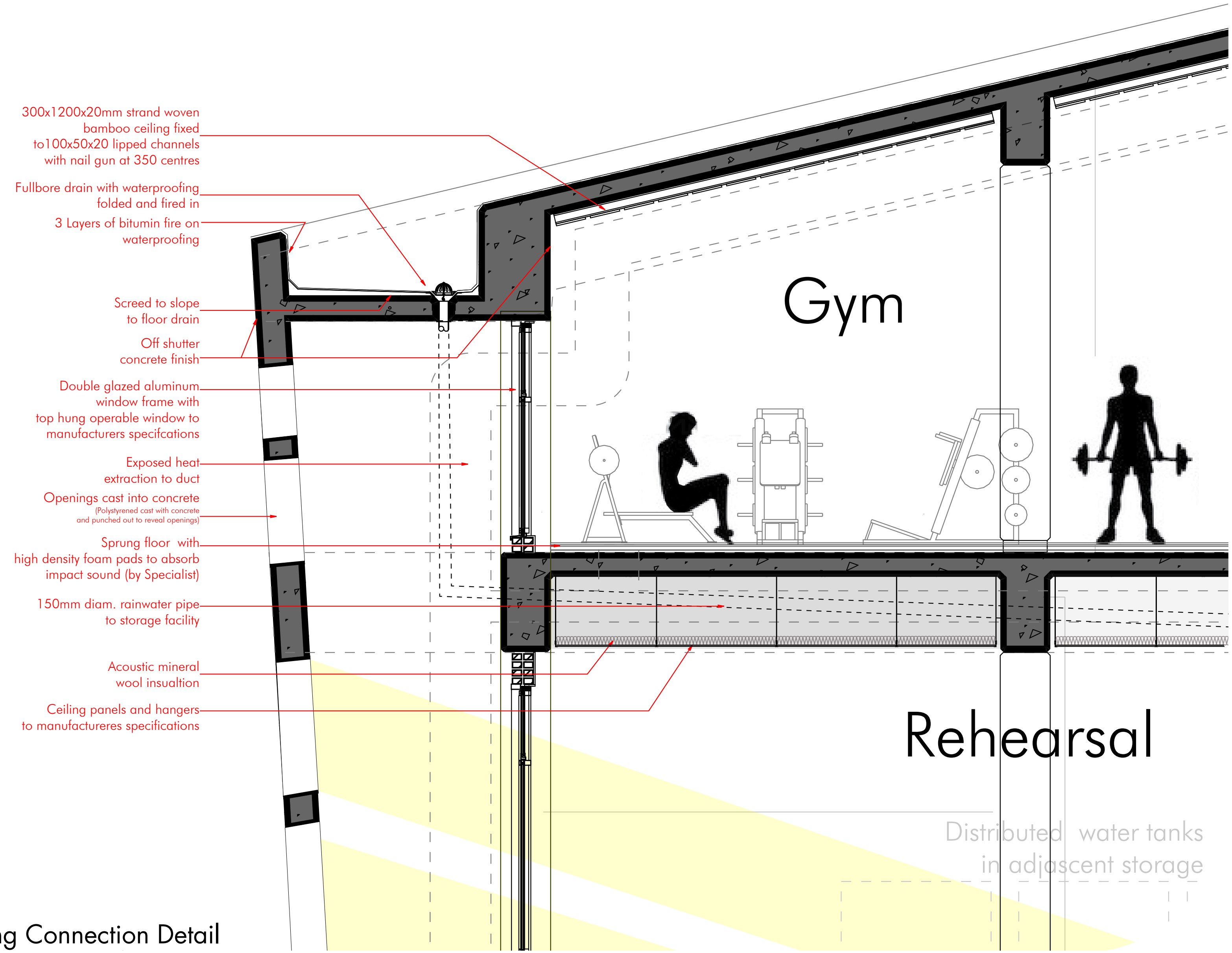


Structure and Enclosure

Concrete

- The main load bearing structure is a column and beam concrete structure. It is a very heavy structure as there are large spans and high columns.
- Off-shutter concrete is a very honest material. It is strong yet elegant. The adjacent photo shows the ceiling in the entrance lobby of Constitutional Court in Johannesburg where a similar finish has been used with long openings cast in to bring in light. The Eastern side of the building will be treated in a similar manner.

Fig. 7.10 Photo of the inside of the constitutional court taken by author.



AA/1 Wrapping Connection Detail

Fig. 7.12 Standing seam roof finish (http://lgcroofingnj.com)

Fig. 7.13 Standing seam roof finish (http://www.euroclad.com)

Roofing

Standing seam aluminium

In order to give a smooth finish to the wrapping structure, a standing seam jointed aluminium sheeting will be used. This will emphasize the verticality of the roof rising up from the ground. It also provides stability to span between the steel supports. Aluminium has a high corrosion resistance, gives a clean homogenous appearance and is low on maintenance as it does not oxidize. Recycled powder coated aluminium will be used as recycled aluminum has very low embodied energy and powder coating in this specific angled application is smoother than anodizing and therefore will retain less dirt.

AA/2 Wrapping Connection Detail

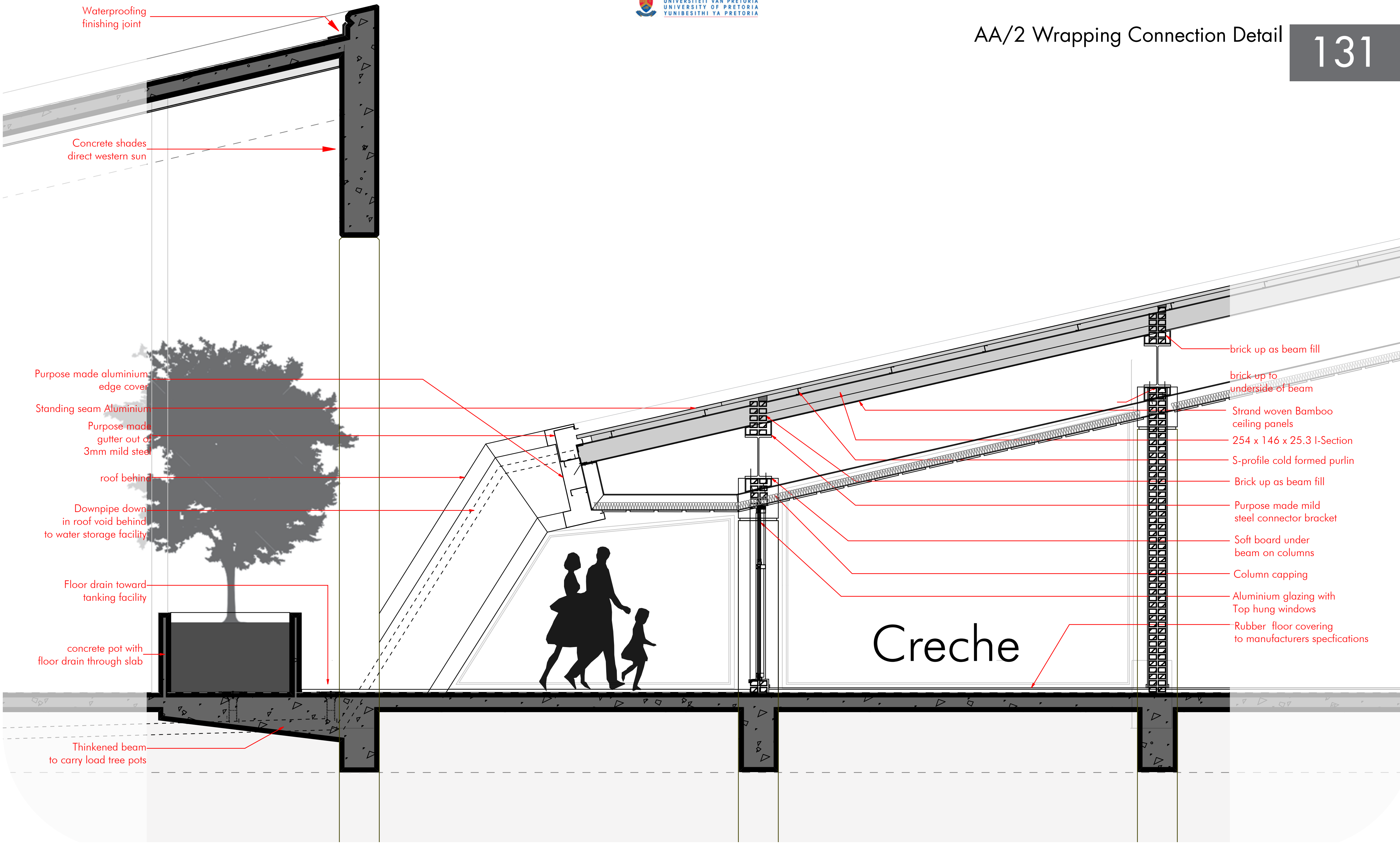


Fig. 7.15-7.17 Showing the Rose Centre at the Museum of Natural history in New York. This transparent building has a very high curtain wall supported by a tensioned stainless steel system similar to the system employed within this project.

Glass Curtain Wall

In order for the Threshold wall to appear as light and transparent as possible, a glass curtain wall supported by as little structure as possible is employed. The glazing panels are held in place by stainless steel spider clamps suspended by high tensile steel cables which brace both the curtain wall and the round columns that carry the load. The glazing is shaded by a louvre system explained earlier in this section. Due to the fact that the curtain wall is very high and will need to therefore withstand wind loads, even though Pretoria is not very windy, as well as contribute to reducing the solar light transmission, the following laminated glass was chosen.

Armourlam:

Armourlam toughened glass from Smart glass will be used with a cool blue low E laminate allowing only 68 percent of light in, thus reducing glare.

- Armourlam is with polyvinyl butyral between 2 layers of glass. As it is toughened it can be supplied with factory drilled holes for fitting of spider clamps in this application.
- Its is best suited for bolted assemblies where solar performance is required
- It works well where additional strength is needed for high wind loads.

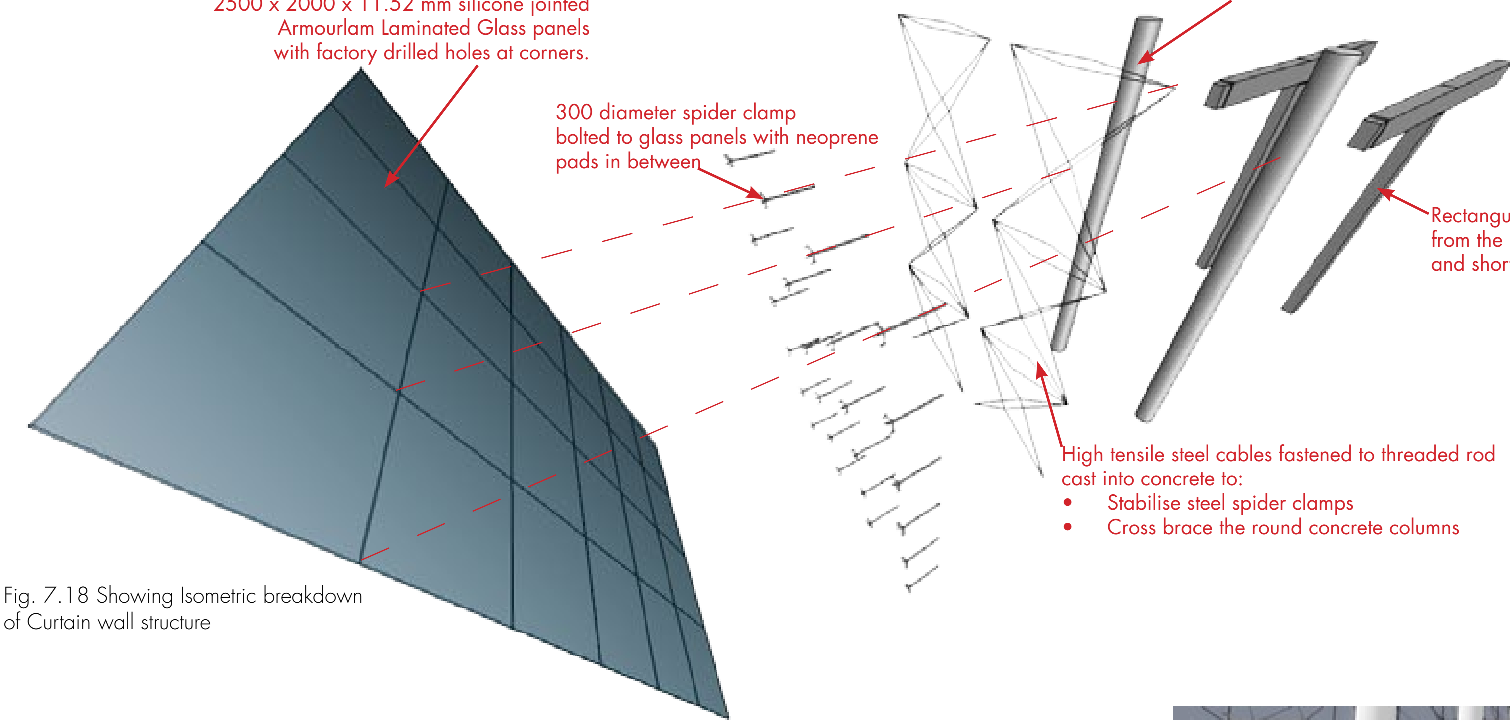


Fig. 7.18 Showing Isometric breakdown of Curtain wall structure

Fig. 7.19 showing glass curtain wall down public arcade

Fig. 7.20 Showing Intervention in context from the North West.

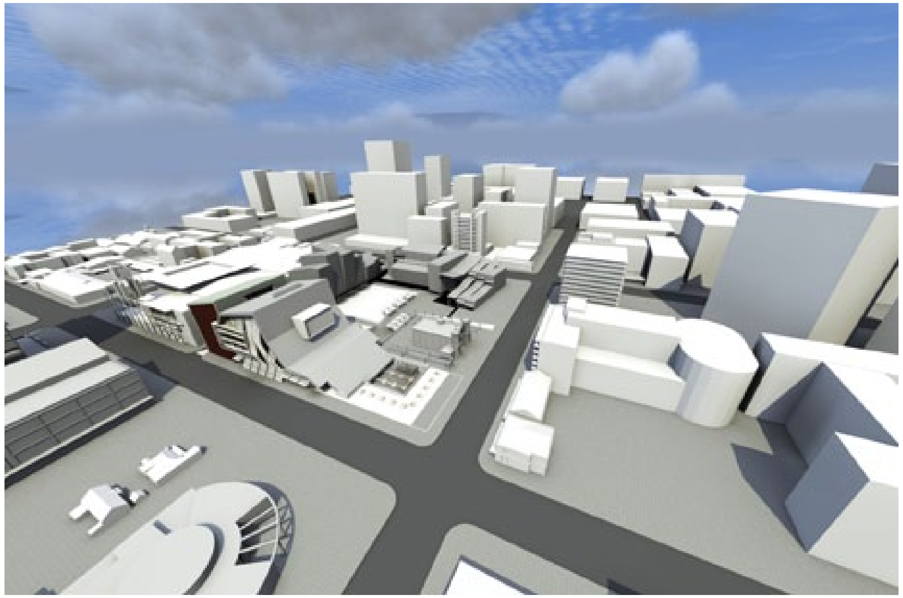
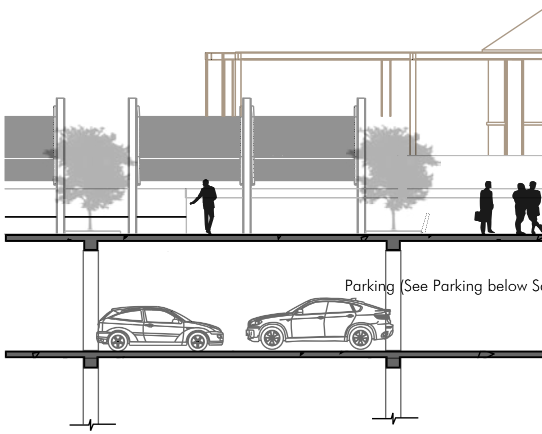
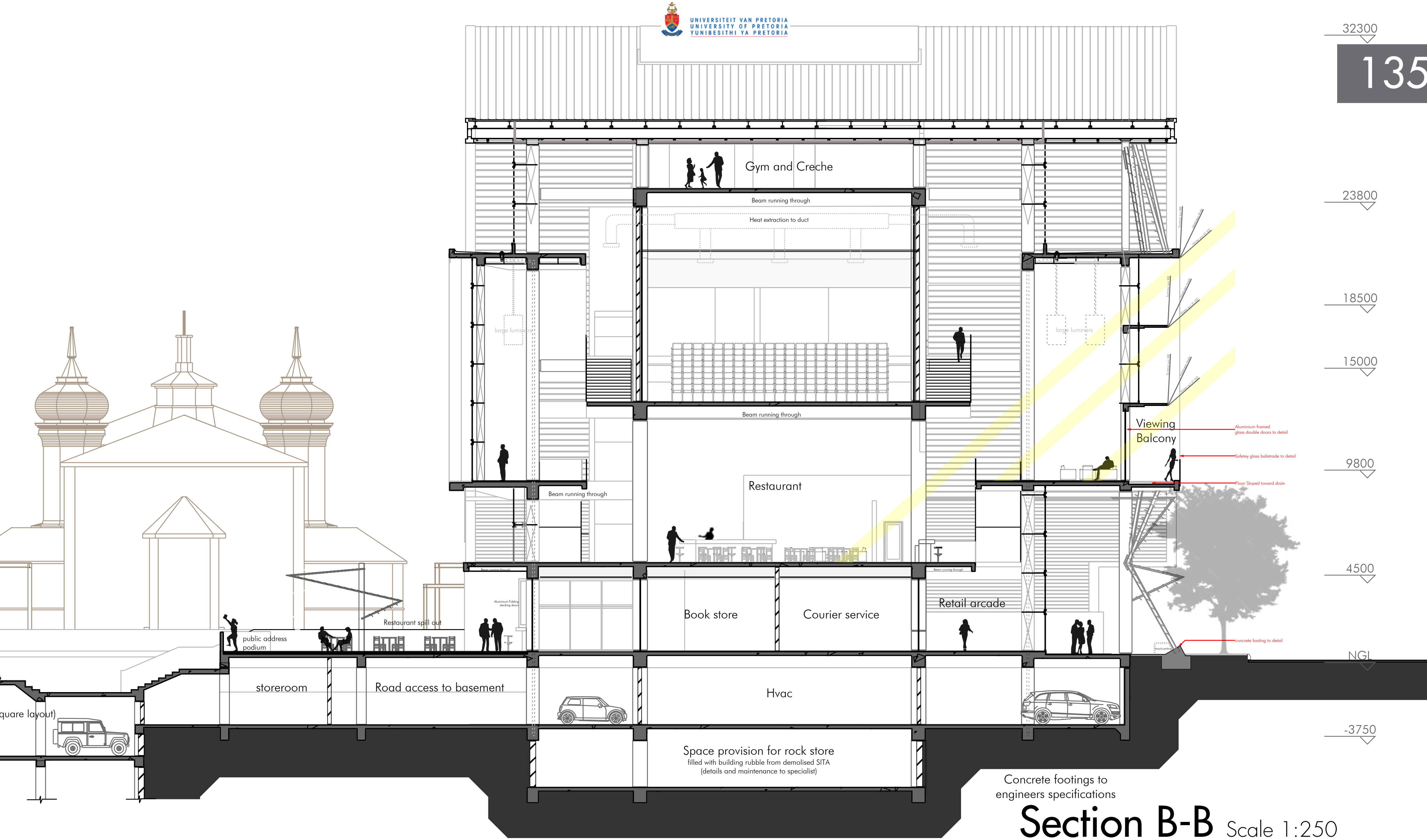


Fig. 7.21 Image showing intervention in context from the South





Section B-B Scale 1:250

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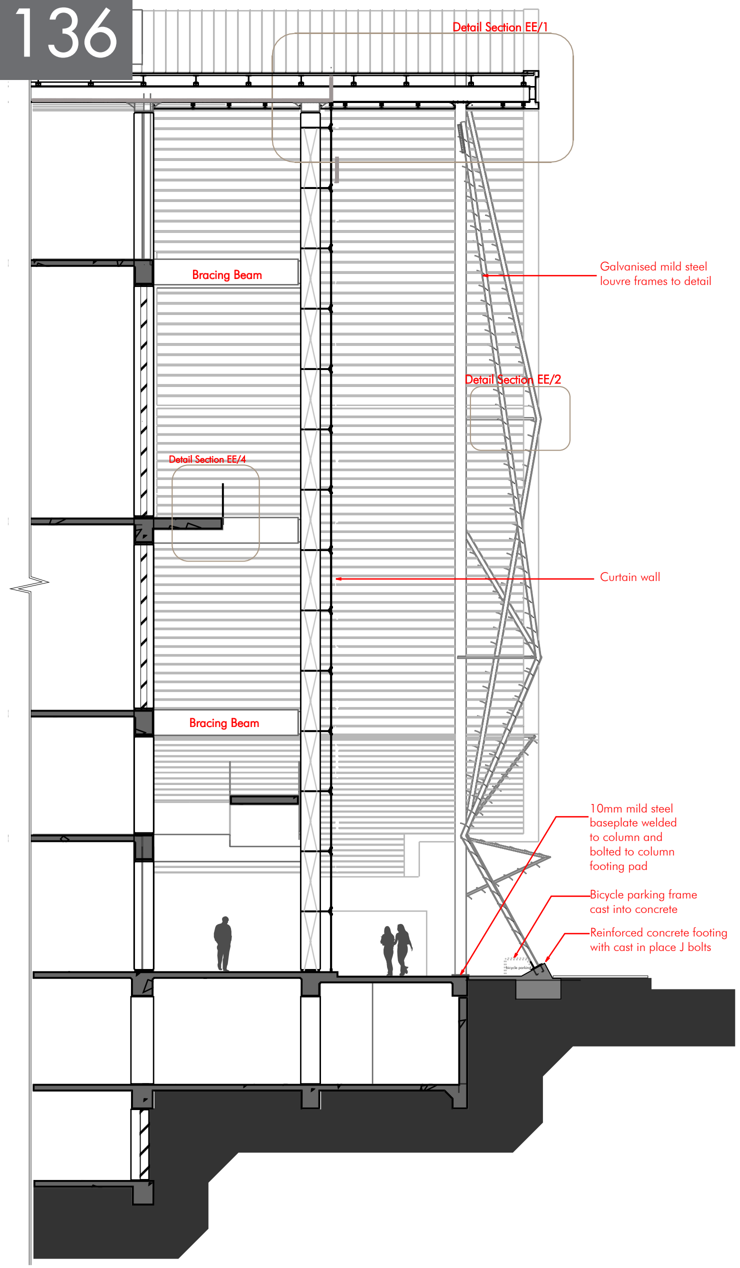


Section EE Scale 1:200

Skin
Louvre Structure

In order to shade the Northern glass curtain wall from direct sun a louvre system has been employed. This creates an intermediate threshold and is designed to cast dappled light onto the glass during the winter months both for small heat gains as well as effect. The louvre frames carry there own weight and are connected to the under side of the composite wrapping structure supported by the beams at the same interval. These frames are large trusses turned on their sides (90 degrees), with the bend of the frames alternating with each consecutive frame system. Each louvre frame system is braced and supports perforated aluminium louvre fins which are held in place by tensioned threaded rod.

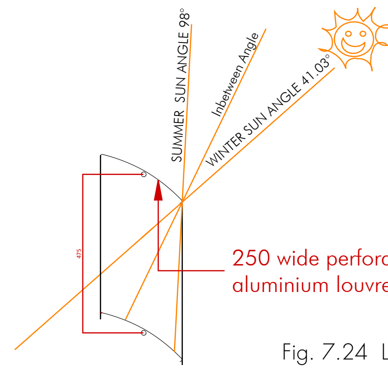
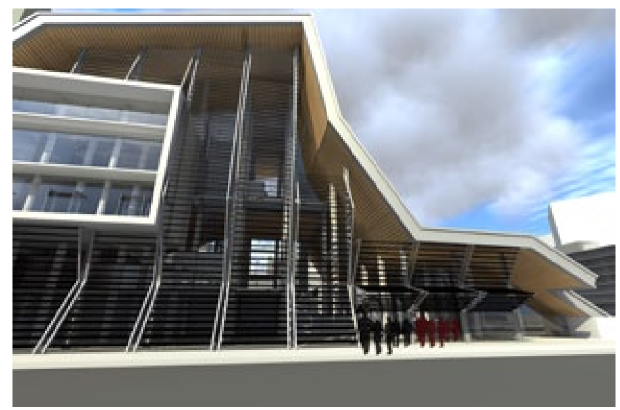
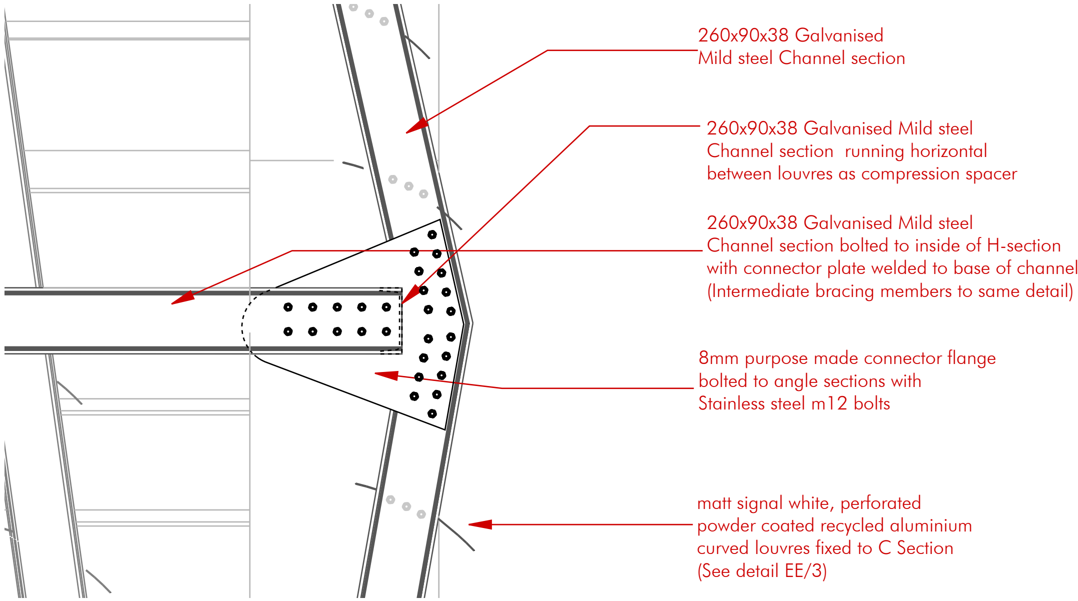


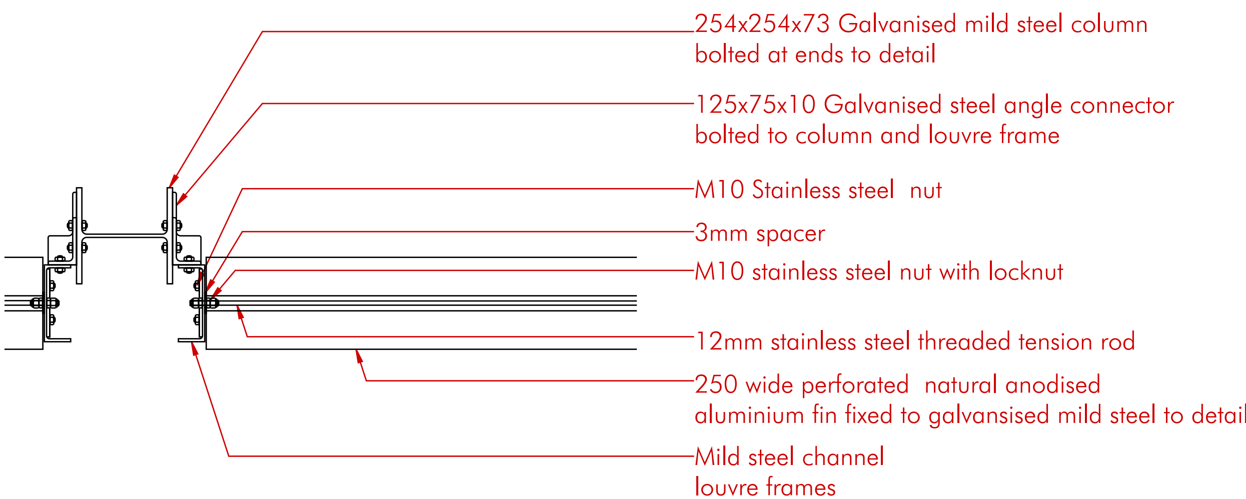
Fig. 7.24 Louvre spacing

Fig. 7.25 Perspective showing the Northern view from Struben street

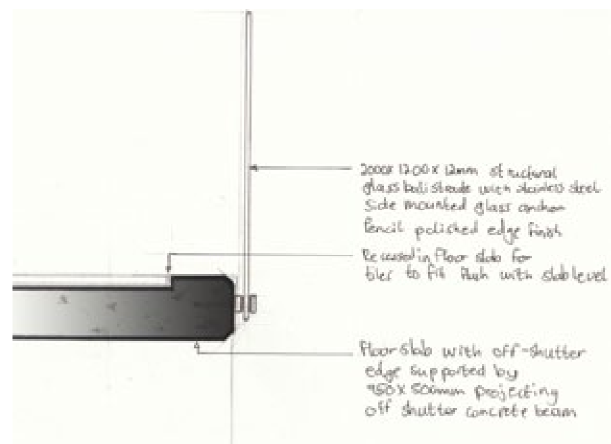




Detail EE/2 Scale1:20



Detail EE/3 Scale1:20



Detail EE/4

Fig. 7.30 Showing Strand woven bamboo finish (www.pandabamboo.co.za)

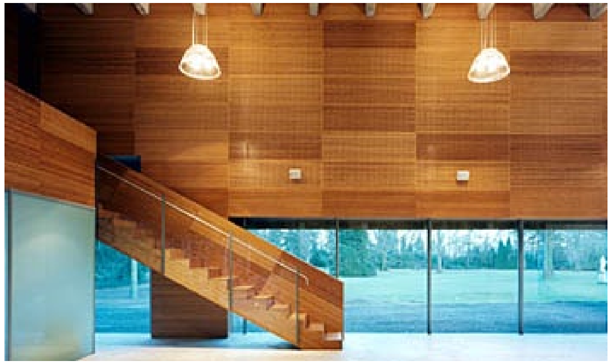


Fig. 7.31 Showing laminated bamboo cladding (www.pandabamboo.co.za)

Fig. 7.29 Bamboo

Laminated Bamboo Ceilings

- Bamboo is a every sustainable material. It grows very quickly and the mature stem is more rigid than a lot of hard woods. Solid timber like oak, cherry or teak take 40-50 years to grow, whereas the Moso bamboo stems take 4 years to reach mature hardness. Bamboo plantations require no pesticides or fertilizers.
- Although strand woven panels are more expensive than the solid bamboo panels, it gives a darker finish with a softer grain and is more hard wearing. Standard size of 2.44 x 1220 will be used as ceiling panels.(www.pandabamboo.co.za)

Detail EE/1

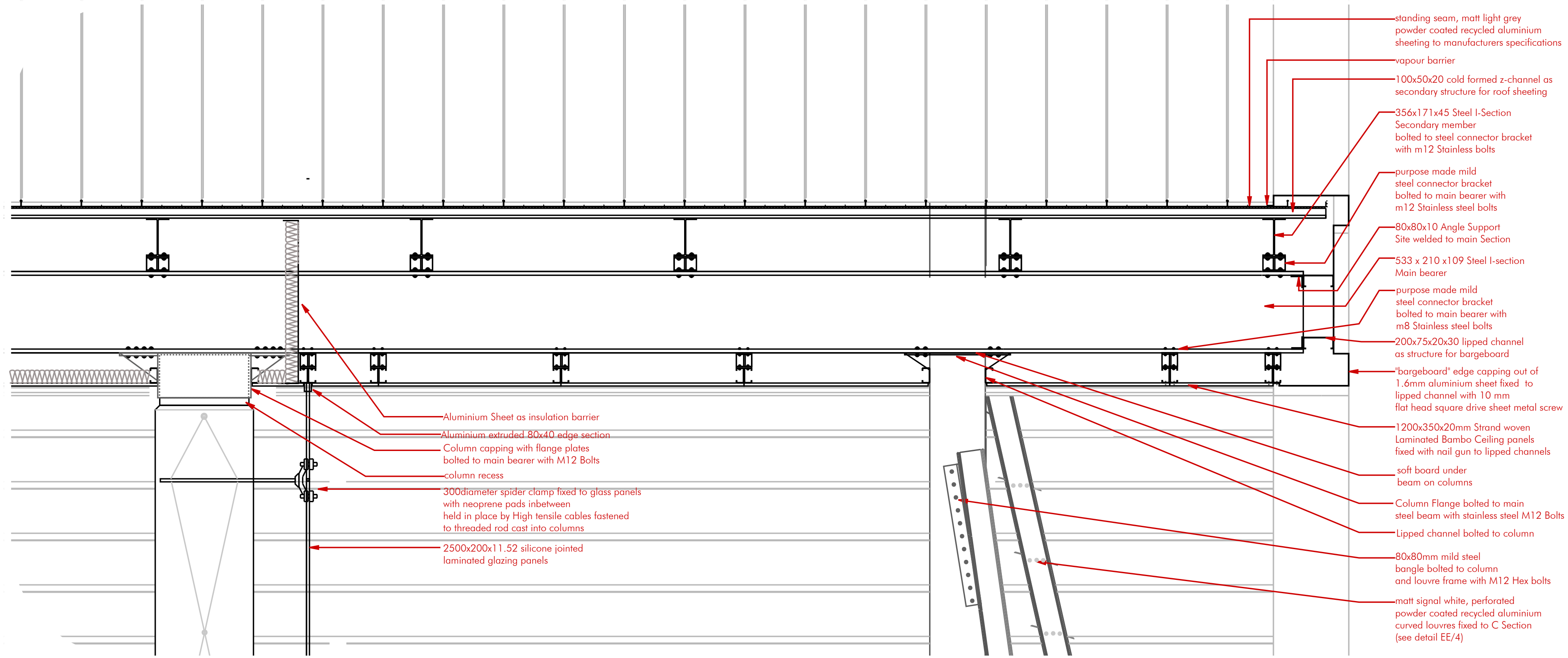

standing seam, matt light grey powder coated recycled aluminium sheeting to manufacturers specifications
vapour barrier
100x50x20 cold formed z-channel as secondary structure for roof sheeting
356x171x45 Steel I-Section Secondary member bolted to steel connector bracket with m12 Stainless bolts
purpose made mild steel connector bracket bolted to main bearer with m12 Stainless steel bolts
80x80x10 Angle Support Site welded to main Section
533 x 210 x109 Steel I-section Main bearer
purpose made mild steel connector bracket bolted to main bearer with m8 Stainless steel bolts
200x75x20x30 lipped channel as structure for bargeboard
"bargeboard" edge capping out of 1.6mm aluminium sheet fixed to lipped channel with 10 mm flat head square drive sheet metal screw
1200x350x20mm Strand woven Laminated Bambo Ceiling panels fixed with nail gun to lipped channels
soft board under beam on columns
Column Flange bolted to main steel beam with stainless steel M12 Bolts
Lipped channel bolted to column
80x80mm mild steel bangle bolted to column and louvre frame with M12 Hex bolts
matt signal white, perforated powder coated recycled aluminium curved louvres fixed to C Section (see detail EE/4)
Aluminium Sheet as insulation barrier
Aluminium extruded 80x40 edge section
Column capping with flange plates bolted to main bearer with M12 Bolts
column recess
300diameter spider clamp fixed to glass panels with neoprene pads inbetween held in place by High tensile cables fastened to threaded rod cast into columns
2500x200x11.52 silicone jointed laminated glazing panels

Fig. 7.33 Image showing View from Struben street of intervention and section clad with perforated Corten.

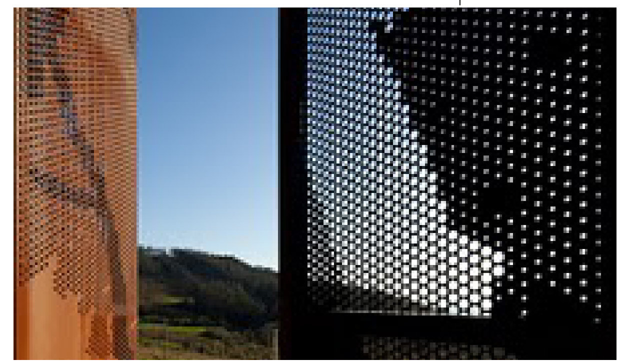
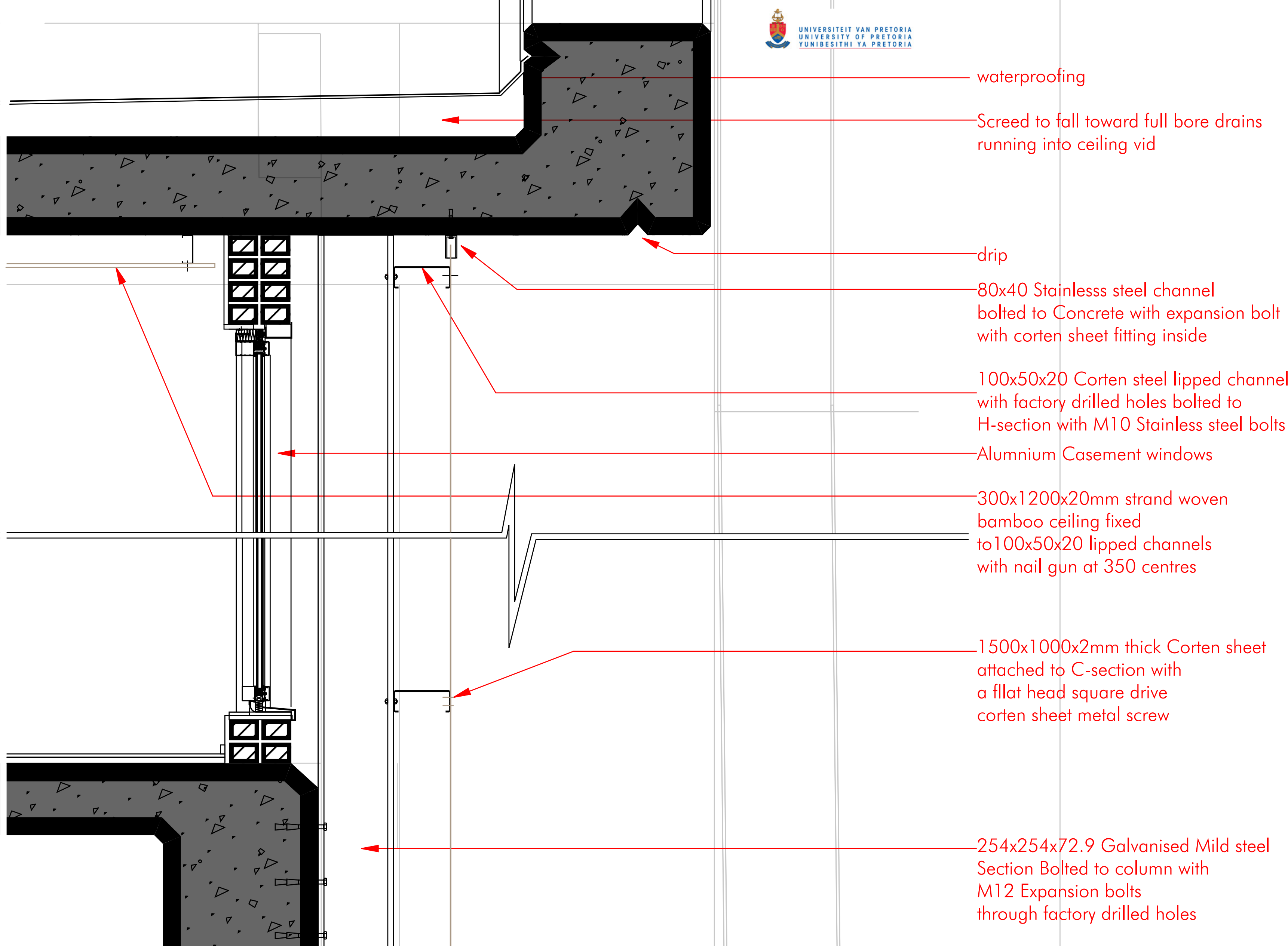


Fig. 7.34 Image showing perforated Corten steel cladding (http://imararquitectura.blogspot.com)

Fig. 7.35 Image showing perforated Corten steel cladding (http://imararquitectura.blogspot.com)

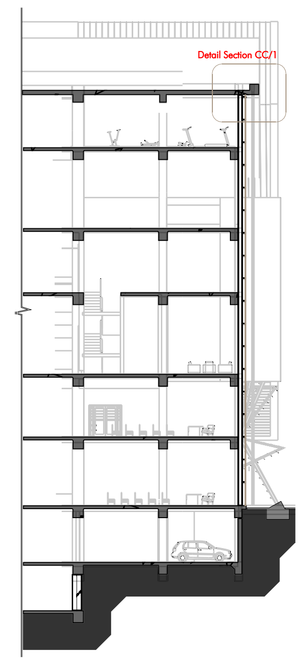
Corten Steel

In order for the facade of the Eastern portion of the building to appear as an homogeneous haze, in line with the conceptual approach of it being "solid, but not quite" it will be clad with circular punched Corten steel with 60 percent coverage. This will be enough to give a virtually solid haze with the effect that the operable windows behind to appear as shadows during the day and hazed light at night. Corten steel is a high strength low alloy structural steel that forms a protective oxide layer under regular atmospheric conditions. This means that the steel can be left unpainted. It has a reddish brown colour.



Detail CC/1 Scale 1:20

Reference Section CC
Scale 1:500



Conclusion

The creation of a spatial milieu that contributes favorably to the urban fabric is possible through interpretation of the context, historical, present and future. People's experience of the built environment should be an over-arching design informant. This being that the user's first impression and interaction with his/her environment as well as lasting impressions and greater social implications should be taken into account in public orientated design.

People perform multiple task during a single day and therefore the built environment should supply these needs within localized precincts to cut down on excessive travelling distances an ensuing frustrations and sustainabilities. This is all possible through mixed used precincts and buildings. Considering that the informants to this thesis have proposed a building with multiple uses layered hierarchically according to various privacy needs.

The validity of individuals in their social context can be enforced through the creation of spaces that are clearly express their given function. It is possible therefore to have transparency within government buildings whilst still maintaining effective control.

Social satisfaction and inclusion can be encouraged through a government building model that has private functions but also invites the public into closely situated intermediate realms where communication, interaction and dialogue can happen.

APPENDIX 08

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Appendix A

Rainwater Harvesting and tank size

Area of roof (m2)	Annual rainfall (mm)	Potential rainfall harvesting capacity(L)	Actual rainfall Harvesting capacity (L) -10%(evaporation)
3000m2	573mm	53000L	47700L

Table 1

Total number devices	Water consumption device	Water consumption (L)	Number of uses per day per device	Water Consumption per floor (L)
60	Flush Toilet	4.5	8	144
25	Urinal	1	16	32
x 23.5 days active per month average for building (Monthly consumption)				47800

Table 2

	V_{actual}	V_t	V_{t-1}	Rainfall (mm)	Runoff (l)	Roof Runoff (l)
Oct	40000	117800	0	71	165600	0
Nov	40000	222600	40000	98	230400	0
Dec	40000	251400	40000	110	259200	211400
Jan	40000	313800	40000	136	321600	273800
Feb	40000	167400	40000	75	175200	127400
March	40000	184200	40000	82	192000	144200
April	40000	109800	40000	51	117600	69800
May	18600	18600	40000	13	26400	0
June	-17200	-17200	18600	7	12000	0
July	-62600	-62600	-17200	3	2400	0
Aug	-100800	-100800	-62600	6	9600	0
Sep	-100600	-100600	-100800	22	48000	0

Table 3