

PALM JUMEIRAH: LOCAL CONCRETE BLOCK MANUFACTURER KEEP THE TIDES AT BAY IN DUBAI

The Palm Jumeirah, Palm Jebel Ali and Palm Deira are three 12-square-mile man-made islands being reclaimed off the coast of Dubai. Dubbed the "Eighth Wonder of the World" and billed as the largest land-reclamation project in the world, the islands will create a large number of residential, leisure and entertainment areas.

With 14,000 labourers working day and night, the first of three palm-shaped artificial islands, Palm Jumeirah, is nearing completion. On 30 November, the palm will open to some 4,000 residents. 'We are right on schedule,' Nakheel Chairman Sultan bin Sulayem told AME Info. 'The villas will be ready by the end of 2005, the trunk apartments in the second quarter of 2006, and the Crescent projects by the end of 2007. When fully complete by 2010, the Palm Jumeirah will be an offshore city, with some 60,000 residents and at least 50,000 workers in 32 hotels and dozens of shops and attractions.

Made possible by the wide continental shelf off the Dubai coast, and the relatively shallow depth of the Persian Gulf, Palm Jumeirah was constructed from about 94 000000 m³ of sand dredged from the bottom of the Persian Gulf. The sand fill was placed directly onto the (typically) 10.5m deep seabed using bottom dump dredgers. Above sea level, the top 3m of the reclamation was achieved using a dredging technique known as "rainbowing" in which the sand fill was sprayed - using dredging ships guided by GPS - over the surface of the emerging island.

The reclamation was made of calcareous sand, which was locally cemented into a soft sandstone. Although Dubai is a low risk earthquake zone, Nakheel's design consultant mitigated the risk of liquefaction by specifying vibro compaction ground improvement - this will also help to control differential settlements across the reclamation.

Access to beach and sea

One of the assurances made by the developers was that all residents would have access to beach and sea. After completion of the fronds of the palm however, it was found that at low tide insufficient water was reaching the 'armpit' area - where each frond joined the main stem of the 'trunk' - thus necessitating deepening of the sea bottom levels in these areas. This in turn called for a retaining wall system to be put in place, protecting the foundations of the buildings and also allowing for the creation of a suitable beach.



In October 2005, a phone call came through to Simon Knutton of Knutton Consulting – a well established engineering company involved in authoring the original design guidelines for CRB walls in South Africa - from Project Manager John Lund, with whom Simon had worked some 15 years previously. "We need to design a system of barrier blocks leading down to the beach and sea....can you assist?"

At this stage Simon Knutton, after having sourced and sent to Dubai photographs of every available block in South Africa - liaised closely with Holger Rust, Director of Terraforce, this particular South African company having had long experience and success in the field of concrete blocks.

After Terraforce supplied the necessary information on the proposed block system, drawings and prototypes were produced, and in November Knutton flew to Dubai with a proposal and sample block. Despite an alternative system being proposed by the dredging company, Knutton left after a short meeting with a confirmed design appointment.

As part of their ongoing co-operation, Knutton and Rust also decided on a strategy to chose a suitable manufacturer for the blocks and within two weeks, after proposing the idea to the company earmarked by Knutton, Rust negotiated an agreement with Alan Sakr, Director of Consent LLC, a Dubai based precast company, appointing them as exclusive producers of Terraforce blocks in the Persian Gulf Region.

Local Terraforce block Manufacture

Consent LLC wasted no time in springing to action and immediately spent 50 000 € on ordering a new mould box in Germany for their machine. The L16 blocks, adapted to local conditions, can be produced 8 blocks per pallet, 16 blocks per m². Under the oversight of Knutton Consulting, 50 000 blocks were produced in Dubai and in March 2006 Rust travelled to Dubai to assist Johannesburg based Jan Rabie of Telegenix with a test section of walling constructed on the island. Following final sign-off by the client, production then began in earnest, with Rabie being retained as consultant on the construction side.



Terraforce's licensee in Dubai, Consent LLC, has a state-of-the-art production facility with a number of modern machines and is currently manufacturing two Terraforce products for the project, namely an L16 rock-face retaining block and a 4x4 step block. The blocks, manufactured in pairs, are split vertically by hydraulic press after 3 to 4 days, creating a natural-looking exposed rock-like face. Due to the use of local aggregates and a blend of oxides and colours, the blocks blend in perfectly with the surrounding environs.

Extremely flexible in terms of design, the system is well-suited to sand applications. Teams have been sent over from South Africa to train the locals in the correct installation of the blocks. To install the blocks, a vertical section is first excavated at the water's edge. The interlocking and overlapping blocks are then placed in position with bottom blocks being recessed 60cms into the sand. Staircases are also being constructed from step blocks, allowing each villa direct access to the beach.

An estimated 1.5 million blocks are required to complete the Palm Jumeirah project at an approximate total cost approaching R70 million for block manufacture and installation alone. The construction company installing the blocks plans to have 1.1 million blocks in place by the end of November this year. Following the installation of the block wall, beach sand is then brought in by dredgers and blown into place, creating a section of 'natural' beach in front of each villa.

Close co-operation

From the sourcing and selection of the original product, followed by arranging for the dimensional alteration of moulds to suit the Dubai manufacturer through to design of the highly-flexible layout of the walling, Simon Knutton has been closely involved at each step in close co-operation with the other companies concerned. Knutton Consulting are scheduled to keep a watching brief over the ongoing construction of the walling until the end of this year and possibly on into 2007. Either Simon Knutton himself or alternatively the laying team trainers are required to be on-site for six days each month to ensure that the design concept is adhered to and that the quality of laying is maintained.

To Holger Rust the project shows once again how co-operation of South African know-how can successfully penetrate lucrative markets in far away places. "Credit has to go to all those who are helping this impressive project proceed smoothly, the more overseas exposure for us as South African service providers, the more benefit to the local economy. We really need to work together and showcase our competence to the rest of the world."



Did you know?

Dutch scientists were called in to study the area and perfect the plans to make sure the island would remain intact over time and through storms, and function correctly. However, the owners could not wait until they had completed their investigation, and ordered construction to commence immediately. After the island had been constructed, the Dutch scientists discovered that the tide could not reach all around the palm and if left, the water would stagnate at the top of the palm, and it would become a haven for algae and mosquitos. The owners saw this as unacceptable and ordered action to be taken immediately. The scientists then came up with the current design, which has two channels through the outer ring, each about a quarter of the way around from the nearest end. These channels allow the tide to come in through the sides as well, and this means that all of the water in the palm is replaced every two weeks.