



Piling Ahead

Construction of Felixstowe South, the UK's newest deep-water container terminal, is continuing on schedule.

The main quay wall will consist of 274 massive steel piles, shipped to Felixstowe from Holland. Each of the piles is up to 38 metres in length, 2.56 metres in diameter, and weighs approximately 47 tonnes.

The piles are installed using floating plant on two specialised barges. Piling gates, supported from temporary piles, are then used to hold the piles in

position while they are driven into the seabed. The gate is first checked to ensure that it is perfectly aligned and fixed into position before the piles are lifted into the gate.

The piles are driven in batches which correspond to the number of piles between fender positions. The pile is lifted into place with a barge mounted crane, and is then checked for vertical and positional alignment. Once in position, a vibratory hammer is used to drive the piles as far into the seabed as possible.



One of the two piling rigs in action

When the piles have been driven to refusal, the piling hammer is switched from a vibrating hammer to an impact hammer. The piles are then driven down to the final quay wall level.

The piles will form a closed wall, and fill will be placed behind them to complete the reclamation of land for the terminal.

Topping Off



A 62 tonne fender unit being transferred on site

The piles driven into the seabed to make the quay wall will be topped with pre-cast concrete 'capping beams'. These capping beams will form the surface of the quay, onto which the rails will be positioned for the giant ship-to-shore cranes.

The pre-cast units range from 23 tonnes up to 62 tonnes and, rather than transport them by land, they are being manufactured on site. The casting is taking place in 22-Shed, which started life as an aircraft hanger when the Royal Navy's seaplane programme was based in Felixstowe.

Although convenient in many respects, the restricted headroom in 22-Shed has required the sourcing of a special 80-tonne telescopic crawler crane to facilitate work within the shed. The crane is used to lift the 23 to 28 tonne units from the casting beds on to a tractor and trailer, which then transports them from the production area into storage.

The 62 tonne fender units are manufactured on a steel casting bed, which is raised 850mm off the ground. In order to move these mammoth units, a 110 tonne multi-axle drawbar trailer is reversed under the frame using a large John Deere tractor.

Using the hydraulic lift capability of the trailer, the unit and frame are lifted off the plinths and towed out the hanger. The total tow weight is 92 tonnes.

The use of 22-Shed on-site has enabled Costain, the main contractor, to consistently produce high quality units without any loss to the programme due to inclement weather conditions.

(Very Big) Ships Ahoy!



The 14,000 TEU MSC Beatrice making her maiden call at Felixstowe in April 2009

Felixstowe South is the only container terminal under construction in the United Kingdom which, when it opens, will be able to accommodate the latest and largest container ships afloat.

There are currently only three berths available in the whole country capable of handling the world's largest container ships, and two of those are at Felixstowe's Trinity Terminal. The number of these ships is set to increase rapidly. At the beginning of 2009, there were only 25 ships in the world with capacities in excess of 10,500 TEU (standard sized containers).

This is forecast to increase to over 200 by 2013.

It is essential for the future of UK trade that Felixstowe South is developed to handle these huge container ships.

Felixstowe South will, ultimately, provide 1,285 metres of quay dredged to a depth of 16 metres alongside – but capable of being deepened to 18 metres – to accommodate these ultra-large vessels. 730 metres of quay will be provided in Phase 1, equipped with seven giant ship-to-shore gantry cranes for transferring the containers between ship and quay.



The dredger Brabo depositing material on site

Digging Deep

Unsurprisingly, the construction of a new container terminal involves a large amount of marine works – both dredging and reclamation.

The dredging work at Felixstowe South is being carried out by Westminster Dredging Company, part of the Royal Boskalis Group. Based in The Netherlands, Royal Boskalis is one of the world's leading dredging specialists. Their first job was to dredge soft, unsuitable material from the reclamation footprint. This work has been completed, and an approximate volume of 750,000m³ of material has been dredged from the site.

Once the unsuitable material is removed, it is then replaced with sands and gravels, with the correct properties upon which to build a modern container terminal. To date, 1,670,000m³ of sand reclamation has been placed on site.

The first phase of the reclamation involves the construction of lower and upper bunds behind the line of the new quay wall. These structures, as well as the fill behind them, is now complete and the material can be clearly seen at low water (see cover photo).

The trailer suction hopper dredger, *Brabo*, has placed the majority of this fill to date. The vessel has a hopper capacity of 12,000m³ and has made 141 trips to mining areas off Great Yarmouth and Felixstowe. There

were also 57 loads delivered by the dredger *Crestway* and 52 by the *Barant Zanen*, all from mining areas off Felixstowe.

A well-graded, coarse, granular sand and gravel was specified as the fill material. This material was necessary to ensure the stability of the retaining bunds. Onboard material technicians, who are able to sample the material as it is dredged, control the overall quality.

Each sample is then tested for grading in a purpose built on-site laboratory. In total, 1,600 tests have been performed in order to prove the quality of material placed. Samples have also been sent to an off-site laboratory, where specialist tests were conducted in order to determine other physical characteristics of the material.

As the construction of Felixstowe South effectively brings the port further out into Harwich Harbour, it is necessary to widen the western side of the main approach channel to maintain the existing channel width. The *Crestway*, a smaller, more suitable vessel for making the short trips across Harwich Harbour, will be used to complete this campaign. The *Crestway*, which has a maximum hopper load of 5,600m³, will place 5-6 loads of sand fill per day on the Felixstowe South site. A total volume of 600,000m³ is expected to be won from the channel widening operation and will be placed to form the new quay.

Quality Assured Halcrow

Although Costain, as main contractor for Felixstowe South, has a wealth of experience, it is important that each stage of construction is checked and double checked to ensure it complies with design standards. Halcrow has been employed as the Employer's Representative for the contract to do just that.

Under group Director Chris Boysons, Halcrow has two main functions. The first is a check to ensure the contractor's design complies with the employer's requirements.

It is then up to Halcrow's site team to ensure that the contractor performs to the 'consented' specifications and drawings. The contractor is obliged to conform to a Quality Assurance procedure which records his workmanship. Halcrow ensure that this procedure is adequate to achieve the requisite quality and through monitoring, observing and auditing, certify that the specifications and progress have been achieved.

Chris Cattell, Chief Resident Engineer for Halcrow explains, "The team is organised into landside and marine works. The Marine Chartered Resident Engineer is Richard Hills, who brings with him nine years of maritime experience and

whose job it is to challenge the main contractor's staff in their management of the works. The 2.56 metre diameter tubular piles which form the main quay wall will allow for a future berth depth of 18 metres alongside. This will accommodate the largest container ships of the foreseeable future and it is essential this work is completed to specification."

Halcrow staff maintain continual liaison with the contractor and port staff whilst recording what is happening on-site.

Safety in modern construction is the number one priority, and both the marine team, who are handling the massive 47 tonne piles, and the land team, who are moving 30 tonne concrete units, have to be vigilant. The review of the contractor's method statements and risk analyses forms an important part of Halcrow's role.

Container yards are not as simple as the surface appearance might lead one to believe, and a myriad of new and existing 'buried' services have to be integrated. Halcrow's role includes assessing potential problems and liaising with the port about the integration of new water and electrical works with the existing services.



Halcrow engineers testing one of the piles

Stack 'em High

Big ships need big cranes, and the Felixstowe South quay cranes currently being built in Shanghai will be capable of lifting containers 45m above the quay and loading a vessel with 24 containers wide on deck. The cranes will have sufficient capacity to handle twin lifting of containers (2 x 20' containers end-to-end) to 70 tonnes, and tandem lifting containers (2 x 40' containers side-by-side).

Each of the cranes weighs approximately 1,800 tonnes, and to increase stability of such a large crane, the distance between the waterside and landside legs (rail gauge) has been increased from the 30m at Trinity to 35m for Felixstowe South.

The cranes will be delivered fully erect from ZPMC in Shanghai,

and will be commissioned as far as possible before departure from China. This will include checking the crane speeds, as well as checking the full functionality of the *Merford Ergo* operator's cabin which is based on the latest cabins as fitted on the Trinity Terminal cranes.

There will also be extensive checks and examinations made on the cranes during manufacture and erection using Port of Felixstowe staff to support a local company for inspections (BV, Shanghai) and also consultants from the USA (Liftech Consultants Inc.) who have already undertaken a review of the crane design.

To assist the crane driver, the cranes are fitted with a Trailer Positioning System, which



The ZPMC construction site in Shanghai

'recognises' the trailer under the crane, and aids the truck operator to correctly position the container. They also have an Automatic Skew Control which corrects any skew movement of the spreader caused by wind, vessel cell guides, or load imbalance.

Additionally, a semi-automatic positioning system will allow the crane operator to pre-select

a ship discharge or loading operation, from which the system will then automatically calculate, positioning the crane to the target location with an optimised path and with anti-sway control.

These innovations will ensure that the cranes for Felixstowe South are as big, and as technologically advanced, as any in the world.

Progress to Date



October 2008



November 2008



December 2008



January 2009



February 2009



March 2009

