TECHNICAL DEVELOPMENT
PRINCIPLES

The utilitarian and functional requirements in the technical resolution of a sport for development community centre within Olievenhoutbosch 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, in the linguistic dialogue between the tectonic and stereotomic that a building gives meaning to the social abstraction of society and ultimately becomes a work of architecture.

STRUCTURAL SYNTHESIS

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

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

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.

TECHNICAL PRECEDENT 1

Foster Lomas
Artists’ Residence Italy

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 rough 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.

MYD Studio, Dominus Winery
Napa Valley, California

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

The uniqueness 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 518 m² playing surface covered by metal roof with gutters and site water down pipes to collect an estimated 40,000 litres of water per year. 25,000 litres of rain water is purified by UV purification and stored on site.

Community Participation
Community participation is regarded as a very important technical quality as it is a technique 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.

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

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 local labour. The materials provide a special quality that is familiar to its context.

Bright colours contrast the weather by colours that dominate the landscape to emphasise the importance of certain elements, such as the rain water down pipes and the storage tank.
TECHNOLOGY AND MATERIALS (PRIMARY STRUCTURE)

WALLS

Introduction to Walls

What is the wall in sport architecture? This is the question raised by the author as an attempt to understand what the walls want to be and what it wants to be made of. As explained in chapter 4, sport architecture is the art and science of the horizontal surface and thus explores the horizontal roofs that lend the spaces or ‘volumes’ of space together, but what is the wall?

In any form of sport, the wall is very rarely an object that stands between objects, 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 need to be a divider, but rather a common denominator, an active participant. The wall wants to push, pull and shape the landscape and the structures on it.

Masonry Walls

Load-bearing and non-load-bearing masonry walls are to be a composite of 446,330,220 and 119 mm paving slabs as well as plastered and painted wall. The reason for the pointed walls are to reflect light in internal spaces that require adequate natural light to bounce off the surfaces.

Concrete Walls

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

Gabion Walls

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 of certain structures.

Gabion Walls - Continued

The gabion wall is often categorized as a cheap engineering solution to retain river banks, canal embankments and systems. I found that the gabion offers much more than just a decorative functional value. The beauty of the gabion lies in its simplicity: the nature than itself. 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 gabions 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 provide thermal mass. It does, in my belief, have a place in the future of architecture.

*Gabion walls are a robust and cost-effective way to build a wall that 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. Columns size range from 230 - 240 mm to 440 - 900 mm. All concrete columns have a rough sawn off shuttered and painted finish.

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 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 columns its aesthetic appeal. The 280 mm steel columns branch into four diagonal columns that carry the overhead roof trusses. The diagonal braced steel columns attach to the truss and bottom columns with 10 mm shop welded galvanized steel flanges.

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 personalization of teamwork and community building.
COLUMN DETAILS

Steel / Timber Composite Column Detail
Various flooring systems are used throughout the design, ranging from mosaic bathroom tiles to concrete rounds and granite in storage facilities. The most influential flooring system 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 a comfortable anti-slip 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 elements which gives the floor its low wear resistance and flexibility.

The Everroll floors installed in the gym and team meeting locker rooms are generally to be installed in 4mm thickness but increased to 6mm thicknesses in high impact areas. The floor is also moisture resistant which makes it effective in bathroom installations.

Other advantages of PUR flooring:

- Fire resistance of the 1M0, depending on thickness.
- Anti-slip: It provides a safe surface for running and jumping with sufficient sliding 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. Up 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 fitness and dance studios.
The Pavilion Facade

The pavilion's western facade is one of the most important facades in the scheme's exterior design. The facade frames a walkway and protects the spectators watching football from the harsh late afternoon sun.

The facade is constructed from reed Totana scaffolding plants. The scaffold plants are essentially fixed to the building frame and columns that stretch from wall to roof. As they stretch from the concrete foundation, they support the composite timber and steel columns. The scaffold plants are housed within the building and create the connectivity and interaction between the building and the community

The facade is a white, timber-framed wall with vertical glass panels that allow the building to be seen from the outside. The facade is designed to allow the sun to partially pass through the glass panels, allowing natural light to enter the building and reduce the need for artificial lighting.

The screen facade is designed to provide shading for the spectators in the late afternoon. The screen is designed to allow the sun to partially pass through the glass panels, allowing natural light to enter the building and reduce the need for artificial lighting.

As seen in Fig. 174, the treated scaffold plants are angled at 5 degrees to ensure a clear solar aspect, and to guide rainwater away from the walkway under.
Rain water harvesting

Rainwater is to be collected from roof by means of gutters and rainwater down pipes and to be stored for:
1) UV purification and supplying fresh drinking water for athletes’
2) Irrigation of leaves and gardens.

To calculate required rainwater storage capacity, we need the following inputs:
1. Rainfall collection area
2. Daily water requirement

Formulas:
1. A rainfall on the month - B = Collection area

2. B = 2 (annual rainfall) / (annual rate of evaporation from the area)

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

Revision has been made for the soil surface storage of 40,000 L of rain water to supply the existing demand on municipal water to irrigate park lawns.

The Gymnasium Facade

1. Light strips
   Poly-carbonate (FR) sheets are used with the stepped roof 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 gampoles. The screening sits in front of the glass curtain wall to protect it from impact and to give the facade a wash and aesthetic appeal that responds to context and the regional identity.

3. Curtain wall
   The curtain wall is framed with aluminium modules. Aluminium is used for its longevity and strength to weight ratio. The aluminium framed curtain walls are built in between concrete columns.
Rain water purification

Given the problem of divided wetland, Olivenhoutbosch and nutrition as one of the fundamental generators of the environment, 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, colour and other materials that might be in the water.

Position roof with trellis area of 400 sqm, with potential of harvesting 190,000 l of rain water per year.

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

Warm and stale air escaping the building through vents in clerestory windows.

Thermal mass on Northern side of Building

Larger Ceiling cavity on Northern side for insulation and air flow barrier.

25 mm Insulated ceiling with glass wool/fibre insulation.

Roofs snap away from the sun to utilise Southern light as primary light source and to avoid solar gain from direct Northern sunlight.

Air from shaded Southern side of building sucked in and blown over cold water pool surface.

Fig. D7: Rain water purification process

Fig. 118: Cooling and ventilation 7.
The Site as System

The illustration below illustrates a series of systems that complement 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 intrusive, expensive and unsustainable air-conditioning appliances.

The prevailing wind direction in Okinawa Prefecture 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 cool existing pool water, the temperature decreases. For further cooling, air travels through a golden wall that retains moisture between the stones and cools the air as it passes through.

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

Fig: 178: Window for more.

The heat and moisture build up within the locker rooms escape by means of natural cross ventilation through operable windows and ventilation vent above the shower areas.

Fig: 179: The site as system.
Sewage

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

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 biodegradable standards.

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.

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 regulate 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.

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.