TECHNICAL DEVELOPMENT _05

PRINCIPLES_

The utilitarian and functional requirements in the technical resolution of a sport for development community centre within Olievenhoutbosh generally include robust and durable surfaces and components that can withstand the kinetic nature of the user and the sport being played. A third requirement is the ability of the technical resolution to include local skills and labour and create opportunities for community participation- an aspect that is of fundamental importance within a community such as Olievenhoutbosch.

Thus, it can be said that robustness, durability and a platform for community participation stands central to the technical resolution, however, it is in the linguistic (taal) dialogue between the tectonic and stereotomic that a building gives meaning to the social abstraction of society and ultimately becomes a work of architecture.

fig 144. Kenetic nature of the games.

Materials to be robust and durable to handle the kinetic nature of sport and sporting equipment such as balls and special shoes.

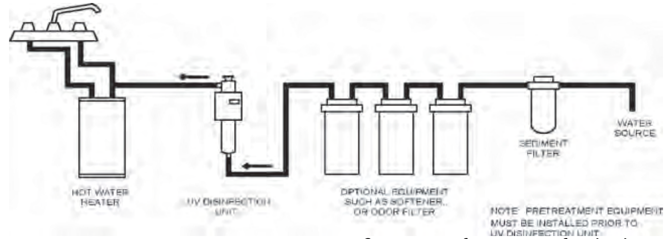

fig 145. Purifying water for drinking.

The basis of good nutrition is fresh water. Fresh water source have throughout history been a place of gathering and interaction.

fig 146. Employed community members.

Willing community members to stamp down their identity by contributing in the process of construction.

This early design sketch illustrates the tectonic concept and response to site.

STRUCTURAL SYNTHESIS_

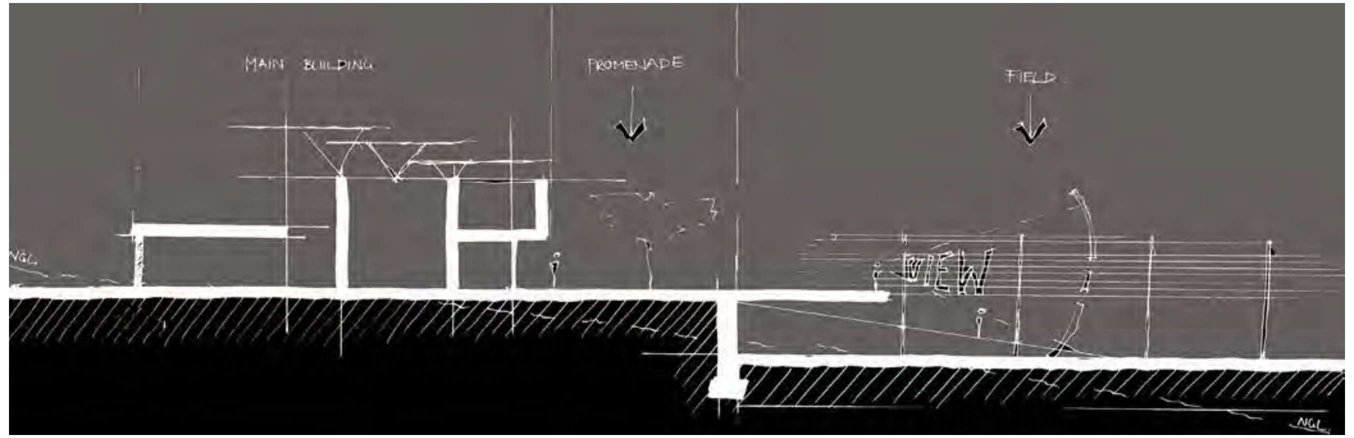

fig 147. Structural Synthesis.

TECHNICAL PRECEDENT 1_

Foster Lomas
Artists' Residency Italy

fig 148 a. Artists Residency (Foster Lomas 2011).

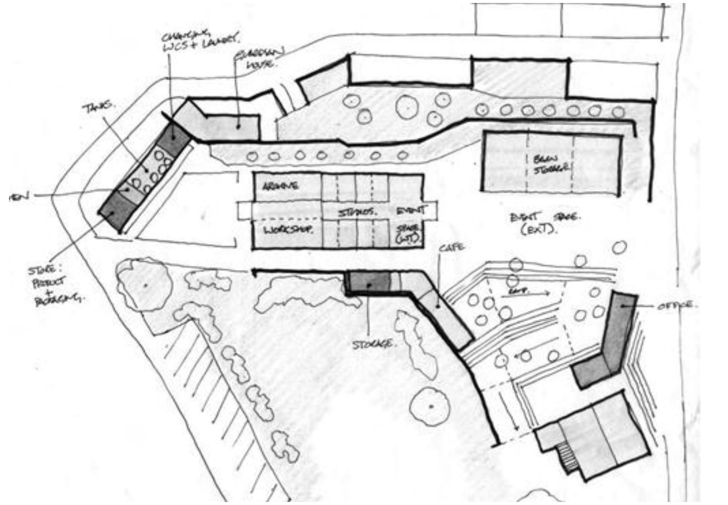

fig 148 b. Artists Residency Plan (Foster Lomas 2011).

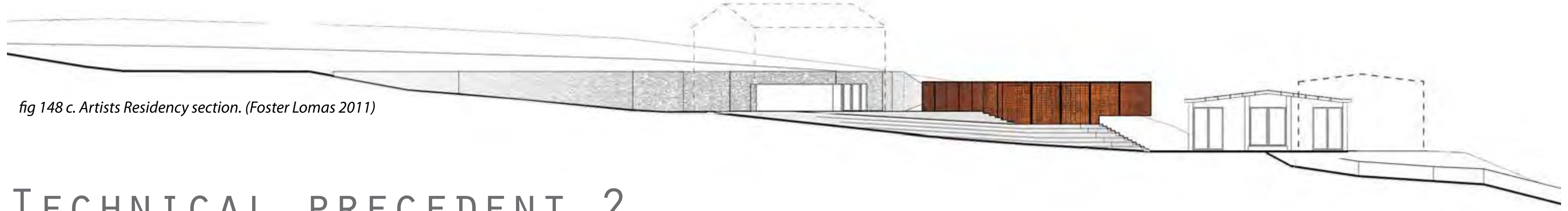

fig 148 c. Artists Residency section. (Foster Lomas 2011)

TECHNICAL PRECEDENT 2_

MYD Studio , Dominus Winery
Napa Valley, California

The winery exemplifies the potential of the gabion.

The winery is a gabion building by Herzog & De Meuron. It was built to integrate into the landscape, almost disappearing, allowing the winery to be what it should be. The buildings' skin is made of bassalt rocks that allows natural light to filter in the entire building, while keeping it naturally insulated, and especially cool in the extreme summer heat of the Napa Valley.

fig 149 a. Dominus Winery. (MYD studio 2010)

fig 149 b.Interior view of Winery. (MYD studio 2010)

TECHNICAL PRECEDENT 3_

Mahiga High Rainwater Court
Mahiga, Nairobi Area, Kenya

fig 150. Fresh water.

fig 151. Community members gathering

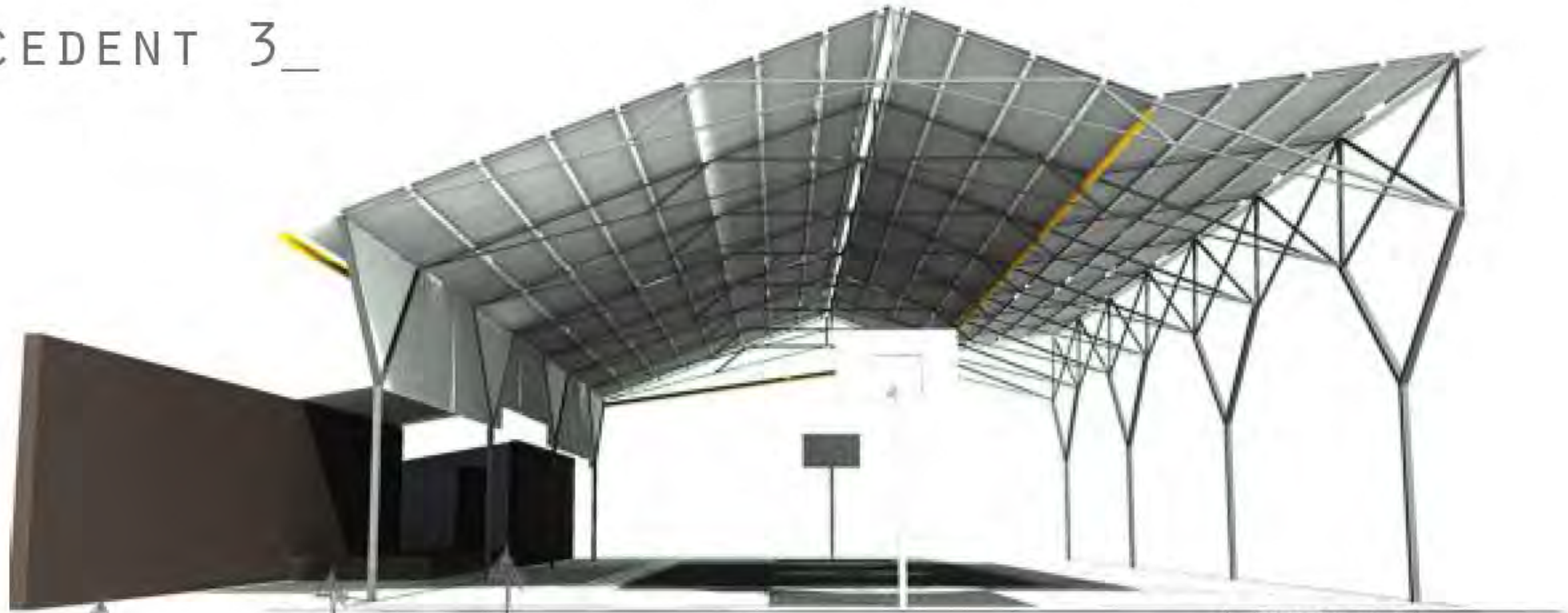

fig 152. Roof construction

North Elevation

fig 153. North Elevation

South Elevation

fig 154. South Elevation

The Rainwater Court is a multipurpose, full-size basketball court designed for the St. Joseph Mahiga Primary School and community of Nyeri, Kenya.

The relevance of this project as technical precedent lies in the simplistic systems and processes that respond to the immediate need and context of the community, namely: Shade, Water, Light ,Materiality and Community participation.

The facilities include a shade structure that has integrated rainwater collection and UV purification! system with solar panels for the water system and night lighting in areas without electricity.

The full-court configuration has a 510 m2 playing surface covered by metal roof with gutters and rain water down pipes to collect an estimated of 40,000 litres of water per year. 25 000 litres of rain water is purified by UV purification and stored on site.

[1] *Refers to the process of water purification where contaminated water is exposed to high levels of ultra violet light. The UV light manipulates the DNA of bacteria in the water to render it harmless and make it safe to drink.*

fig 155. Community participation

Community Participation

Community participation is regarded as a very important technical quality as it is a techniques that is used to prolong the life span of the building. This principle establishes a shared sense of ownership and responsibility toward building with ultimately relates to more efficient use and architectural success.

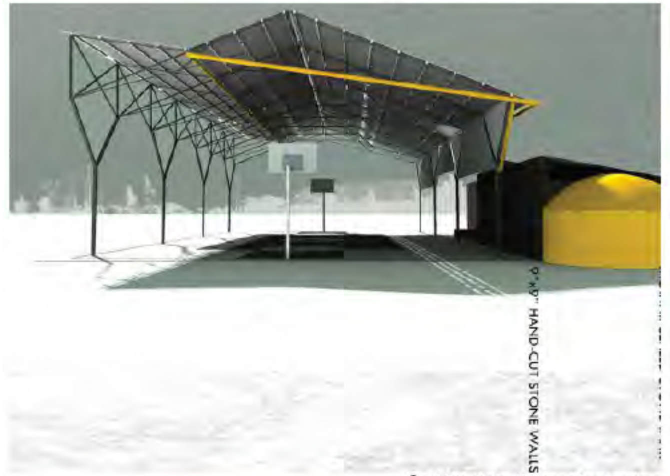

fig 156. Rain Water Harvesting

Rain Water Purification

The rain water is purified by a uv purification system. Water pumps and the UV light is powered by a soar panel that is exposed to the sun between 10 am and 3 pm. This water purification system is a very relevant technical precedents in the proposed sport for development community centre as Health and Nutrition is one of the four main focus points of the project.

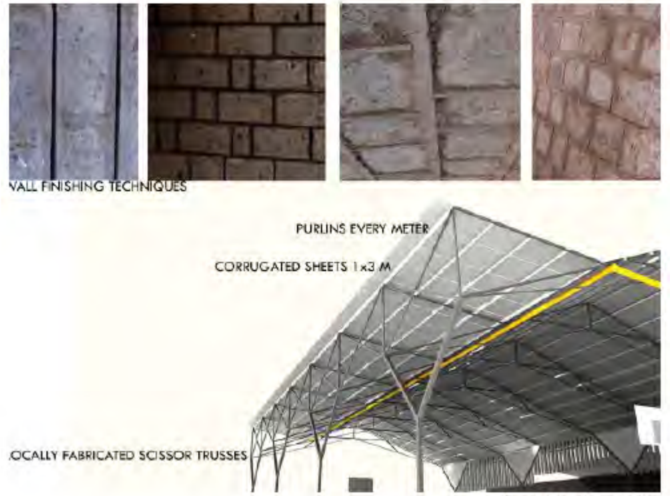

fig 157. Materiality

Materiality

The materiality of the building has an inherent vernacular quality as all the components are locally available and erected by means of local construction teams and other local labour. The materials provide a spacial quality that is familiar to its context.

Bright colours contrast the earthy colours that dominate the landscape to emphasise the importance of certain elements, such as the rain water down pipes and the storage tanks.

Technology and Materials_ (primary structure)

Walls_

Introduction to Walls

What is the wall in sport architecture? This is the question raised by the author in an attempt to understand what the walls want to be and what it wants to be made of. As explained in chapter 04, sport architecture is the architecture of the horizontal surface and thus explains the horizontal roofs that bind the spaces or 'boxes of space together, but what is the wall?

In any form of sport, the wall is vary rarely on object that stands between opponents, but rather the common denominator in the sport being played. Furthermore, when, for example: a squash ball is hit against the wall, the wall will always hit it back. The wall in this scheme does not want to be a divider, but rather a common denominator, an active participant. The wall wants to push, pull and carry the landscape and the structures on it.

Masonry Walls

Load bearing and non load bearing masonry walls are to be a composite of 440, 330, 220 and 110 mm Roan Satin face brick walls with flush mortar joints as well as plastered and painted walls. The reason for the painted walls are to reflect light in internal spaces that require adequate natural light to bounce of the surfaces.

fig 158. Roan satin facebrick(www.corobrick.co.za 2012)

Concrete Walls

Concrete walls are not used often throughout the buildings but when the concrete is exposed the finish of the wall will be horizontally off-shuttered with rough sawn timber planks to coincide with the concrete columns.

fig 159. Rough sawn off shuttered concrete (google images)

Gabion Walls

Manipulating the landscape is the point of the departure in the construction process of the sport fields on a sloping site. Gabion walls are used to create a series of horizontal level differences and to retain banks and slopes and even used as to create the face af certain structures.

fig 160. Gabion wall (Google images)

fig 161. Gabion grass terraces.

Gabion Walls - Continued

The gabion wall[1] is often categorised as a cheap engineering solution to maintain river banks, canals and fluvial systems. I found that the gabion offers much more than just its effective functional value. The beauty of the gabion lies in its simplistic nature. The nature that IS the colour, the texture and the pattern.

In the context of the new sport for development community centre, gabions are used to as retaining walls that often form vegetated terraces for watching sport. Furthermore, the construction of the gabion provides ample opportunity for community participation, as filling the wire baskets is a labour intensive job.

Gabions generally require little maintenance, are cheap to install and also provides thermal mass if it is used in any built form.

fig 162. Gabion walls. (Google images)

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[1] A gabion wall is a mild steel zink coated wire basket that is filled with stone an can be used for retaining walls and river bank reinforcement.

Columns_

Concrete Columns

The concrete columns work in collaboration with load bearing walls to carry concrete floor slabs. Column sizes range from 220 - 240 mm to 440 - 800 mm. All concrete columns to have a rough sawn off-shuttered and unpainted finish.

fig 163. Rough sawn off-shuttering. (Google images 2012).

Steel / Timber Composite Columns

The columns that support the pavilion roof are a steel and timber composite. The bridge concept manifests itself in the combination of the materials to form an collective aesthetic. The steel interior core consists of 10 mm steel flat bar welded together with a baseplate at the top and bottom to form the structural core. 280 mm diameter timber are sawn to make quarter rounds, and fixed to the steel to give the column its aesthetic appeal. The single 280 mm steel column branches into four diagonal columns that carry the overhead roof trusses. The diagonal branched steel columns attach to the truss and bottom column with 10 mm shop welded galvanized steel fin plates.

Concrete- Steel Column Composite

The concrete and steel composite columns carry the roof structure over the pool and gymnasium. Again, the composition of different materials is a response to the concept and a personification of teamwork and community building.

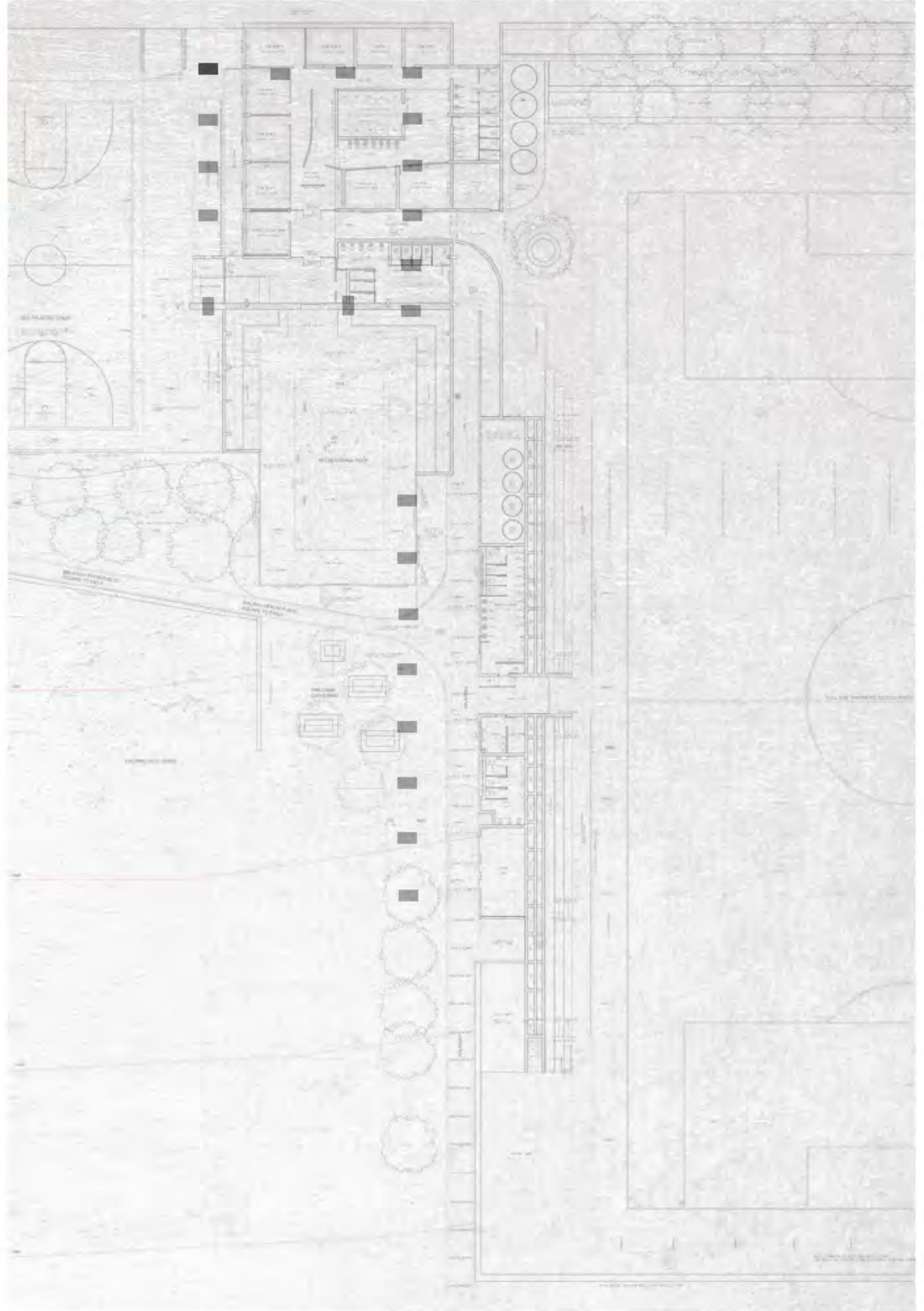


fig 164. Diagram of structure 1 (not to scale)

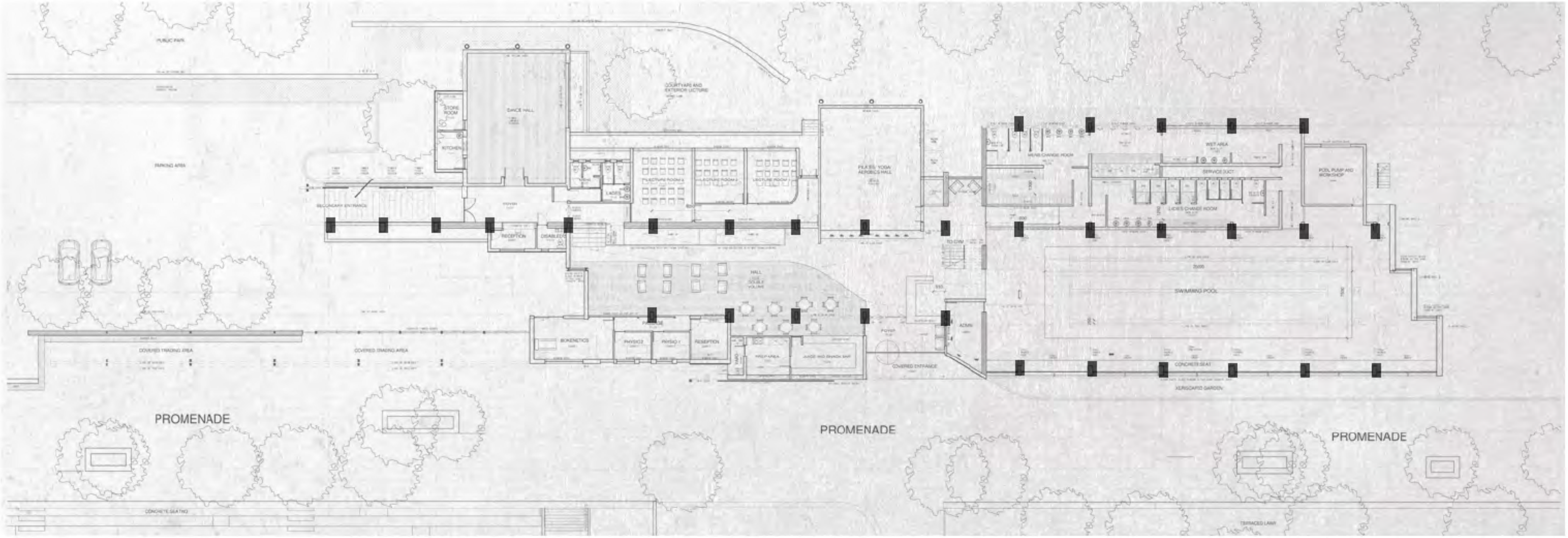
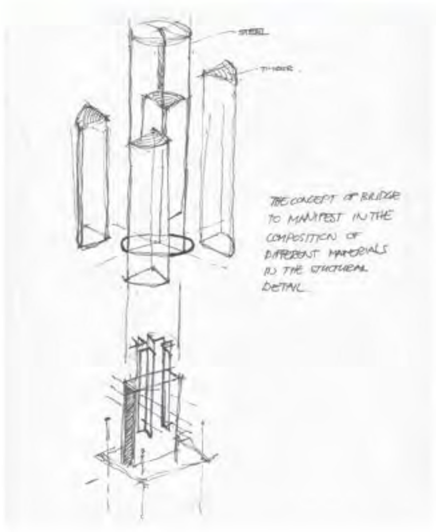
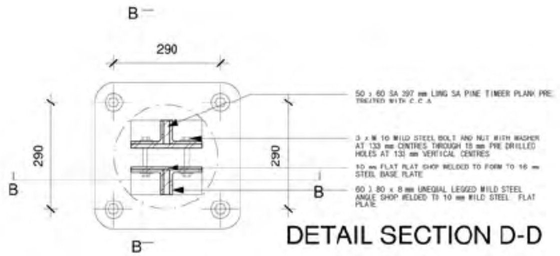


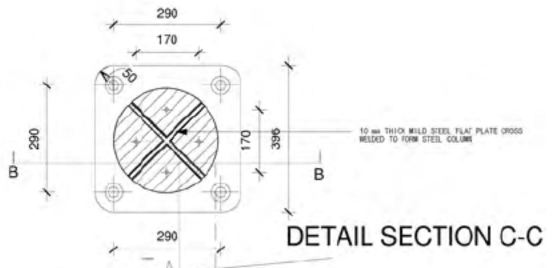
fig 165. Diagram of structure 2. (not to scale)

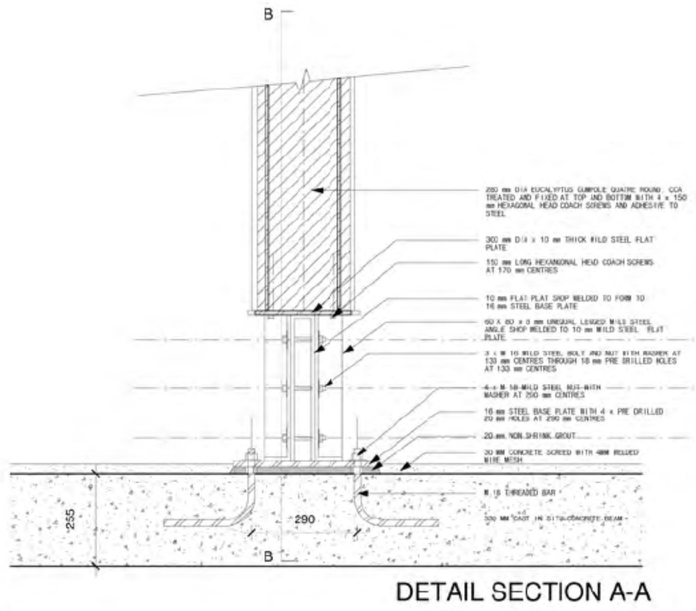
Column details_

Steel / Timber Composite Column Detail









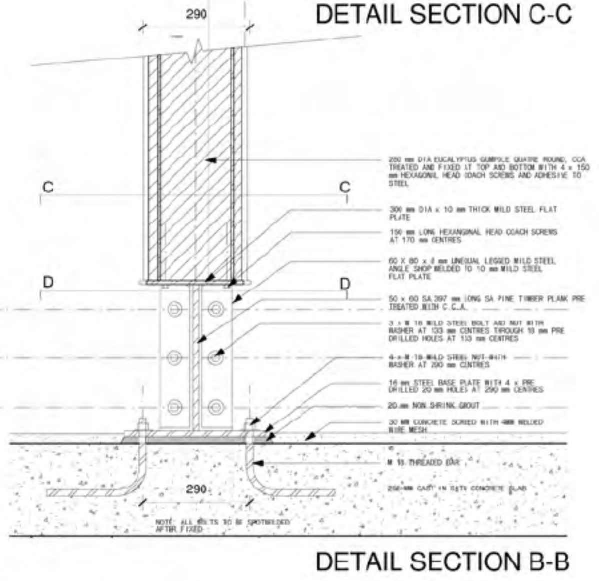
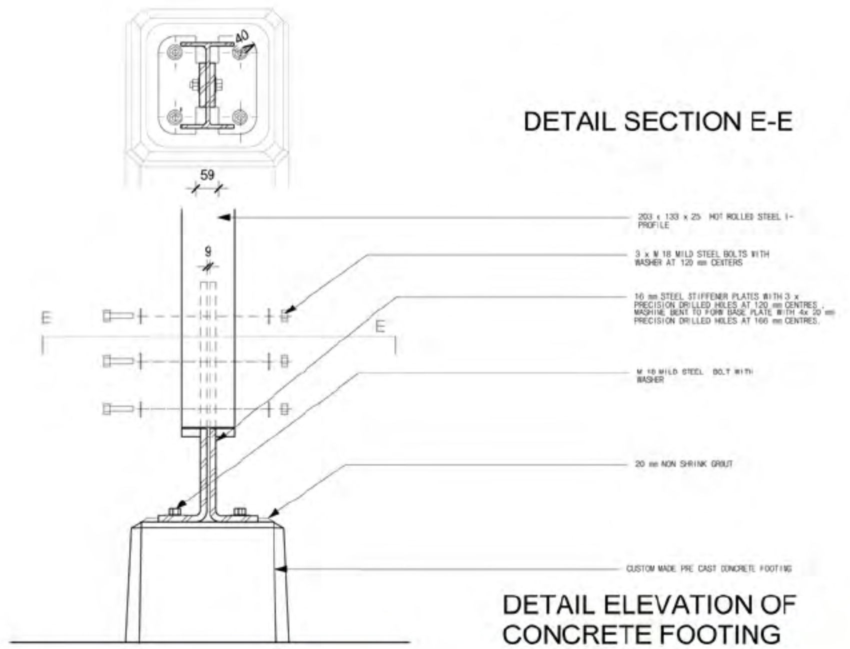


fig 166. Steel- timber composite footing detail. (not to scale)



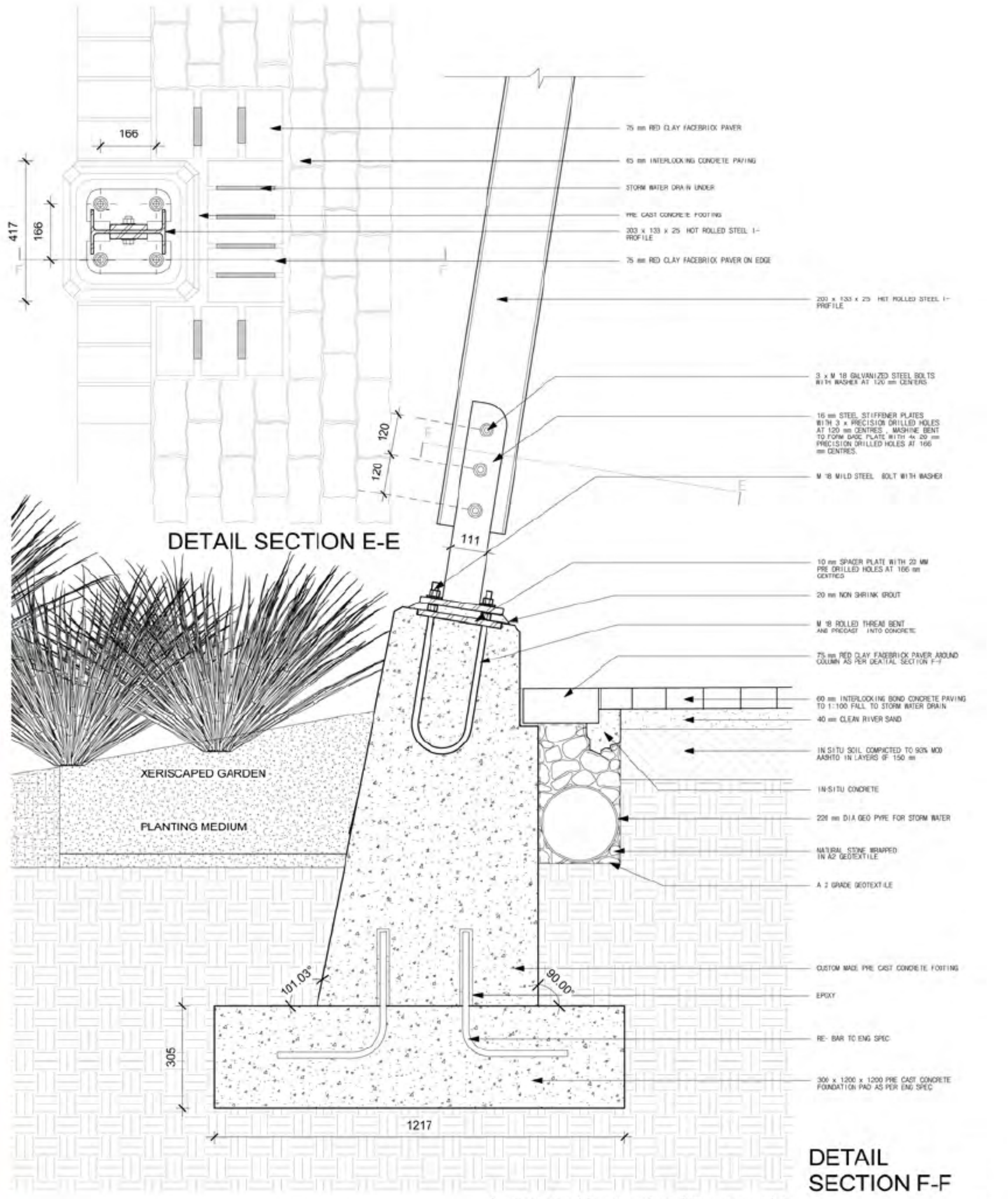


fig 167. Steel footing detail (not to scale)

TECHNOLOGY AND MATERIALS_(SECONDARY STRUCTURE)

ROOFS_

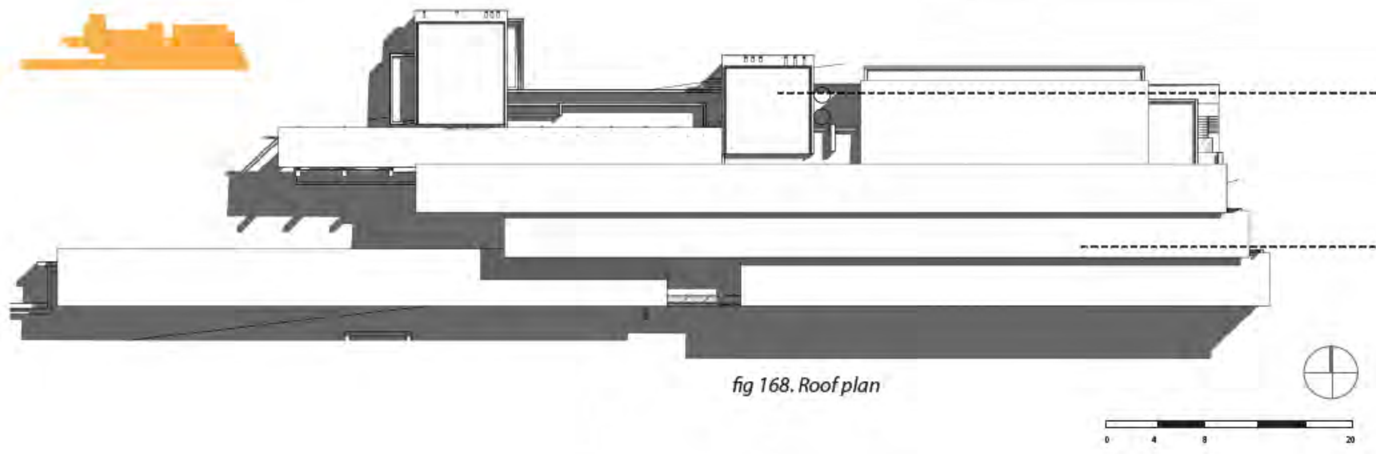


fig 168. Roof plan

Cast in-in situ concrete roofs with screed at min 1:100 fall to fullbore outlets and 75mm rain water downpipes built into wall.

Zincalume klip lock concealed-fix 38.1mm "EZ clad" roof sheeting at 2 degrees to gutters and rain water downpipes.

Zincalume Roofing

Zincalume roof sheets are selected rather than galvanised mild steel. The zinc/aluminium alloy coating on steel imparts corrosion resistance of up to four times the corrosion resistance of galvanised steel.

The roof pitch over the pavilion is at 5 degrees pitch Zincalume IBR profile sheets. The roofs over the sports complex has a pitch of 2 degrees are Zincalume Klip lock sheeting and placed at 2 degrees, clad with 0,8 mm Zincalume Kliplock profile roof sheets. In both cases sheeting are fixed to steel purlins that are spaced at 1100mm centres. Roofs to receive gutters and rain water down pipes that lead to storage tanks. Zincalume Roofing has a life expectancy of well over 40 Years.

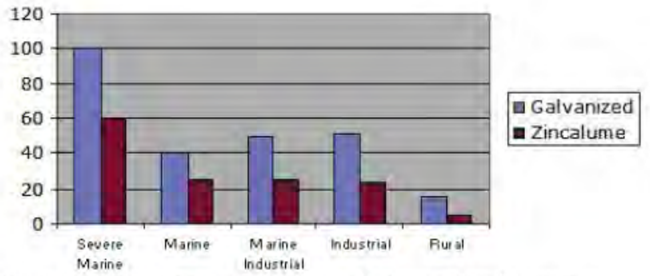


fig 169. Graph comparing surface erosion of Galvanized roof sheeting to Zincalume.

Concrete Roofs

The Concrete roofs cover the dance studio provide thermal mass to keep the spaces cool in the hot climate. Openable strip allows warm air to escape and provides cross ventilation. Concrete roofs are to be made waterproof to specialist spec.

FLOORS_

Various flooring systems are used throughout the design, ranging from nonslip bathroom tiles to cement screeds and grano in storage facilities. The most influential flooring systems will be discussed.

1. Everroll PUR High Performance Flooring Systems

Given the nature of the building, especially the locker rooms next to the field and the gymnasium, the floor required a finish that can withstand the impact of weights being dropped and provide comfortable nonslip surface for walking on with soccer or rugby boots.

The Everroll flooring range is a collection of rubber flooring colour combinations using high recycled rubber content and manufactured using combination of different elastomers which gives the floor its level of wear resistance and flexibility.

The Everroll floors installed in the gym and basement locker rooms are generally to be installed in 4mm thickness but increased to 8mm thicknesses in high impact areas. The floor is also moisture resistant which makes it effective in bathroom installations.

Other advantages of PUR flooring :

- Force reduction of 16-19%, depending on thickness.
- Antislip : it provides a safe surface for running and jumping with sufficient gliding capacity to allow for stopping movements.
- Absorbs the impact force of falling objects such as dumbbells without incurring any damage.
- Bears the load of fitness equipment placed on the flooring and prevents it from slipping.
- Absorbs impact sound. 15 to 20 dB depending on the thickness of the material.

2. Timber Laminate Flooring

Dance studios require a smooth floor finish that allows for a certain sliding ability. Timber laminate flooring will be applied in the Pilates and dance studios.

fig 170. Everoll flooring. (Google images)

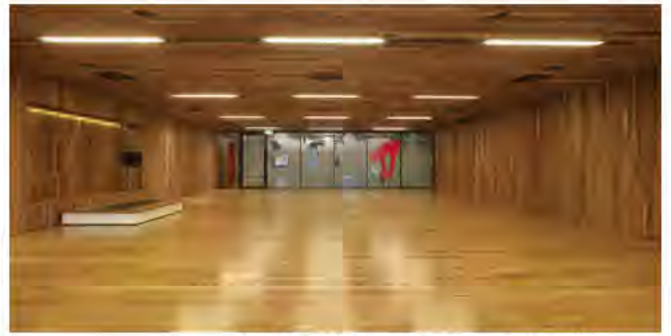


fig 171. Timber Laminate Fooring (Google images)

FACADE_

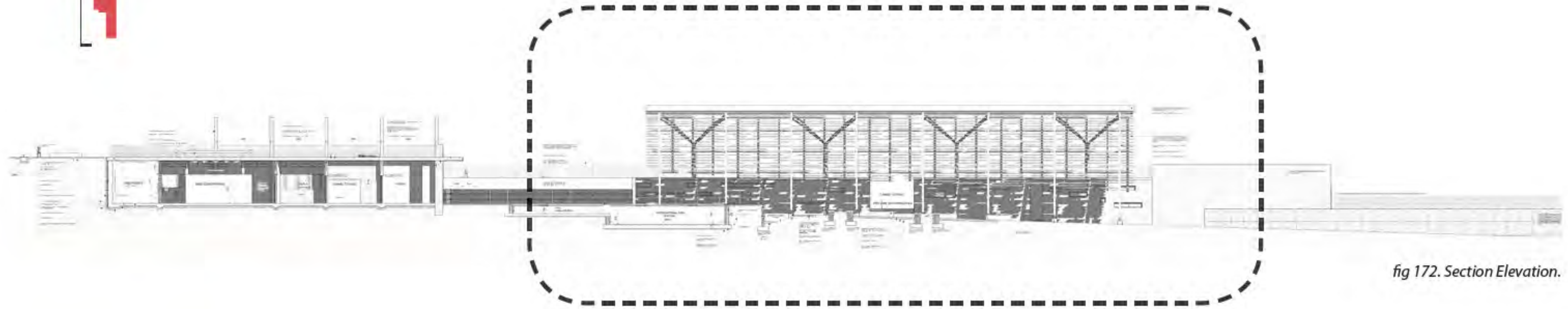


fig 172. Section Elevation.

The Pavilion Facade

The pavilion's western facade is one of the most important facades as it forms a canvas or backdrop for the basketball and netball courts and perceived from the main access road. The facade frames a walkway and protects the spectators watching football from the harsh late afternoon sun.

The facade is constructed from reused saligna scaffolding planks. The scaffold planks are essentially fixed to shop bent I- beams that transform from wall to roof as they stretch from the concrete footing next to the pedestrian walkway to be supported by the composite timber and steel columns. The scaffold planks are honest in their materiality and represent the community involvement in the process of construction. The scaffold planks is also a strategy to get organization involved in funding and sponsorships, as scaffold planks van be sponsored by companies and individuals to ultimately represent an integrated whole. The facade is essentially a woven timber blanket that abruptly pauses at regular intervals to reveal the curving structural steel column that graciously transforms from column to truss.

The aging character of timber is seen as opportunity rather than constraint as it provides opportunities for employment and skill development.

fig 173. Section Elevation.

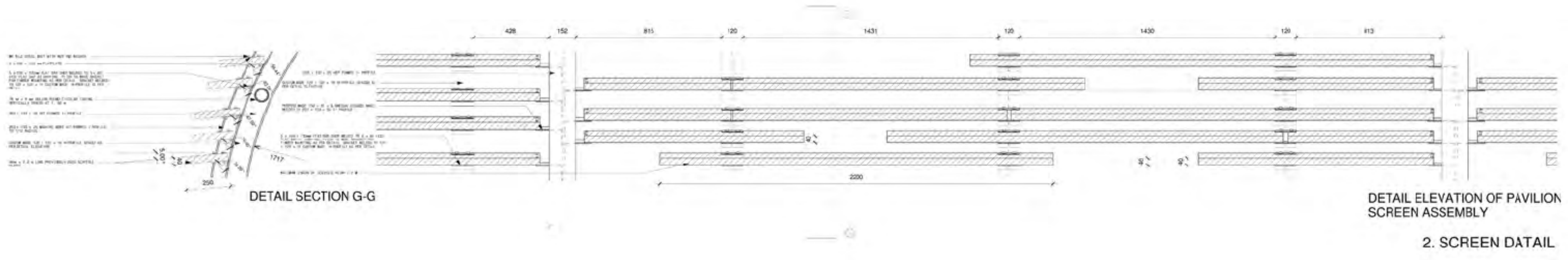


fig 174a. Screen Detail.

The screen faces West and is designed to offer sun shading for the spectators in the late afternoon. The screen is designed to allow the sun to partially filter through from 17:00 pm in summer afternoons when the temperature drops.

As seen in fig 174a. the treated scaffold planks are angled at 5 degrees to achieve the desired solar aspect and to guide rain water away from the walkway under.

fig 174b. Detail of timber Scaffold screen.

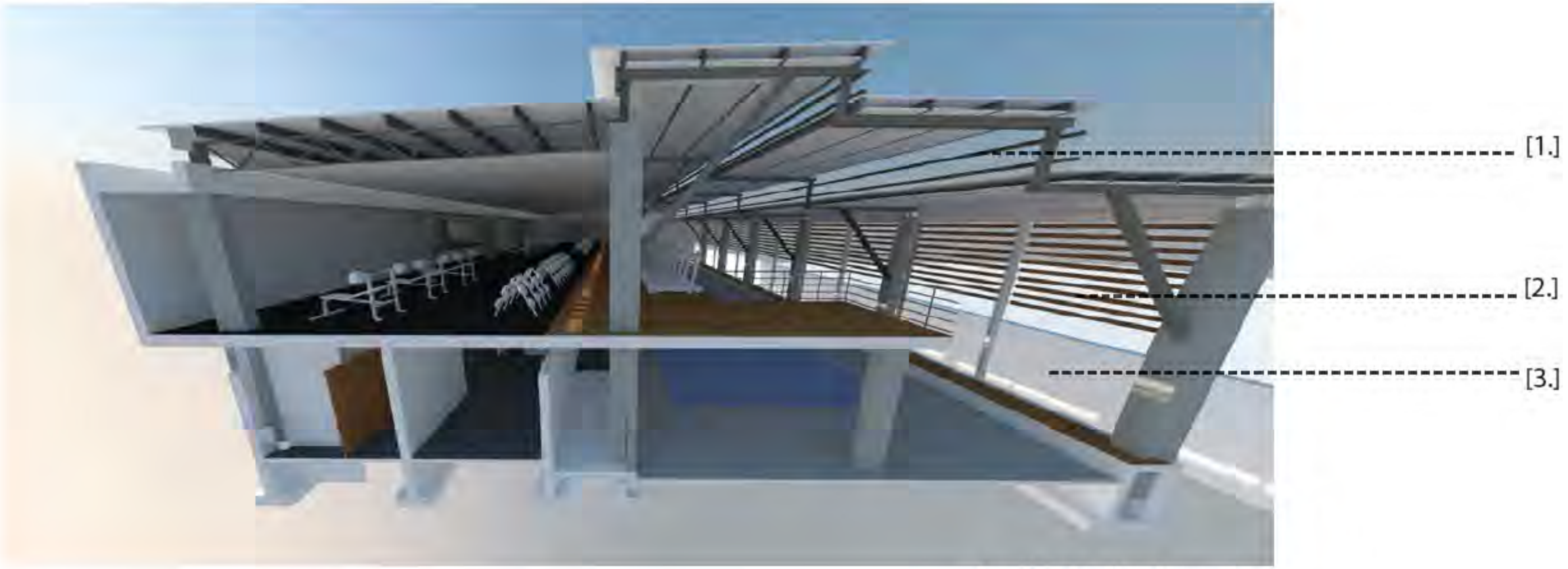


fig 175. Section through gymnasium

The Gymnasium Facade

1. Light strips

Poly carbonate IBR sheeting are used with the stepped roofs to bring southern light into the building. The poly carbonate sheeting is cheaper than glass and has an excellent strength to weight ratio.

2. Screening.

Screening on the South of the building with turned 100mm diameter gumpoles. The screening sits in front of the glass curtain wall to protect it from impact and to give the facade a warm aesthetic appeal that responds to context and the regional identity.

3. Curtain wall

The curtain wall is framed with aluminium mullions. Aluminium is use for its longevity and strength to weight ratio. The aluminium framed curtain walls are built in between concrete columns.

SYSTEMS_

WATER

Rain water harvesting

Rainwater are to be collected from roofs by means of gutters and rain water down pipes and to be stored for:

1) UV purification and Suppling fresh drinking water for athlete's.

2) Irrigation of lawns and gardens.

To calculate required rainwater storage capacity, we need the following info: 1. Run-off collection area

2. Daily water requirement

3. Rain statistics – from http://www.weathersa.co.za/Publications/PublicationList.jsp

Formula: 0.8 (avg rainfall for the month- B) x Collection area

where: 0,8= efficiency factor

B= 2mm= loss factors

After careful spacial, monetary and aesthetic consideration, provision has been made for the storage of 40 000 L of rain water to surplus the existing demand on municipal water.

Calculation for water storage to irrugate lawned terraces on Northern edge of sportsfield:

PRECIPITATION	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTALS	HIGHS	LOWS
DAYS															
	136	75	82	51	13	7	3	6	22	71	98	11	674		
m	0,136	0,075	0,082	0,051	0,013	0,007	0,003	0,006	0,022	0,071	0,098	0,11	0,674		
AREA (m²)	840														
LITRES (m³)	114,24	63	68,88	42,84	10,92	5,88	2,52	5,04	18,48	59,64	82,32	92,4	566,16		
HARVEST (m³)	102,816	56,7	61,992	38,556	9,828	5,292	2,268	4,536	16,632	53,676	74,088	83,16	509,544		21,924
MONTHLY USAGE (m³)		42	42	42	42	42	42	42	42	42	42	42	42		168
SURPLUS/DEFICIT		60,816	75,516	95,508	92,064	59,892	23,184	-16,548	-54,012	-79,38	-67,704	-35,616	5,544		
	60,816	14,7	19,992	-3,444	-32,172	-36,708	-39,732	-37,464	-25,368	11,676	32,088	41,16			
HOARDING															146,076

fig 176. Rain water calculation results 1.

Provision has been made for the sub surface storage of 80 000 L of rain water to surplus the existing demand on municipal water to irrigate park lawns.

Calculation for water storage to irrugate recreational park:

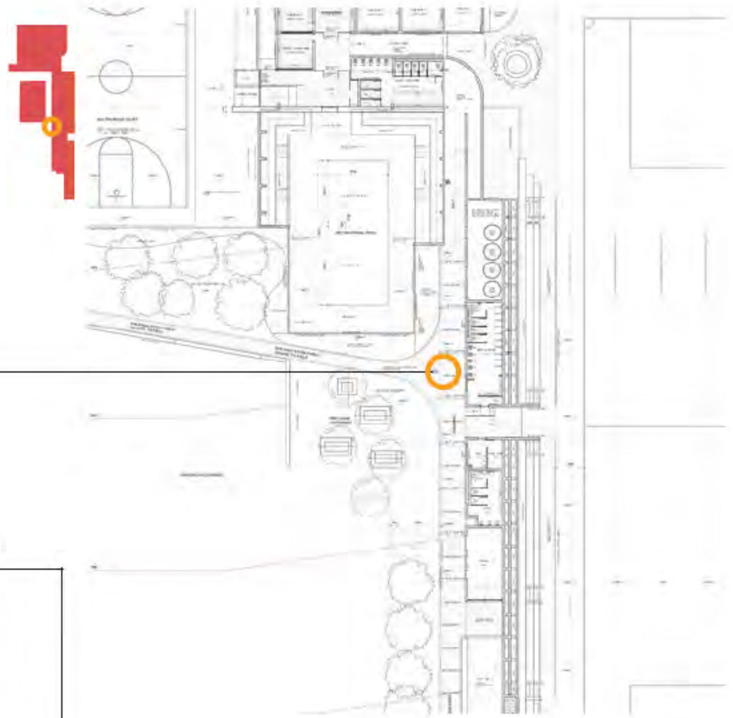
	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTALS	HIGHS	LOWS
AREA (m²)	1479														
LITRES (m³)	201,144	110,925	121,278	75,429	19,227	10,353	4,437	8,874	32,538	105,009	144,942	162,69	996,846		
HARVEST (m³)	181,0296	99,8325	109,1502	67,8861	17,3043	9,3177	3,9933	7,9866	29,2842	94,5081	130,4478	146,421	897,1614		38,6019
MONTHLY USAGE (m³)		100	100	100	100	100	100	100	100	100	100	100	100		400
SURPLUS/DEFICIT		81,0296	80,8621	90,0123	57,8984	-24,7973	-115,4796	-211,4863	-303,4997	-374,2155	-379,7074	-349,2596	-302,8386		
	81,0296	-0,1675	9,1502	-32,1139	-82,6957	-90,6823	-96,0067	-92,0134	-70,7158	-5,4919	30,4478	46,421			
HOARDING															361,3981

fig 176b. Rain water calculation results 2.

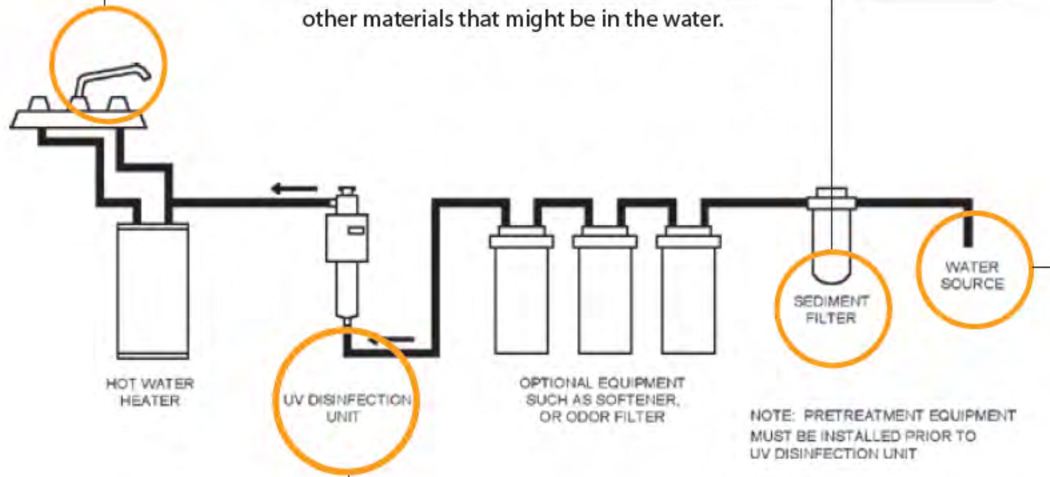
Rain water purification

Intent - Celebrating Water

Given the problem of division within Olievenhoutbosch and nutrition as one of the fundamental generators of the intervention, it is the attempt of the author to create community by means the visual act of harvesting and purifying rain water for the purpose of drinking. Furthermore, the drinking fountain is situated at a crossroads where people meet, gather and interact.



To remove dust and bird droppings, odour and other materials that might be in the water.



Pavilion roof with total area of 300 sqm, with potential of harvesting 150 000 L of rain water per year.

fig 177. Rain water purification process.

UV disinfection or the reverse osmosis process is process were harmful bacteria within water is rendered harmless by means of exposure to UV light.

COOLING

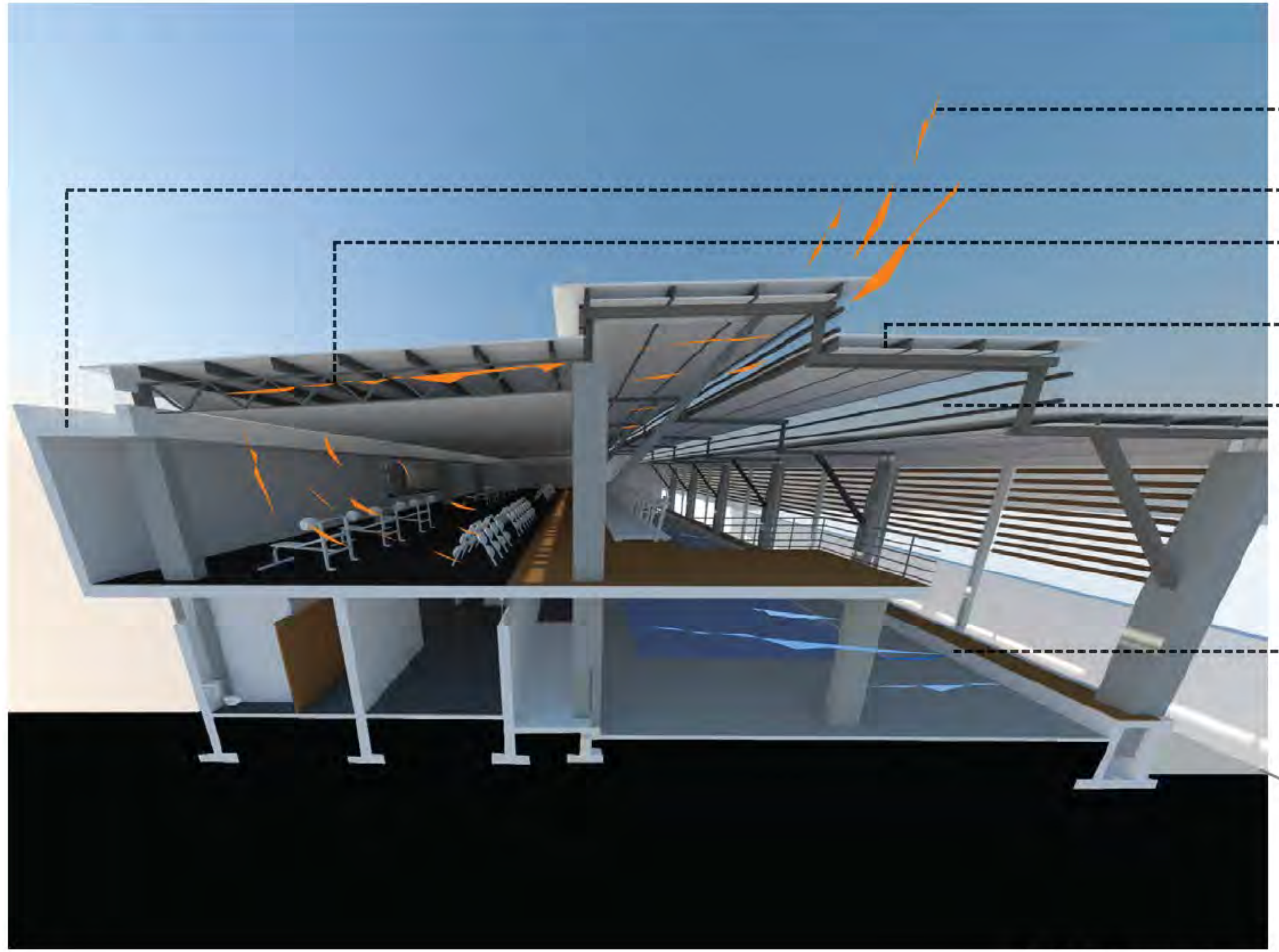


fig 178. Cooling and ventilation 1.

Trees provide shade all along the promenade.

Warm and moist air is sucked out by low voltage mechanical extractor fans above the shower area

The gabion is wide enough to prevent rain water penetration, but maintains the moisture within the wall. The cavities within the gabion wall allow for air penetration that cools over the moist stones

Air from the South is cooled as it passes over the pool

The sun screen protects the spectators from late afternoon sun and provides cover for the pedestrians using the walkway under. see figure 174b.

Trees provide shade for pregame gathering areas.

The Site as System

The illustration below illustrates a series of systems that compliment one another to cool the interior of the building in a natural and sustainable manner. The point of departure is to use the site as a system to minimize intricate, expensive and unsustainable air conditioning appliances.

The prevailing wind direction in Olievenhoutbosch is from the South. This brings cooler, moist air from the stream below up toward the site. In both buildings cool air is introduced from the Southern side of the building as it is generally more effective due to the building's shadow. As air moves over the cold swimming pool water, the temperature decreases. For further cooling, air travels through a gabion wall that retains moisture between the stones and cools the air as it passes through.

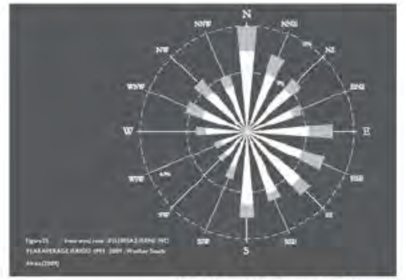


fig 178. Windrose for Irene.

The heat and moisture build up within the locker rooms escape by means of natural cross ventilation through openable windows and voltage extractor vents above the shower area.

Trees and light weight shading elements with low embodied energy provide shade over walkways and seating areas.

The predominant Southern breeze carries cool air from the wetland up toward the buildings.

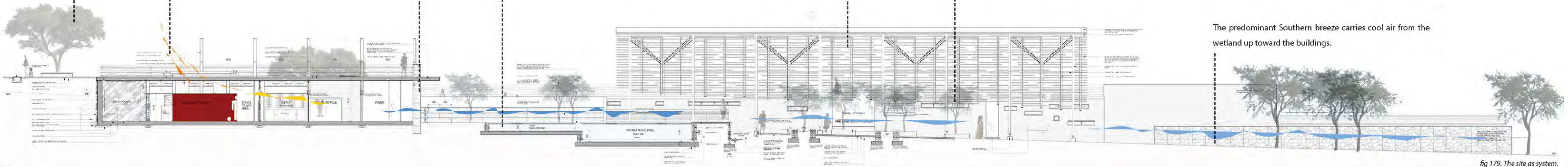


fig 179. The site as system.

SEWAGE

All sewage to be treated with a septic tank system not closer than 12 m from source.

12 m min.

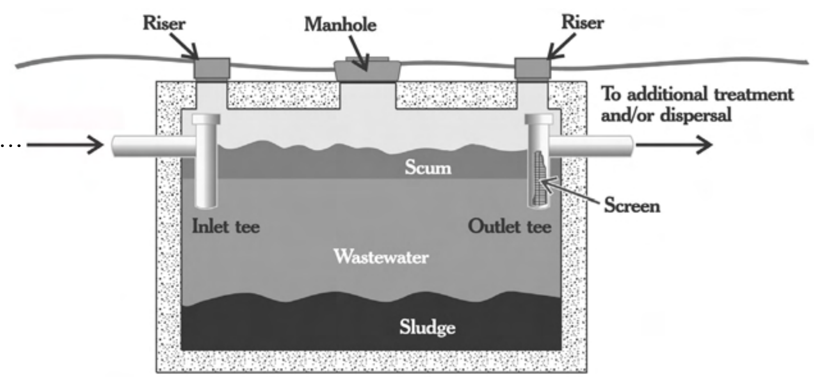


fig 180. Septic tank sytem. (Google images)

GREY WATER

All grey water from hand wash basins will be used for watering lawns and gardens. The soap in bathrooms and locker rooms are to comply with biodegradeable standards.

fig 181. Garden resQ. (Google images)

WATER CLOSETS

The Lecico Reveira is a standard water-saving toilet, using just 4.5 litres for a full flush and 2.6 litres for a half flush. The Lecico Reveira water closet available at Plumlink at R1195. The saving compared to a 9 l toilet per 5 users will save R625 every year at current Tshwane water rates.

fig 182. Lecico Reveira water closet. (Google Images)

VEGETATION

Given the nature of the site , vegetation is included as a designed system that responds to environmental issues. Strategies are used that promote local bird life, require minimal irrigation and regulates cooling.

XERISCAPING

Xerophytes are plants that require very little water to survive and still have high aesthetic appeal. Xerophytes often have thorns that can be used as natural barriers

fig 183a. Existing Grassland

fig 183. Aloe. (Google Images)

TREES

Currently, there are no trees on site. Ingenious trees are to be planted that represent the regional identity of the highveld, provide shade and motivate the habitation of local bird life.

fig 184. Fever tree "Koorsboom"

fig 185. Acasia Erioloba "Kameeldoringboom"

fig 186. Ziziphus Mucronata "Blinkblaar Wag n Bietjie."

Fig 187. Acasia Sieberiana "Papierbas doring boom"

BASEMENT CONSTRUCTION_

Tanking

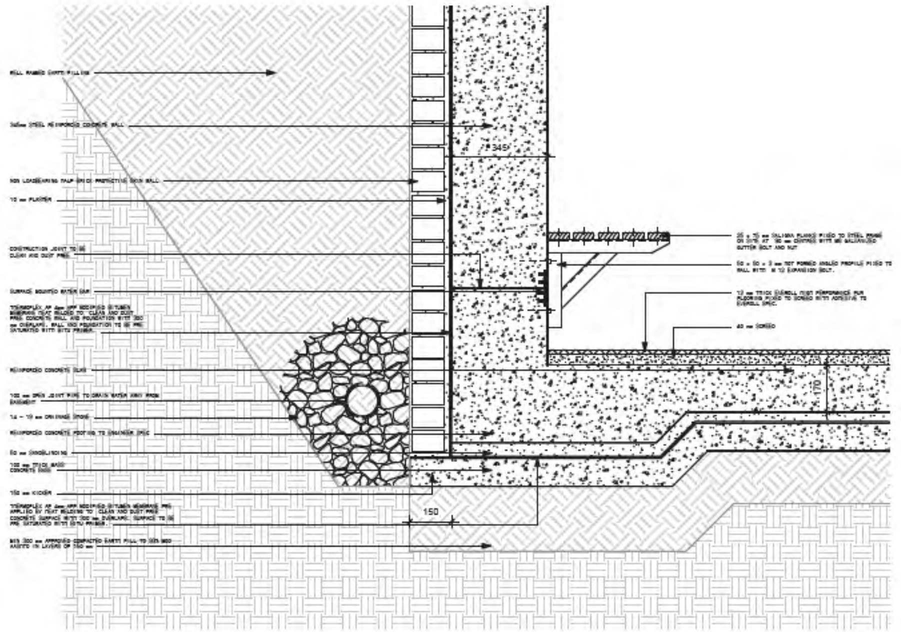


fig 188. Tanking detail.

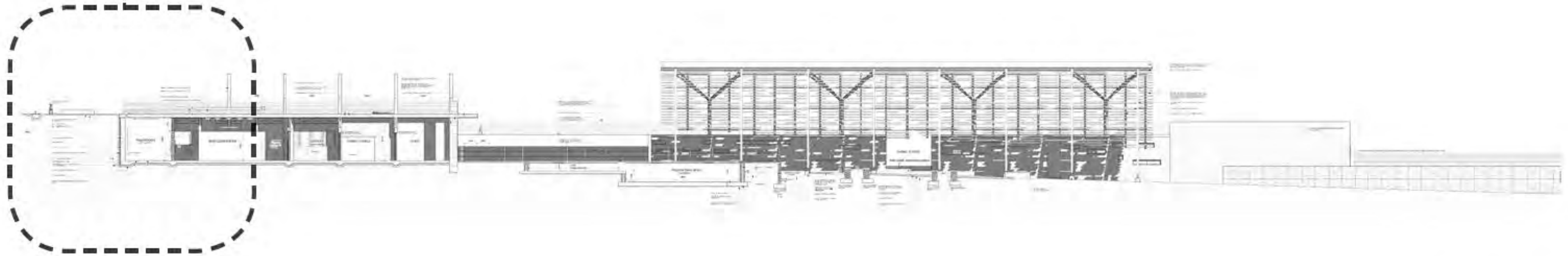


Fig 189. Section elevation.

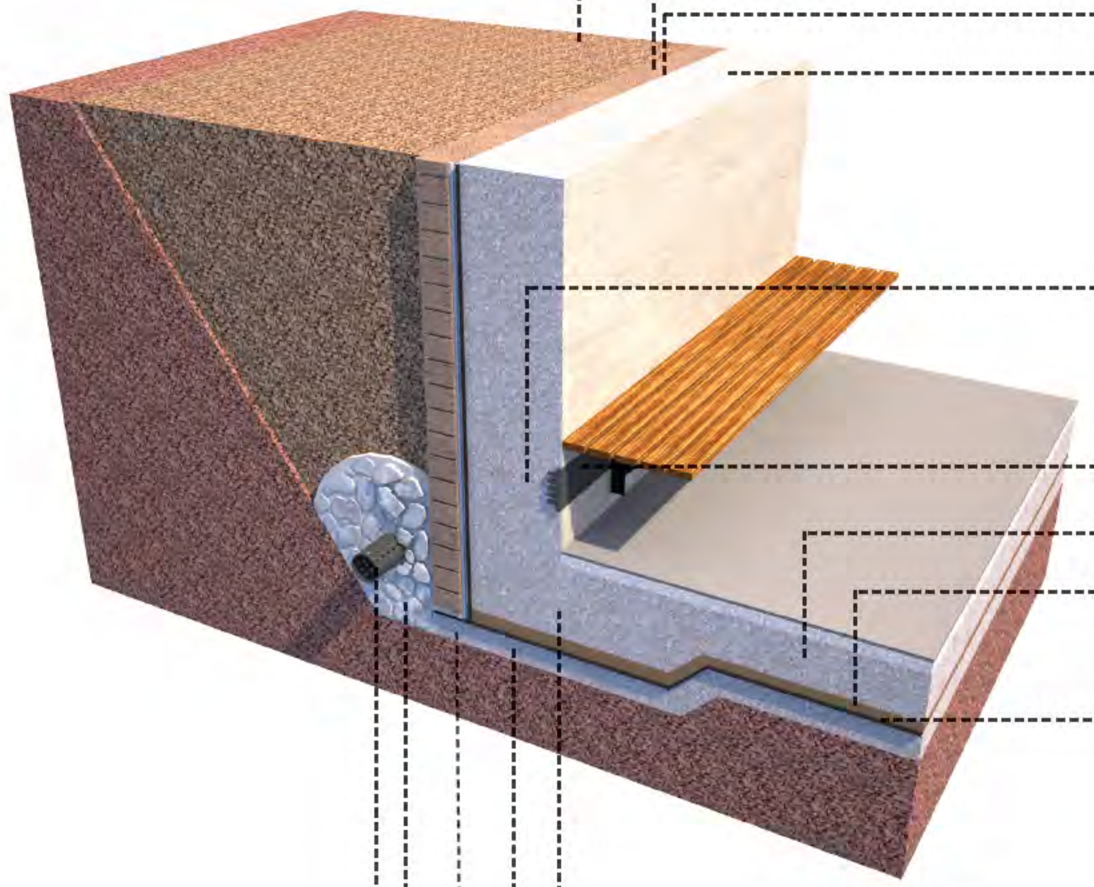


fig 190. 3D of Tanking detail.

Detail Section_

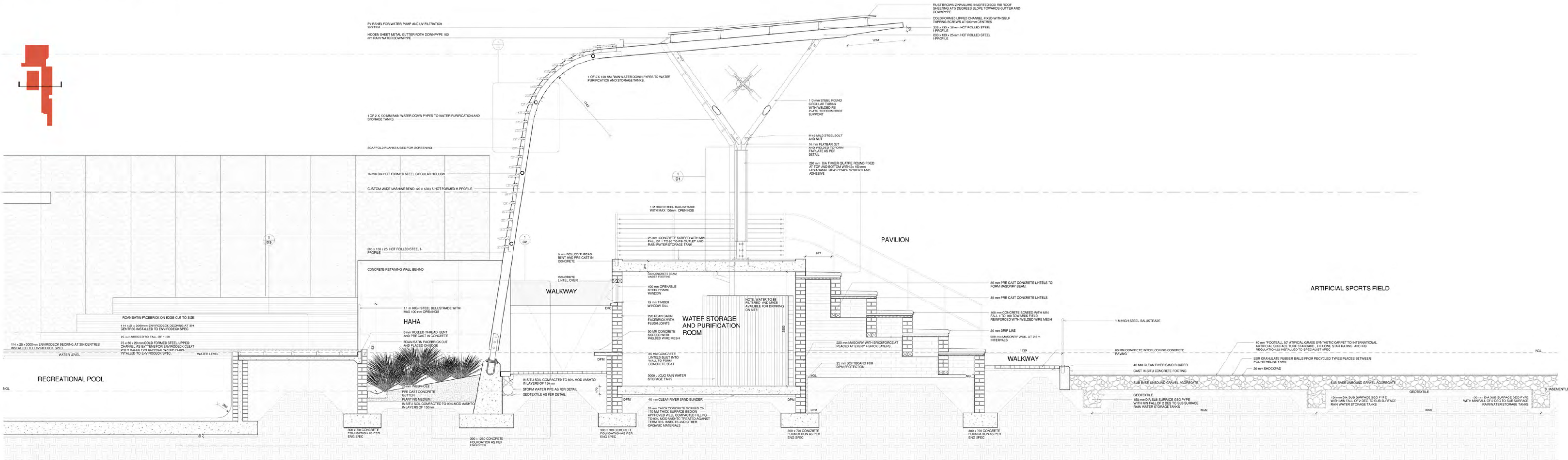


fig 191. Detail through pavilion