An Iconic Building And A Successful Stadium
The Moses Mabhida Stadium is a stadium in Durban, South Africa, named after Moses Mabhida, a former General Secretary of the South African Communist Party. It is a multi-use stadium. It was one of the host stadiums for the 2010 FIFA World Cup.
Moses Mabhida Stadium

**Client:** Strategic Projects Unit, Ethekwini Municipality

**Professional Team:** Ibhola Lethu Consortium (Pty) Ltd

**Main Contractors:** Group 5, WBHO, PANDEV Joint Venture

**Address:** Stamford Hill, Durban, South Africa

**Capacity:** 85,000

**Opened:** November 28, 2009

**Height:** 344 feet (105 m)

**Stadium:** 320m x 280m x 45m
Introduction:

- The multifunctional stadium is situated on a raised platform and is accessed from the South by a broad flight of steps.

- The 85,000 capacity stadium sits on an elevated platform, with a façade of perforated metal sheeting and a cable-tied canopy roof.

- Construction began in 2007 and was completed November, 2009.

- The Ibhola Lethu Consortium (ILC) was responsible for the design and project management of the stadium. Schlaic, Bergermann und Partner (sbp) served as conceptual structural engineers.
- **Major concept**: representing *Unity* among the different parts of the nation.

- The arch design representing unity has been inspired by the **African Flag**.

- The arch as a **landmark** forms an imposing part of skyline of Durban.

- From the **sky deck**, visitors can enjoy a spectacular view over the city and the Indian Ocean.
The stadium stands on saturated swamp-land that was blanketed with sea-sand.

In these marshy condition all heavy structures must be piled down to the bedrock, 20 meters below the ground level.

Diaphragm walls chosen because they were the most practical and least time consuming.

Foundations are elongated rectangular boxes with 800 mm thick reinforced concrete walls. The northern foundation is 44 m x 7 m in plan and the two southern foundations are 30 m x 4 m in plan.
The main forces transferred through the arch onto the **reinforced concrete foundations** are in excess of 100 MN applied at an inclination of 38 degree to the horizontal.

Finally it took **five and a half months** and required a total of 4000 (cubic meter) concrete and 9 Km of anchor cables, and 800 tons of reinforcing.
The connection of the arch to its foundation is facilitated through the application of a reinforced concrete plinth.

- Southern foundation structure showing cables used to post-tension the diaphragm panels.
- Concrete plinth where arch meets its foundation with a trapezoidal shape.
The stadium includes:

- Indoor Arena
- Institute Of Physical Education
- Football Museum
Moses Mabhida Stadium’s Structure

- A 105 M (Two-pronged) Arch
- Radial Pre-stressing Cable System
- PTFE-coated Roof Membrane (Tensile Roof)
- Compression Ring And Façade
- Precast Concrete Columns Below And Hollow Box Steel Columns Above
- Raised Platform
The expansive 350 meter arch (two-pronged) rises 105 meter and carries the weight of the roof’s inner membrane.

At the northern end, a cable car transports visitors to the ‘Sky Deck’ at the apex of the arch.

The arch consists of a 5×5m steel hollow box and weighs 2,600 T
The arch is connected by cable system to the external edges of the roof.

The unusual geometry of the cable system is derived logically from the structure.

Radial pre-stressing cables are attached to the external edge of the roof all round the stadium and the great arch on one side, and the inner edge of the roof on the other.

95mm diameter steel cables.
• **Roof** consists of a 46,000 sqm (500,000 sqft), Teflon-coated glass-fibre membrane
• The **PTFE-coated** roof membrane **admits 50% of the sunlight** into the arena, while providing shade with providing protection against glare and rain.
The **Bowl**

- The shape of the bowl results from the *interaction of the circular roof structure* with the triple-radius geometry of the arena.
- Around the field, **900m of retaining walls** stretches 8m high.
- **A total of 1,780 pre-cast concrete seating panels** creates the bowl form.
- The stadium’s bowl was created by a total of **1780 precast concrete** seating panels, with **1750 columns** and **216 raking beams**.
The compression ring and facade are carried on precast concrete columns below and hollow box steel columns above.

Over 100 columns surround the stadium. The height and angle of inclination varying around the stadium.

The facade membrane of perforated metal sheeting provides protection against driving rain, strong winds and direct sunlight.

Perforated facade membrane forming a live pattern of light and shadow.

In total 15,000 sqm (160,000 sqft) of facade will surround the stadium.
Load Tracing
The artificial lighting of the stadium is not just functional, but also serves to illuminate the architecture.
The roof surfaces on either side of the great arch are illuminated on top by a line of LEDs mounted directly on the arch. Atmospheric quality and functional efficiency have been combined to put Durban’s new icon in the right light.
A total of 225 520 T of concrete and 9150 T of reinforcing steel has been used in the project

- concrete slabs for level floors
- 56*10 meter long steel segments for the arch
- 95-mm-diameter steel cables
- 880-m-long steel compression ring
A Green Stadium

- 90 percent of the labor used was local
- 85 percent of the materials used were locally sourced.
- Some fly-ash from post-consumer use was used in the cement mix of this beachfront monolith.
- High percentage of recycled steel components were used
- All of the 70000 seats have been manufactured from 100 percent recycled plastic.
- The stadium has a high energy usage during an event which would last four hours and then low energy usage during non-event periods.
Process of Construction of Arch And Compression Ring
Process of Construction of Arch
Process of **Construction-Arch and hollow columns Completed.**
Process of Construction of Roof
Process of Construction - Arch Completed.
References

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