

NORTHERN WWTW Electro-Mechanical Refurbishment of Unit 3 CLARIFIERS

SUMMARY OF WORKS	
Type of Works	Waste Water Treatment Works
Location of Works	Diepsloot, Johannesburg
Size of Works (M&D)	150 ML/D
Date of Award	26 May 2016
Date of Completion	30 April 2019
Completion Value (Including VAT)	R 17 095 568.82
Client	Johannesburg Water
Conditions of Contract	GCC Second Edition 2010

INTRODUCTION

PCI AFRICA was appointed as the mechanical Contractor to refurbish Clarifier 3.3, 3.2 & 3.1, which included supplying, delivering and installing mechanical equipment for the Northern Wastewater Treatment Works.

This supply comprises of the following equipment

- Refurbishment of three (3) Clarifier and Associated Equipment's
- Construction of Concrete Scum Chamber

Section A – Clarifier

Plant Description

Clarifier Description

The refurbished clarifier - called secondary clarifier tanks. The clarifies are a flat bottom designed and use a siphon system to de-sludge

General

The machine is a rotating bridge design, supported at the centre on a pivot bearing and its outer end on a peripheral drive carriage assembly. Suspended from the bridge are a series of vertical suction pipes. Ten vee-shaped scrapers are fixed to the bottom of the suction pipes.

The settling tank inlet pipe passes under the tank floor turning upwards at the centre to discharge and disperse the mixed liquor within a deflector drum, inducing even radial flow into the body of the tank.

Activated sludge is deposited on the floor of the tank and is scraped to the centre of the vee-shaped scrapers, from which point it is withdrawn under hydrostatic head, through the transfer pipes into a sight box. Each of the vee-shaped scrapers has an individual transfer pipe and control/plug valve, thus enabling accurate control of the withdrawal of sludge to be carried out from the different zones of the tank. This facility is extremely useful as sludge will settle in varying concentrations at different radii of the tank.

Sludge is transferred from the sight box, via a siphon pipe into the sludge drum at the centre of the tank, and from this point, is transferred to the outside of the tank via an underground pipe to a chamber located adjacent to the Clarifier.

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Clarified effluent passes over a peripheral 'V' notch weir into an outlet launder around the top of the tank wall.

Stilling well Inlet dispersion arrangement

Flow from the central feed pipe is discharged and dispersed from the central column through a series of vertical slots just below the water level. The flow is then stilled and deflected downwards by the inner wall of the annular sludge drum which acts as a deflector and produces an even outward radial flow across the body of the tank. The central feed pipe/column also acts as a support for the bridge via the centre pivot.

Rotating Bridge

The rotating bridge, which spans from the tank centre to the peripheral wall, is manufactured from two channel sections, and is securely gusseted and braced. The bridge incorporates walkway, which is flanked on both sides by double row, tubular hand railing and stanchions, providing access to the transfer pipe control valves, the siphon, the centre pivot bearing and electrical pickup rings.

The bridge is designed to carry a superimposed load over the walkway area, as indicated in the 'Technical Specifications', and to cater for a deflection no greater than $1/325^{\text{th}}$ of the span, in accordance with established structural practice.

Centre Pivot

A pivot bearing assembly is used to mount the bridge on the central support. The centre pivot incorporates ball bearing units, designed to carry the bridge with superimposed loading and any twisting loads imposed by the scrapers. An arrangement is incorporated to allow small vertical movement of the bridge without imposing undue twisting to the bearing assembly.

End Carriage and Drive unit

Four heavy duty resilient tyred wheels, which run on the peripheral wall, are used to support the outer end of the bridge on an end carriage. The tyres are manufactured from polyurethane, which is resistant to oil and water, and which has a high wear resistance.

The leading wheel is driven by a TEFC waterproof, shaft geared motor unit mounted onto the wheel axle, which, in turn, is supported in two sealed pillow block bearing units, rigidly fixed to the end carriage. This ensures that the gearbox shaft and bearings are isolated from any overhung load due to bridge mass. The gearbox incorporates a service factor in excess of 3:1 of the design loading.

Full guards cover the wheels. The drive wheel cover incorporates a deflector to remove any foreign objects from the wall and prevent accidents/slippages.

Scraper and Sludge removal Equipment

A series of vee-shaped scrapers with abrasion-resistant rubber-wearing edges extends across the floor of the tank. Each scraper is secured to a vertical uptake pipe, suspended from the bridge structure with a horizontal branch leading to a common sight box mounted below the walkway. As the bridge rotates, the scrapers sweep the floor of the tank, and the accumulated sludge is discharged under hydrostatic head through the vertical tubes passing along the horizontal branches to the sight box. Precise control of the flow from each of the tubes is provided by a trimming plug valve in each vertical leg. These valves are accessible from the bridge.

The level of the sludge in the sight box is maintained below the discharge points of the horizontal branches by means of a siphon connected with the annular sludge outlet drum. Initial priming of the siphon is achieved by means of a hand pump. A sludge withdrawal pipe, connecting the annular sludge drum to the sludge removal pipe, below the tank floor, is provided.

The Contract was awarded to PCI in 26 May 2016 and completion envisaged 30 April 2019

The contract sum was approximately R 17 000 000.00