



160m LONG CABLE STAYED PEDESTRIAN BRIDGE



The Blackburn Pedestrian Bridge is the first cable stay bridge project awarded to Structural Systems Africa (SSA) as a specialist subcontractor, and is also the first cable stay bridge awarded to the Structural Systems group on the African continent.

SSA's work included the supply, installation, stressing and grouting of the post-tensioning to the bridge deck as well as the supply, installation and tensioning of the cable stay system. At 160m in length, it is one of the longest cable stayed pedestrian bridges in the world and sits 10m above the dual carriage-way N2 highway located in Durban, South Africa. The two main 70m long spans are mirrored about the 61m high A-frame concrete Pylon. There is an 18m end span on the western end which does not incorporate any cable-stays.

The bridge will allow pedestrians from the nearby Blackburn community to cross safely over the highway to the Umhlanga Ridge Town Centre. Prior to the completion of the bridge, pedestrians had to cross the free-flowing N2 highway at road level, which has recently seen a dramatic increase in traffic since the opening of the new King Shaka International Airport in La Mercy, just north of Durban.

Rather than constructing the bridge using the balanced cantilever method, which would be typical for construction over 4 lanes of traffic, the bridge was constructed using staging which required extensive use of scaffolding, which had to bridge the highway to ensure 2 lanes of traffic per carriageway remained open whilst it allowed easy access for both post-tensioning and cable stay construction works.

Post-Tensioned Deck

The concrete deck is only 4.9m wide, typically cast in 16m segment lengths, with edge beams either side of the deck to accommodate 4x 12-strand PT tendons with 1206 BBR CONA CMI multi-strand anchors and a 200mm thick deck slab spanning between the beams. The longest of the deck tendons is 72m which is about the centre of the Pylon.

Stressing of tendons was done using a 300t centre-hole multi-strand jack, handled by a small SSA purpose made gantry due to limited overhead crane reach. Job specific permanent steel grout caps for the coupling anchor heads were designed by SSA to ensure that the continuity of each adjoining segment was not delayed by grouting of the completed segment, and designed such that the strands did not clash with the caps after coupling to the coupler.

Cable Stays

There were 16 sets of cable stays supporting the bridge deck, ranging in length from 25m to 72m, with 8 pairs of stays either side of the pylon. The cable stays for this bridge are on a small scale in terms of the number of strands per stay, with each stay consisting of 4x 15.7mm galvanized HDPE coated strands inside a black HDPE stay pipe. The BBR HiAm CONA 0406 system was used for the stay anchors. Pre-assembly of the stay sets was completed on the bridge deck, with the galvanized top fork anchors fitted to the stay prior to the stay being lifted and secured to 50mm stainless steel support plates cast into the top of the pylon, by means of a pin to allow rotation of the top anchor, after which the stays were inserted through the bridge deck into the bottom cast-in stay anchors and tensioned below deck.

The tensioning of the stays was completed below the bridge deck in 2 stages; the initial tensioning typically went to an average of 80% of the expected final stressing value. The second stage of tensioning was effectively a fine-tuning of the stays, based on the behaviour of the structure after Stage 1 stressing and also the actual forces in each stay pair.



Project Data Sheet

Year:
2009/2010

Location:
Durban, South Africa

Client:
JT Ross /
Devru Construction JV

Division:
Structural Systems
(Africa) Pty Ltd

Scope:
Supply, Installation and
Post-Tensioning of
Bridge Deck

Supply, Installation and
Tensioning of Cable
Stay System

Ph: +27 11 409 6700
Fx: +27 11 409 6789
Fx: +27 86 616 7482
Em: info@sslafrica.com
Web: www.structuralsystemsafrika.com