# CONCRETEBETON

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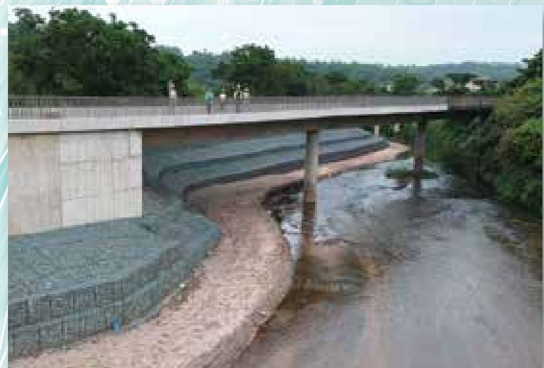
## FULTON Awards 2022





A CELEBRATION OF EXCELLENCE AND INNOVATION IN THE USE OF CONCRETE

# King Edward VII School (KES) Aquatic Centre

## PROJECT DESCRIPTION:

The King Edward VII School (KES) Aquatic Centre, in Houghton Johannesburg, comprises the redevelopment of the previous uncovered aging school swimming pool where portions dated back to 1927, into a world class aquatic centre to be used for the swimming and waterpolo learners of both the high and junior schools.

The architectural design maximised the existing swimming pool site to encompass a new 2 750 m² covered yet naturally ventilated aquatic centre to include two large new pools plus a learn-to-swim facility.

Within the covered area, a new double storey adjoining structure houses the changing rooms, upper viewing platform and plant rooms while keeping and upgrading the original 1920's northern entrance - a structure with significant heritage value to the school. A focal point of the development is the intricate feature roof with clear spans of 38 m over the pools and an intriguing, stepped apex in plan creating an unusual form and space.

The collaborative and iterative design process resulted in concrete being used extensively and it forms an integral part of the building.

The KES Aquatic Centre proved that upfront collaborative design engagement can result in a combined architectural and structural engineering solution that not only compliments the original intent of the Architect's design but enhances it, with concrete being proposed and used to benefit both.

## CONCRETE DESCRIPTION:

This project includes portal frames and support columns to the long span structural steel roof incorporating high-capacity Peikko COPRA cast-in anchors used for the first time in Africa. Each portal frame and the opposing support column were cast in one cast each without joints using specialized steel shuttering to create the finished sculptural elements. The feature roof of structural steel and reinforced concrete elements has an apex of consistent height above the pools to slide on plan by 20 m over the 56 m length of the roof, or 360 mm shift per metre length.

Reinforced concrete was used for the two large pools to ensure the desired shape of the pools could be met, plus ensuring watertight shells with the addition of a waterproofing admixture.

The Centre has a reinforced concrete frame. To create a unique and contrasting feature to the lighter and slimmer long span roof, a feature "diving" architecturally exposed RC column and cantilevering beam was proposed for the internal support of the roof rafters. Standard RC beams and external column completed the eastern support frames. Nine of these frame elements were repeated along the length on the building on grid at a typical spacing of 6 m.

On the eastern and western facades between the feature RC frames and columns a set of concrete eaves beams were added, in two braced bays to provide a reinforced concrete portal frame in the north-south direction for stability.

To limit the depth of the roof structure the design chosen was a double portal frame, namely the 38 m span portal over the pools and the shorter 9.335 m span portal over the eastern block.

The final element of the superstructure was the suspended first floor of the eastern block creating an elevated viewing platform for the pools above the changing rooms and housing the heat pumps for the water heating system above the pool plant rooms. To eliminate vertical supports in the plant room and enable flexibility in the changing room design, a flooring solution capable of carrying the 650 kg/m² imposed loading over the 9 m clear span was required. To provide this one-way spanning solution, a precast prestressed concrete hollowcore plank and in-situ structural topping system was proposed. These planks were supported on either loadbearing brick walls or on in-situ RC beams where openings were required at ground level. This provided a prefabricated solution that was lighter than an in-situ solution and faster to construct with an optimal load capacity to weight ratio for a concrete slab solution over this span.

# Entry

Below the superstructure a standard concrete surface bed with typical joints on compacted fill was designed for all ground floor slabs. The superstructure was supported off deep piled foundations – cast in-situ reinforced concrete augured piles with reinforced pile caps and ground beams. The RC ground beams along the eastern and western façade between supporting piles on grid acted both as the vertical support of the façade brickwork and the horizontal restraint via passive earth pressure to resist the base horizontal thrust of the roof.

The design addressed sustainability on various levels: the appropriate use of materials to reduce material use and waste; blended concrete mixes were used to reduce the embodied carbon footprint of the concrete; and attention was to paid to detail to reduce the need for over-cladding, dropping the material usage as a whole.

## TEAM

**Location:** Johannesburg, Gauteng
**Categories Entered:** Buildings up to R50 Million Value | Innovation and Invention in Concrete
**Submitted By:** Akhane Construction (Pty) Ltd
**Client/Developer/Owner:** King Edward VII School
**Project Manager/Principal Agent:** Shed Architecture + Design
**Structural Designer:** Webber Civil & Structural Engineers
**Architect:** Shed Architecture + Design
**Specialist Sub-Contractor:** Concrete Slab Supplies (Pty) Ltd
**Specialist Sub-Contractor:** Form-Scaff – A division of Waco Africa (Pty) Ltd
**Specialist Sub-Contractor:** Peikko South Africa (Pty) Ltd
**Specialist Sub-Contractor:** Penetron South Africa (Pty) Ltd
**Concrete Supplier:** Métier Mixed Concrete (Pty) Ltd