

Moma jetty in northern Mozambique – the new berthing facilities after completion

# Moma Mineral Sands – marine jetty upgrade



**Carl Wehlitz**  
Assistant Resident Engineer  
Project Management International (PMI)  
carl.wehlitz@pmi-ltd.co.za

## BACKGROUND

The export jetty at Kenmare's Mineral Sands Mine in Moma, northern Mozambique, required upgrading. The jetty is used to load mineral products onto a transshipment barge, which transports the product to bulk carriers anchored in deeper waters. This facility therefore forms an essential part of the mine's operations, and the upgrading works had to be performed without limiting on-going export operations.

Group Five was awarded an EPC (Engineering, Procurement and Construction) contract in September 2010 to refurbish the facility. The new design for upgrades to the facility was based on

FEED (Front End Engineering Design) engineering, which was completed by RLH Consulting Engineers, while the detail engineering for the project was carried out by WSP Africa Coastal Engineers.

The new design dictated that the entire existing berthing structure on the northern side of the jetty be replaced with a new, stronger berth. The design also included an additional berth on the southern side of the jetty as part of the mine's expansion programme, and to allow loading on either side of the jetty, depending on prevailing weather and sea conditions.

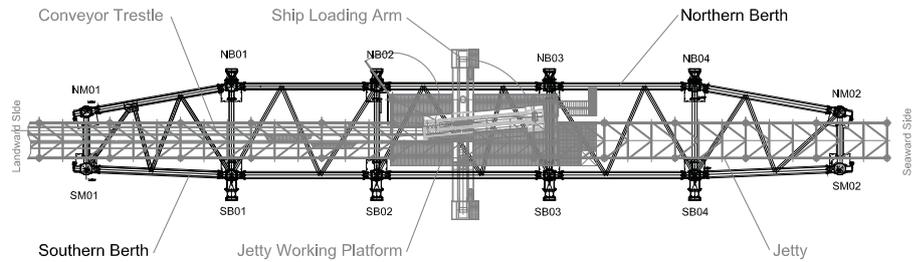
The two new berths consist of twelve Ø1.2 m steel piles driven to approximately 21 m CD (Chart Datum) with connecting headstocks. Horizontal bracing members were installed between the two berths to form a braced dual-berth structure. The horizontal bracing members are designed to distribute the berthing loads over several piles.

Group Five selected Subtech and Dura Pile to provide the marine and piling plant and other necessary technical support. PMI (Project Management International) was appointed by Kenmare for the management and supervision of the project, and to ensure the works were carried out according to the contract.

## THE WORKS

Refurbishment and upgrade works, as described in the contract, included the removal of the entire existing northern berth and replacing it with a new berth, the construction of a new full berth on the southern side of the jetty, and the installation of bracing members between the northern and southern berths to form a dual-berth structure.

Onsite preparation started in February 2011, and construction works commenced beginning March 2011 after the arrival of the crane barge and piling equipment.



A plan view illustration of the new berth design. The facility consists of two berths, one on the northern (N) side of the jetty and one on the southern (S) side. Each berth has four berthing (B) dolphins and two mooring (M) dolphins



The 5-ton drop hammer used to confirm pile refusal. All piling equipment was kept on the barge at all times

The remoteness of the site made this project a challenging one. To transport heavy material and equipment to site by road was a daunting task, and custom clearance often took longer than anticipated.

To tackle the transport issue, all the requisite plant and prefabricated components were loaded onto two barges in Durban and towed to site. Good planning was essential as the remoteness of the site meant that additional or emergency supplies had to be driven to site or flown in, with major time and cost implications.

At the start of the project, one of the main challenges of the execution plan was to accommodate the mine's export operations during construction. With the assistance of PMI, the sequence of construction activities was carefully developed to allow the mine to continue exporting material, while work on the berthing facilities continued.



The existing northern berth was removed in small portions. On completion of the project, all scrap material was removed from site

The execution plan required that Group Five construct the new berth on the southern side of the jetty while the mine continued its loading activities on the existing northern berth. After the work on the new berth had been finalised, the facility was well equipped to deal with Kenmare's export operations. This allowed Kenmare to shift its operations to the new berth and continue

loading, while Group Five continued construction on the northern side.

To achieve continuous loading, the conveyor system had to remain fully operational throughout the entire construction period. The presence of the conveyor trestle and ship loader limited access to the working area, so that all marine and piling operations had to be carried out off a floating plant.

The execution plan was developed to utilise the existing structures as far as possible to facilitate construction. Several landing and assembly guides were pre-manufactured to facilitate piling and heavy lifting operations.

A piling guide frame was designed to be installed onto the existing jetty rails to support the piles during operations from the crane barge. This guide frame was modified several times on site to facilitate work at the various locations. For instance, the guide frame was modified to be wider and taller to allow clearance for the conveyor trestle when installing the landward piles.

Similarly, the rise of the conveyor trestle to the ship loader made it impractical to install the guide frame for the installation of certain piles. In this instance, two separate frames were installed and welded to the jetty underneath the conveyor system to facilitate work at these locations, so that the piles could be installed successfully.

The two berths were designed in such a manner that the various structural components would fit easily into one another and be bolted together. All steel components were prefabricated in South Africa and the construction methodology was developed to minimise the need for onsite welding.

The workability of the floating plant and equipment was dependent on wave height and sea conditions. Consequently work could only be done during calm weather. As the project started at the end of the good weather period, the weather was a major determining factor for workability. Seven-day weather forecasts were used to plan the work in advance. However, due to the nature of the plant and the construction methodology, weather limitations still resulted in long periods of standby time.

During bad weather periods, the floating plant was moved to a secure location in the lee of an island approximately 11 km offsite. During good weather periods, the construction team worked extended hours, often rotating day and night shifts to capitalise on the construction opportunity.

## PROJECT FINALISATION

Work on the new southern berthing facility was finalised and taken over by the client in mid-August 2011.

By the end of August, all piles were



The piling guide was modified to allow clearance from the conveyor trestle. The hanging frame was also extended to cope with the additional height



The construction barge *AEGIR30* and equipment barge *Imvubu* at work alongside the jetty. Barge *Imvubu* was loaded with headstocks, walkways and bracing members. These components were prefabricated in South Africa and sent to Moma to reduce the need for welding on site

installed. Remaining work included the installation and grouting of headstocks, the installation and welding of the remaining cross brace members and the installation of all marine furniture.

Work on the northern berth was finalised by the end of September 2011 and the fully braced facility was handed over to Kenmare soon after. Kenmare has successfully loaded products on both sides of the jetty and both facilities are functioning well. Since the completion of the new facilities, Kenmare has increased its throughput capabilities.

The refurbishment and upgrading of the Moma export jetty was an unusually challenging marine project, mainly due to the harsh marine environment of northern Mozambique, and the fact that the project was undertaken entirely off a floating plant and on an open coastline.

### Editor's Note

This article follows on a previous article about this fascinating project that appeared in the July 2011 edition of *Civil Engineering* (pages 41-45). ■



The transshipment barge loading on the southern side of the jetty for the first time