Radar towers get a lift

Slipforming the shaft and lifting the external platforms of the George Airport radar tower.

Stefannuti Stocks Civils has recently participated in airport upgrading projects through their involvement in constructing new radar towers at airports in George, Durban and in neighbouring Swaziland.

The company was awarded the construction of a radar tower at George Airport in October 2008, with practical completion scheduled for July 2009.

The 45-m high concrete radar tower is situated on the eastern side of the main runway and forms part of a national upgrade of the radar coverage throughout the country for the air traffic industry by the Air Traffic and Navigation Services Company (ATNS). The tower will be equipped with an approach radar, comprising primary and secondary radar.

The primary radar functions to determine the position of an aircraft by making use of echoes from the aircraft. The secondary then relies on transponders in the aircraft to retransmit a signal that will be used by the secondary radar to determine the aircraft position. “The new radar is part and parcel of ATNS’ drive to improve its service delivery at George Airport,” says Frank Oliveira, Stefanutti Stocks Civils contracts director for the project.

Adverse weather conditions in the Western Cape as well as programme constraints led Stefanutti Stocks Civils and the consulting engineers Mzansi Africa Civils to investigate various methods of construction. The most innovative and practical engineering solution was to construct the central shaft using the method of slipforming and to construct the two external platforms at ground level. These platforms could then be lifted individually into their final position.

“Having completed similar towers previously, we knew what the challenges were likely to be and we were able to make some improvements to the construction process,” said Oliveira. “Weather conditions often made operations difficult, of course, but the site team coped well under the circumstances and the project was completed on time.”

The radar tower is 55 m high including the spherical radome, which protects the radar antenna from the elements. The concrete shaft, with an overall plan size of 6,4 x 6,4 m is founded on 16 cast-in-situ driven piles 520 mm in diameter. The 38-m high walls were slipformed by Stefanutti Stocks Civils’ sliding department.

Internal platforms inside the shaft provide space for a store room, a radar equipment room, turning gear room and an antenna platform at the top of the structure. The store room and radar room slabs are supported on steel beams with Bond Lock and structural steel decking. The turning gear room and antenna platform slabs are reinforced cast-in-situ slabs.

Vanguard in conjunction with Stefanutti Stocks Civils designed the lifting rig for the platforms. It consists of steel beams mounted to the top of the tower and to the underside of each platform with four lifting points each connected to a 70-t strand jack. Due to the limited lifting capacity of the

strand jacks, each platform was lifted into position individually. When the two concrete platforms had been hoisted to their final position, they were connected to the shaft with shear keys through openings left in the shaft walls.

Two hoist beams supported by electric hoists were installed to facilitate lifting/maintenance of the radar equipment and a galvanised structural steel staircase was provided inside the shaft for access.

Generator and UPS buildings are situated at ground level adjacent to the radar tower. The full scope of works includes the electrical reticulation, air conditioning, lightning and fire protection as well as the installation of the UPS and generator.

The 45-m radar tower at King Shaka International Airport, also constructed for ATNS over a six-month period, was completed in December 2009. The 400 m^3 of ready-mixed concrete required for the project was supplied by NPC-Cimpor from a batch plant set up within the airport construction site to facilitate delivery.

Various concrete mixes were designed for different applications on the tower. Foundations utilised 25-MPa concrete, the tower shaft walls and the external platforms required a 30-MPa pump mix and the shear keys needed a 45-MPa mix. Chryso SA superplasticisers were used to achieve slump retention properties. The mix contained NPC-Cimpor's CEM IIA-S 42,5N cement, tillite aggregate and a slag extender.

Traffic control tower at Sikhupe International Airport, Swaziland.

Oliveira explains that here too, construction of the external platforms was done at ground level and they were subsequently lifted into position with hydraulic strand jacks. "This proved to be as effective a method of construction as it was on the George Airport project," said Oliveira.

In Swaziland, the 55-m traffic control tower at Sikhupe International Airport is being built for the Swaziland Ministry of Economic Planning and Development. The eight-month contract is scheduled for completion in March 2010.

The 550 m^3 of readymix for the tower was supplied by Stefanutti Bressan Swaziland and the Inyatsi JV out of a batch plant set up within the airport construction site. Strengths consisted of 25-MPa concrete for the foundations and 30 MPa for the tower shaft walls and internal platforms.

The central shaft is being slipformed and the lift shaft inside the tower is constructed simultaneously with the tower's external walls. The internal staircase is of structural steel and, in order to provide earlier access, VCR and technical room platforms were designed in structural steel with concrete infill and external aluminium cladding. ■

More information from Maggie Ackerman on Tel: 011 571 4300