

The concrete challenges of Cape Town's BRT network

C&I input helped ensure consistency in the textured broom finishes, writes **Jan de Beer**.

About 28 000 m³ of concrete will be required for the construction of the dedicated bus lanes of the City of Cape Town's new Bus Rapid Transport (BRT) network.

By the end of April this year, the BRT project's Phase 1A will – at a cost of R4,6 billion – provide an extensive inner city



Quality control is an important aspect of the contract awarded to AfriSam for the readymix concrete for the BRT.



The City of Cape Town decided on a textured broom finish for the BRT network after considering various options.

link with Blaauwberg and Paarden Eiland, including stops at strategic points such as the new Green Point Soccer Stadium and Century City. Ultimately, by 2018, after the completion of all seven phases, the BRT network will extend all over the Peninsula, including Atlantis.

The BRT's dedicated lanes – sporting a distinctive pigmented red colour – are mainly situated in the middle of existing streets with glass-encased weather-protected concrete stations provided at intervals. Raised concrete kerbs will prevent any other traffic from using the two lanes provided for the new articulated buses.

Cape Town's BRT system was designed by civil engineering consultants, Hawkins Hawkins & Osborne in association with Vela VKE. Construction is being carried out by four local contractors, each allocated a specific section of the 27-km-long network of continuously-reinforced concrete lanes. Civis 2000 is laying 380-mm-thick lanes while contractors, Vusela Construction, Martin East and Baseline, will all be providing 200-mm-thick lanes. The lanes are between 4,5 m and 7 m wide.

The readymix concrete is being supplied by AfriSam from its Woodstock and Peninsula Quarry facilities for the bus lanes (with Chryso Lanxess red iron-oxide pigment added to the mix to achieve the red colour). Peninsula Quarry has supplied the concrete for all the sub-base and base course layerworks on which the red oxide concrete has been placed.

Jaco Cokart, works manager: Peninsula for AfriSam Aggregate & Readymix's Cape division, who designed and refined the concrete mix for the project, says: "We initially had to provide 60 m³ of readymix for the City of Cape Town's approval. NMC, the contractor who laid the concrete, cast the concrete in four sections with four different finishes. The first was a tined finish, achieved by dragging metal prongs on



One of the BRT stations under construction.

the semi-hardened concrete to create grooves; the second was a burlap finish produced by dragging a strong, coarse woven cloth over the concrete to produce scoring; the third and fourth were smooth floated and textured broom surface finishes. In the end, the City of Cape Town decided on the textured broom finish which initially proved a bit of a challenge for the contractors in terms of consistency of finish on the concrete surface. Thanks to input from Bryan Perrie, MD of the Cement & Concrete Institute, who visited Cape Town at AfriSam's request, the issue of achieving a suitable finish was resolved," Cokart stated.

Bryan Perrie says the continuously-reinforced concrete pavements (CRCP) were designed using cncPave, a special concrete pavement design program developed by C&CI. "The institute was consulted during the design process and provided input on ways of countering plastic shrinkage cracking caused by hot, dry winds. At AfriSam's request, C&CI ran a half-day workshop on CRCP construction for all the parties involved. The training was provided over a weekend to minimise disruption of work on the sites," he stated.

Cokart says in addition to the Lanxess red oxide pigment, Chryso's Omega 101 plasticiser was added to the concrete mix to reduce the water content and boost workability. Ash Resources' DuraPozz Pro fly ash was also added to the concrete mix to increase the workability of the concrete and control setting times.

The City of Cape Town's concrete mix design calls for 35 MPa (340 kg cement/m³). For the aggregates, the 26-mm stone specified initially required a 30% blend of 9-mm stone to boost flexural strength and density. The average 7-day flexural strength achieved is 5 MPa. "There was no time to wait for the 28-day flexural strengths, so – because of the fast-paced nature of the contract – it was decided to refer to the 7-day flexural results. The average 7-day cube strength achieved is 45,4 MPa; and for 28 days, it was 52,7 MPa.

AfriSam's initial concrete production rate was based on a required placement rate of 24 m³/hour but it has since been increased to 42 m³/hour. "Quality control is an extremely important aspect of the contract. Cube compressive strengths were checked daily and concrete beams were cast to assess flexural strength. Daily workability checks were carried out on every truck of concrete supplied by AfriSam with an AfriSam technologist on duty at each of the sites every day," Cokart added.

The major challenges of the project have included working on streets filled with heavy traffic and the need to provide concrete for casting volumes of up to 200 m³ per day. ■

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