

About ESC Edition 08.03.2023

Further to simply supplying products we at ESC take a different approach to piling which is tailored to the customers' requirements. ESC believes that just supplying a product is insufficient and we strive to provide a level of support that is beyond customer expectations. This support ranges from general advice on the Client's options to full engineering support and design. ESC has amongst its divisions expertise in marine equipment, corrosion, trench safety and structural steel fabrication.

ESC products are produced & designed in accordance with the latest international standards as well as ISO 9001 Quality

Management Systems. Other specific standards depending on the client's needs can be applied on request.

ESC has designed and supplied its products to projects in every continent of the world, including Antarctica. In the last decade, ESC has successfully diversified into structural steel fabrication, synthetic sheet piling, cathodic protection, mooring bollards and marine fender systems to provide complete engineered solutions.

An Affiliate Of:





#### **COMPANY CERTIFICATION**

ESC products are produced & designed in accordance with the latest international standards 9001:2015, ISO 14001:2015, OHSAS 45001:2018 certifications for both supply, design and installation scopes related to sheet piling and piling related products.









#### **About ESC**

Across the globe, the ESC Group of Companies now consists of the following registered enterprises:

- ESC Al Sharafi Steel LLC, UAE
- ESC Al Sharafi General Contracting LLC, UAE
- ESC Steel Engineering Sdn Bhd, Malaysia
- Acerlum ESC SAPI de CV, Mexico
- ESC Nigeria Ltd., Nigeria
- ESC Steel Philippines Inc., Philippines
- ESC-Beregstal Jsc, Russia
- ESC Steel LLC, USA
- PT ESC Steel, Indonesia

#### And partners,

- Cimtronic Design & Engineering, Argentina
- Europile B.V., Netherlands
- Mageba Ukraine LLC, Ukraine
- Bulkplus Integrated Limited, Nigeria

The ESC Group has manufacturing plants located in China and the United Arab Emirates.

The ESC Group is also represented by agents of our own officers across Asia, Europe, North & South America, India, Africa and the Pacitic.

The ESC Case Study Booklet aims to highlight and explain the more technical components of some older and more recent jobs that ESC has completed.

#### **Global Locations**



- ESC Offices
- Registered Agents/Partners

### **ESC Project Case Studies Index**

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Project Name Al Jazeera Port

Project Owner Emirate of Ras Al Khaimah

General Contractor Athena SA

Project Location Ras Al Khaimah , United Arab Emirates

Product H Piles, Sheet Piles with Protective Coating, Tie Rods

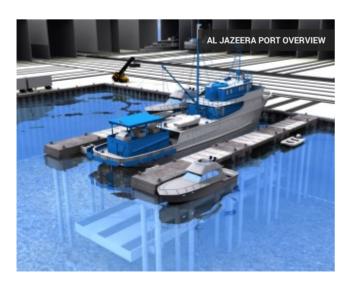
Total Tonnage 2,000 MT
Year 2008

#### INTRODUCTION

ESC's relationship with Athena SA continues to blossom with the award of more than 2,000 tons of steel sheet piles for the Al Jazeera Port in Ras Al Khaimah, UAE.

ESC looked at the design with the Contractor. ESC went through Section 4.3.4 of the document "Basis of Design" (922277-r-001, Rev B dated 16-8-07) which specifies that "a peak ground acceleration of 4 m/s 2 shall be considered for the lifting piers design as identified from the Global Seismic Hazard Map". It further specifies that "a horizontal seismic coefficient (kh) of 0.2 shall be used for the sheet pile quay wall".

Data from the Global Seismic Hazard Assessment Program (GSHAP) is shown visually as broad coloured zones on the hazard map. However, for more accurate identification, data is available also as a table of numeric values for specific latitudes and longitudes. In the data table, the geographic



location of the Al Jazeera Port is assigned a peak acceleration of 0.1998g. Thus, a peak ground acceleration of 0.2g represents the recommended design value arising from GSHAP data.

The suitability of such a design value can be confirmed by a site specific assessment of seismic hazard. Such assessment identifies potential seismotectonic sources that could influence the site as:-

The Dibba Fault Zone;

The Zendan Fault Zone; and

The Subduction Zone along the Zagros Mountains and Makran Region

From analysis of the available earthquake catalogue, it can be determined that earthquake magnitudes corresponding to 10% chance of exceedance in 50 years (rounded to the nearest 0.5) for these three zones are:-

Source	Magnitude for 10% Exceedance
Dibba Zone	6.5
Zendan Zone	7.0
Subduction Zone	7.5

For these magnitudes and the distances of the various seismotectonic sources from the site, attenuation relationships such as Sharma (1998), Ambraseys (1975) and Joyner & Boore (1981) demonstrate that the near-field Dibba Zone is the governing seismotectonic source. Further, the attenuation relationships predict that the peak ground acceleration with a 10% risk of exceedance in 50 years arising from the Dibba Fault Zone is in the range of 0.15g to 0.2g.

### **ESC SCOPE OF SUPPLY**

ESC continues to reach all corners of the world to provide customers with economic sheet piling solutions.

#### H-PILES, SHEET PILES, TIE RODS

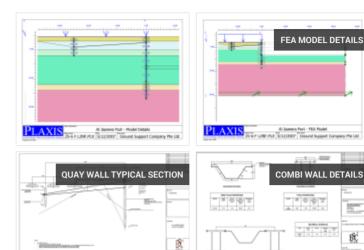
Thus, a peak ground acceleration of 0.2g as listed in the table of GSHAP values is supported by a site specific hazard assessment for Al Jazeera Port.

This project involved the delivery of ESC-H70/30B-2 H Piles and ESC-S10 sheet piles for the combi wall in 21.0 metre lengths. Main walls were accompanied by 10.0 metre ESC-EU25 deadman sheet piles. All piles are of Q345B steel grade and coated with 500 microns of Jotamastic 87 paint.

ESC also delivered tie rods 44.5 metres long in 72mm diameter, Grade 700, as part of the complete package for this project.

Pipe piles in 23.5 metre lengths with diameter of 900mm were also supplied in grade Q345B for the same site.

The piles were produced in China by ESC.



## **PACKING & DELIVERY**









### **UNLOADING TO SITE**



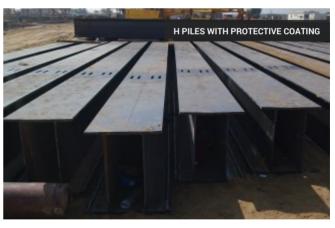


## **MATERIALS ON SITE**



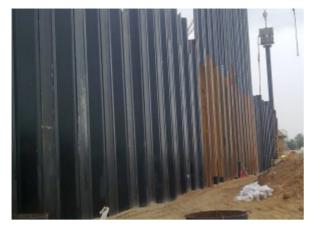




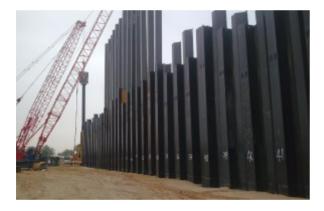




# **ON-SITE INSTALLATION**













# PROJECT COMPLETION









Project Name Barrow Island Load-Out Jetty

Project Owner Chevron Australia Pty Ltd

**General Contractor** MMJV

**Project Location** Western Australia

**Product** 

LSAW & SSAW Tubular Piles

**Total Tonnage** 

1,100 MT

Year

2010

#### INTRODUCTION

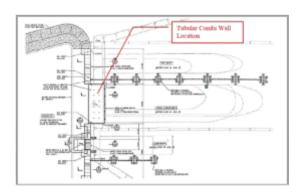
ESC delivered over 1,100 tons of combined wall system to MMJV for the prestigious Barrow Island LNG Plant Material Offloading Facility in Western Australia. ESC completed manufacture in both its China and Malaysia facilities. The King Pipe Pile design also contained structural fabrication scope for lifting lugs, tie rod brackets, shear connections and more.

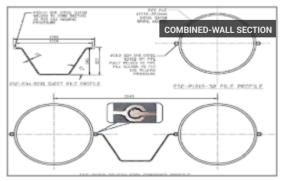
ESC in Malaysia and China built the combi-wall system specially designed for the Barrow Island LNG Plant Material Offloading Facility (MOF). This is part of the massive Gorgon Project for Chevron Australia Pty Ltd. The MOF will facilitate the offloading of the materials and the components that will be used to construct a major LNG (Liquefied Natural Gas) processing facility on the island. The Gorgon gas fields, off the northwest coast of Western Australia (WA), contain about 40 trillion cubic feet of natural gas and this development currently represents the largest single project underway in the world.

ESC's client was MMJV which is a project specific joint venture created by the joining of Marine and Civil Construction Pty Ltd of Australia and Murray & Roberts Marine of South Africa.

The unique aspects of the project were dealt with by ESC through constant dialogue with MMJV and Chevron's

Engineers Kellog Joint Venture (KBR, JGC, Hatch and Clough). Design evolution during the project construction required the manufacture from ESC to be very dynamic and able to facilitate change.





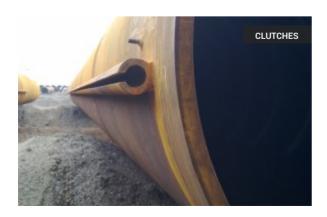
## **FABRICATION OF PIPES & PILES**

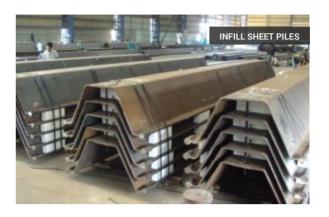
#### **ACTIVITIES**













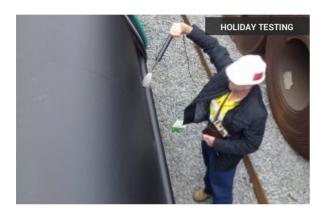




## **PAINTING OF PIPES**

#### **ACTIVITIES**









## **PACKING & STACKING**





## **SHIP LOADING**





# **ON-SITE INSTALLATION**







Project Name BHP Tug Harbour

Client Lend Lease Engineering Pty. Ltd.

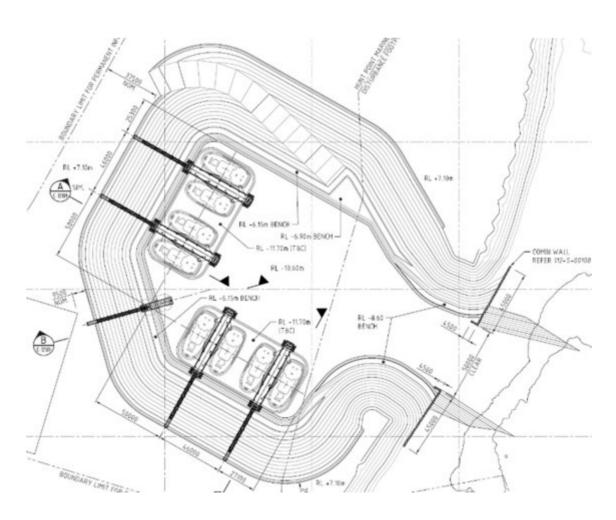
Project Location Port Headland, Australia

**Product** Tubular Pile with Clutches and Mooring Pipes

Total Tonnage 2,242 MT Year 2016



- 1. Mooring spuds with 3 LPE Coating that were used for the Tug Pontoons & Jetties.
- 2. Clutched Tubular Piles for the breakwater at the entrance to the harbor.



### **PRODUCT & PROCESS AUDIT**





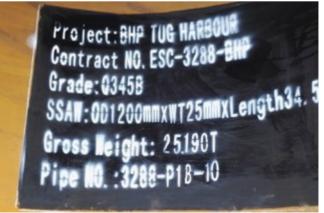
Clients mill visit.

### **WELDED TUBULAR PILES**









## **RAW MATERIAL RETEST**

#### **INSPECTION**







## PIPE INSPECTION PRIOR TO COATING





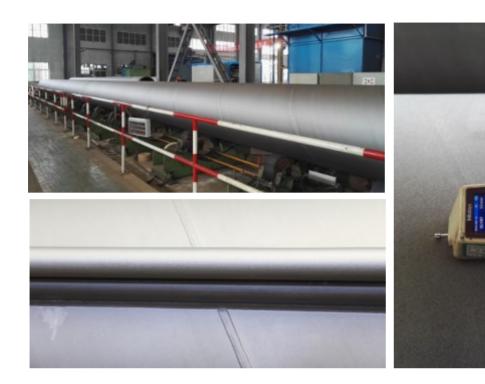






### SURFACE PREPARATION

#### **BLASTING**



### **PAINTING OF PIPES**











## **MDPE COATING**







## **HEAT SHRINK SLEEVE INSTALLATION**







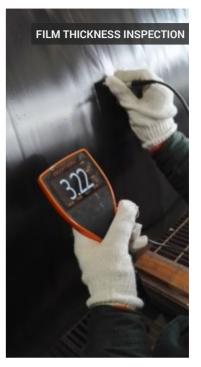




### **PAINTING INSPECTION**











### **PACKING & STACKING**







# CARGO STACKING















# CARGO LOADING



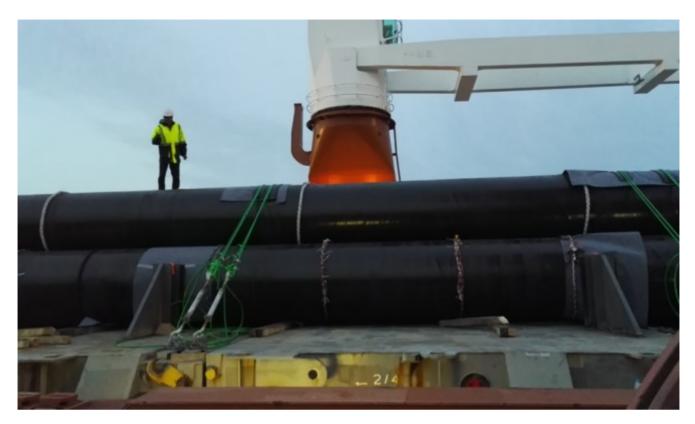








# **CARGO LOADING PROTECTION**











### **CARGO LOADING PROTECTION**











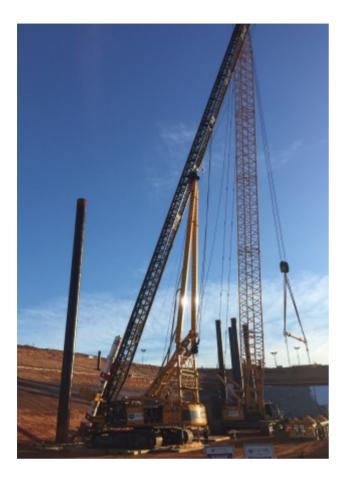
### **SHIP LOADING**





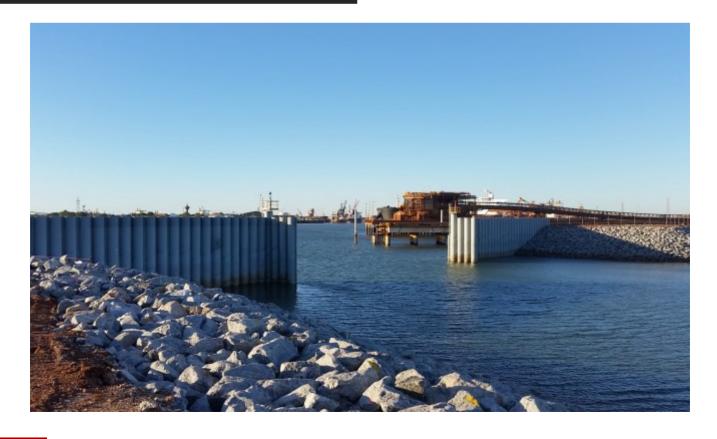


# **ON-SITE INSTALLATION**





# PROJECT COMPLETED





**Project Name** 

Client

**Main Subcontractor** 

Location

**Product** 

**Total Tonnage** 

**Delivery Date** 

Jubail Supply Base Project

Jubail Commercial Port

Dialog E & C Sdn Bhd

Jubail, Saudi Arabia

H Piles, Sheet Piles & Tie Rods

2,078 MT

2011

#### INTRODUCTION

The Jubail Supply Base (JSB) is located within the Jubail Commercial Port limits utilizing a shallow water wharf adjacent to the Commercial Port, with a common approach channel. The JSB at 80km north of Damman City and airport, is strategically located within the international air and shipping routes on the Arabian Gulf and in close proximity to major oil/gas fields within the Arabian Gulf and petrochemical complexes onshore.

Dialog E&C Sdn Bhd needed the water depth to be increased from -3.5m CD to -6.0m CD in order to cater for offshore support vessels for the supply base. A new sheet pile wall would need to be installed in front of the old wall to cater for the new depth requirements. They to ESC and we provided a solution that combined shipments from ESC's factories in China and Malaysia.

The best solution was an H Pile combination wall with deadman sheet pile and tie rods linking both walls.

### **ESC SCOPE OF SUPPLY**

#### H PILES, SHEET PILES & TIE RODS

The project tonnage was:

- ► ESC H90/40A-1 x 18m Q345B-1160 Tons
- ► ESC S9.5 x 18m Q345B−624 Tons (with pile shoes)
- ► ESC 22BP x 6m S355 294 Tons
- ► Tie Rods—57.55mm diameter with rolled thread grade St 670/800 x 19m—20m; 1740 kN yield capacity; Fully galvanized.

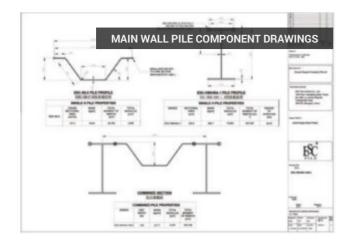
Waling beam (painted) size 305x305 (total 347 ton) with all necessary stiffener plates cut to size for fast and easy installation on site.

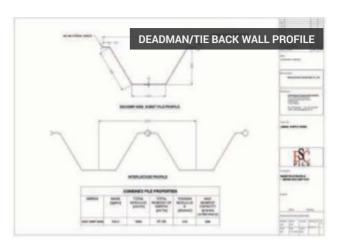
Based on soil investigation results, the wharf basin seabed was overlaid with a layer of very dense sand/cemented sandstone with thickness ranging from 0.5m-2m. Below the caprock, the subsoil statum comprised of medium dense sand and very stiff clay.

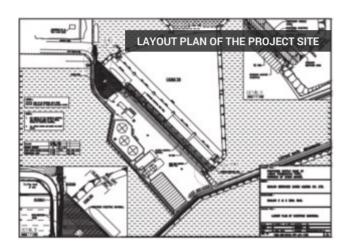
These soil conditions encouraged ESC to advise the client to carry out predrilling for the King(H) Piles and sheet piles to ensure full penetration and speed of installation. In addition, due to the hand driving conditions at the site ESC attached pile shoes on the infill S9.5 sheet pile.

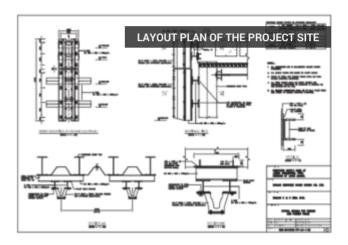
The painting system and surface preparation of the H Piles and sheet piles including other accessories had to cater for the environment category of C5M as stated in BS EN ISO 12944 and ISO 9223. The coating comprised of two layers of epoxy mastic totalling 400  $\mu m$  dry film thickness, Jotamastic 87 was used for this task. The surface preparation was sandblasted to SA 2.5 according to ISO 8501-1. All the sheet piles, tie rods, waling beam and other steel items were provided with these protective coatings.

## **PROJECT DETAILS**









# **PAINTING**



### **SHIP LOADING**





### **ON-SITE INSTALLATION**









# COMPLETED WALL





### **KAOHSUING PORT COMBI WALL, TAIWAN**

#### **COMBI WALL PROJECT**

Project Name Kaohsuing Port Combi Wall, Taiwan

Main Subcontractor Meng-Deng Construction Co. Ltd, of

**Location** Kaohsuing, Taiwan

Product Tubular Piles and Sheet Piles

Total Tonnage 10,282 MT

Delivery Date 2011

#### INTRODUCTION

Meng-Deng Construction Co. Ltd, of Taiwan had a project for the Port expansion in Kaohsuing, Taiwan. The options they were given by the normal large sheet pile providers were just not cost effective enough for the budget and design constraints that the Port had.

ESC Pile Steel Trading (Shanghai) Co, Ltd looked at the best method for the contractor and the Kaohsuing Harbour Bureau, Ministry of Communications. After several discussions and design options ESC and Meng-Deng settled on the Tubular sheet pile combi wall.

The Existing structure was unable to take the larger size of

the newer vessels as well as the required dredge depth for the larger vessels that were calling in Kaohsuing. The method approved was to install the main wall of the tube and sheet pile in front of the existing structure and then proceed with the removal of the old wall and installation of the rest of the system.

With Ports globally getting deeper and deeper in order to handle the post Panamax Container vessels and other newer and larger conventional vessels it is expected that more and more clients and Port owners will look to these solutions for their requirements.

### **ESC SCOPE OF SUPPLY**

#### **TUBULAR PILES & SHEET PILES**

The unbeatable combination of ESC's design and sourcing allowed the contractor to manufacture the 1470mm diameter, 15mm thickness tubes in 31 metre lengths (approx. 8000 tons) in Taiwan. Then, we sourced 28, 19 and 13 metre sheet piles from Nippon Steel in Japan (2,282 tons of IIIw in SY390) and finally the 109 tons of specially made IIIw sheet pile clutches that are unique to ESC.

The project saved considerable time and money for the contractor and was a very successful first tubular combi wall application in Taiwan.

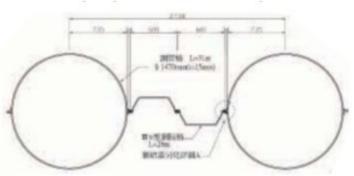


Figure 1 Plan view of the Combi wall profile

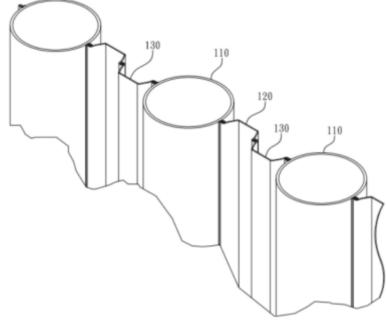


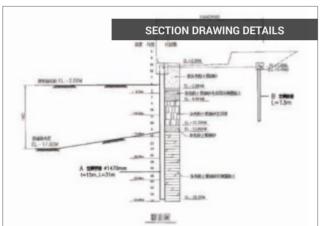
Figure 2 Clutch configuration detail

### PROJECT DETAILS

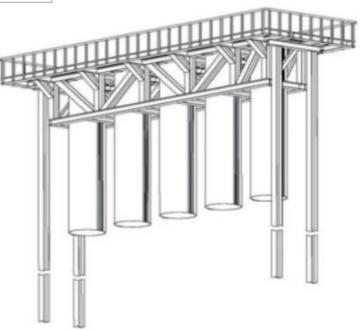
Here is the isometric drawing of the wall profile showing the two IIIw infill sheet piles in between the 1470mm tubes. This system is installed with the tubes or king piles first using a driving guide. Once the tubes are installed the guide is removed and the IIIw sheet piles installed between the spaces and slotted in using the special clutches attached to the tubular piles. Below, we can see the schematic drawing which allows for five tubular piles to be installed before the guide is removed. This guide is essential in the efficient installation of long marine sheet pile walls. Without it productivity is greatly reduced as well as the straightness and aesthetics of the final wall. As you can well imagine if you get the tubular piles out of alignment then it will be nearly impossible to install the infill sheet piles.

#### ISOMETRIC DETAIL OF THE MAIN WALL SYSTEM





#### DRIVING GUIDE DESIGNED BY ESC

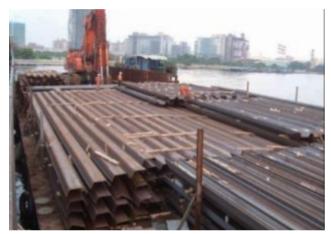


## PROJECT DETAILS





## **DELIVERY TO SITE**











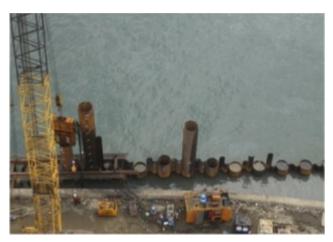


# **ON-SITE INSTALLATION**



















**Project Name** 

**Main Subcontractor** 

Location

Product

**Total Tonnage** 

**Delivery Date** 

**Ohau Channel Diversion** 

HEB Smithbridge Ltd

Rotorua, New Zealand

H Piles, Sheet Piles with Clutches

2,637 MT

January 2008

#### INTRODUCTION

Environment Bay of Plenty was granted resource consent to build the diversion wall structure in Lake Rotoiti. The Diversion Wall is designed to stop water flowing from Lake Rotorua into the main body of Lake Rotoiti, instead diverting it down the Kaituna River via the Ohau Channel.

Most of Lake Rotoiti's problems are caused by nutrients flowing into it from Lake Rotorua. So the diversion wall will, over time, significantly improve the lake's water quality. The Ohau Channel Diversion Wall is located at the outlet of the

Ohau Channel, which links Lake Rotorua and Lake Rotoiti. It is 1275 metres long and diverts the water from Lake Rotorua, with its higher nutrient levels, directly down the Kaituna River, preventing it from degrading Lake Rotoiti's water quality.

The wall cost just under \$10 million to build and was funded by Environment Bay of Plenty and Central Government. It is expected to improve Lake Rotoiti's water quality in less than five years, with the support of lakeside sewerage reticulation projects.

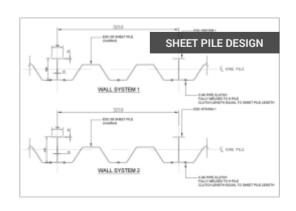
### **ESC SCOPE OF SUPPLY**

#### **H PILES & SHEET PILES with CLUTCHES**

ESC worked very closely with the Contractor (HEB Smithbridge Ltd) to provide the most practical and economical solution for this prestigious project.

The materials were all manufactured in ESC's China factory and delivered over the course of 2007. ESC constructed a custom wall system which allowed for a king post at 3.2 metre centres and infill sheet piles (3 numbers). The design was a reconfiguration of the ESC H Pile Combination series wall. All designs and calculations were carried out by ESC.

In terms of engineering, the wall was unique in that the engineer required a guaranteed zero settlement, even with NZ's high seismic activity. The H pile wall solution was therefore employed because the H piles could be driven deep through the soft lakebed mud and down onto the bedrock. In some cases, this meant H piles over 50m in length, which had to be extended during driving until the required set was achieved.



### **MATERIALS READY TO SHIP**



The diversion wall is driven into Rotoiti's lake bed and rises to just above lake level. It is made of large, precast interlinking concrete and steel wall segments designed to last for at least 50 years. There is a cap on top of the wall to discourage people from walking on it, for safety reasons.

The final design of the structure was based on feedback from the public at various hui (Maori Assembly) and public meetings, as well as comments received on the questionnaires, and a number of technical studies. These studies include:

- Water quality modelling
- Sediment transport modelling
- ► Hydrodynamic modelling of the lake
- Geotechnical investigations
- Assessment of effects on downstream water quality in the Kaituna River and Maketu Estuary
- Landscape and visual assessment
- Cultural assessment
- Ecological assessment, including effects on fish and water birds

The wall will divert water currently flowing through the channel from Lake Rotorua into Lake Rotoiti, directly down the Kaituna River. Currently, about 40 percent of this water flows into the Kaituna River, mostly in summer. The rest of the year it flows mostly into Lake Rotoiti.

The diversion will prevent 180 tonnes of nitrogen and 15 tonnes of phosphorus entering the main body of Lake Rotoiti from Lake



Rotorua each year through the Ohau Channel. The diversion is expected to improve Lake Rotoiti's water quality within five years, as research has shown that 70 per cent of the nutrients entering the lake come through the Ohau Channel. It is not expected to have any significant impact on Kaituna River quality.

A 5 knot/50 metre wide channel on the western side of the diversion wall allows boat access to/from Lake Rotoiti and the Ohau Channel. This channel is between the diversion wall and the red conical buoys. An exclusion zone between the red conical buoys and the lake edge protects birdlife.

The wall was part of a number of initiatives being used to help protect and restore the lakes - from structural interventions like the wall through to land use management practices to reduce nutrients leaching from farm land.

The effect of the wall is now being closely monitored to assess its success and whether wildlife is adversely affected by it or not, including a five-year fisheries monitoring programme.



# **ON-SITE INSTALLATION**











Project Name Port of Fujairah Oil Terminal 2, Phase 1

Client Port of Fujairah, UAE

Main Contractor Athena SA
Engineer MUC

**Location** Port of Fujairah, United Arab Emirates

Product Tubular Piles, Sheet Piles, Waling Beams, Tie Rods & Corrosion Protection

**Total Tonnage** 17,000 MT

**Delivery Date** November 2008

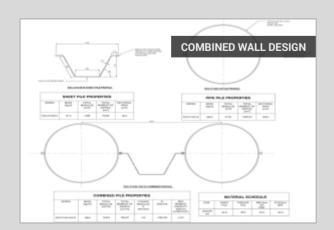
#### INTRODUCTION

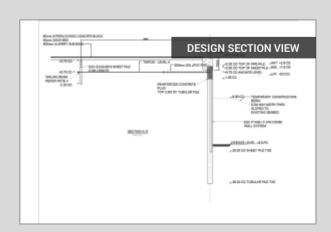
Athena SA and ESC proposed the ESC Combi-wall Tubular Pile system which eventually won the award from the Port of Fujairah and their Engineers MUC of the Netherlands. During the course of the design stage of the project ESC held site meetings in the UAE and visited MUC's geotechnical and structural team in Terheijden, Netherlands. ESC ensured that all facets required by the Client and their Engineers were able to be met.

The Port of Fujairah proposed a new quay wall for an oil terminal facility to be constructed to the north of

the existing port facility. The name of this project is Fujairah OT2. The main purpose of this quay will be as a vessel loading facility for oil products.

The type of retaining wall used is a steel tubular pile wall with sheet pile infills, restrained by tie rods to a buried sheet pile anchor wall. This wall was backfilled with locally dredged material. In addition, in order to counter possible liquefaction issues there was significant removal of inadequate material and replacement with suitable rock material.





### **ESC SCOPE OF SUPPLY**

### **TUBULAR PILES & SHEET PILES**

ESC delivered over 17,000 tons of combined wall pipe piles, sheet piles, tie rods and waling beams for the quay wall constuction as part of the expansion works for the Port of Fujairah - a multi-prupose port on the Eastern seaboard of the United Arab Emirates, approximately 110 kilometres from the Straits of Hormuz.

ESC not only worked with the owners but the contractor Athena SA had constant site visits and communication from ESC both during the design stage and the implementation stage of the project. Designs of the wall system took into account the preferred method of construction detailed by Athena SA and were adapted accordingly whilst at the same time ensuring the

stringent safety factors of the Clients Engineers were followed in terms of the seismic and structural conditions.



### **PROJECT DETAILS**



The design of the sheet pile wall was undertaken by ESC and detailed in a series of reports. The scope of the design covered by these series of reports was as follows;

- Evaluation of geological data and existing site conditions to determine a range of geotechnical parameters for use in the designs.
- Analysis of the retaining wall and restraint system given the geotechnical parameters, site requirements and loading considerations, including seismic design.
- Specification and design of necessary sheet pile and tie rod components to withstand the calculated geotechnical and imposed loads
- Evaluation of the corrosion conditions, and design of the sheet pile system components to accommodate these conditions, including specification of protective coatings.
- Various method statements required for specific tasks, including painting, bitumen sealing and clutch strength testing.

### **SURFACE PREPARATION**

### **ACTIVITIES**





## PAINTING OF PIPES



The specified coating for the sheet piles is for shot blasting to SA2.5 followed by 2 layers of 250 micron Jotamastic 87. The coating was applied to the top 22.3m of the front of the ESC Tubular Piles and the back 4m. The ESC Sheet Piles had the full 22m length both sides with paint applied. The ESC Anchor Piles had no coating.

# CARGO SHIPPING

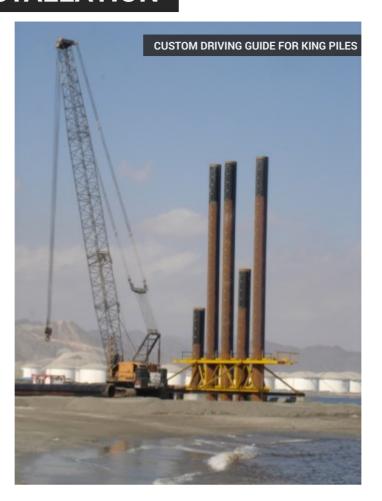


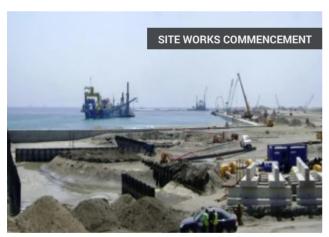


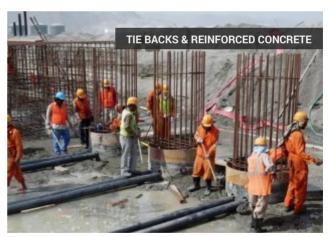




# **ON-SITE INSTALLATION**





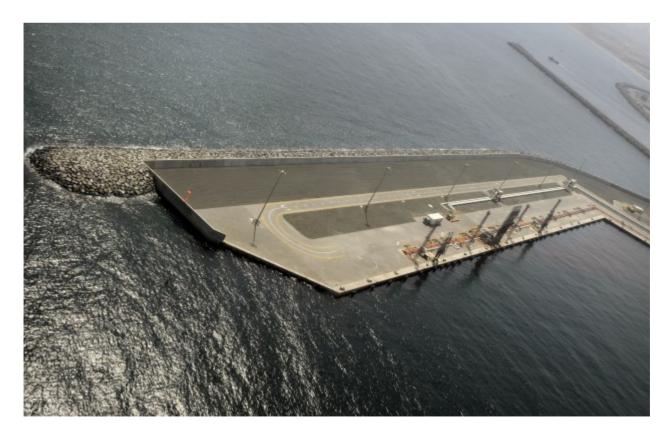






# PROJECT COMPLETED







Project Name

Port of Fujairah Oil Terminal 2, Phase 2

**Main Subcontractor** 

Athena SA

Client

Port of Fujairah, UAE

**Engineer** 

MUC

Location

Fujairah, United Arab Emirates

Product

SSAW Pipes, H Beams and Sheet Piles

Total Tonnage

8,445 MT

**Delivery Date** 

2013

#### INTRODUCTION

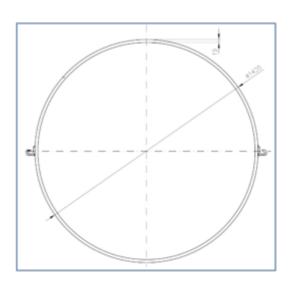
This project includes the construction of new quay wall for the extension of Port of Fujairah Oil Terminal 2, Phase 2, Berths 8 and 9. The total length of the quay wall is 890m and has a retaining height of 23.6m. The structure is a combi wall with driven OD1420mm tubular piles and sheet pile infills with raking H piles used to provide the support for the deep berth.



### **ESC SCOPE OF SUPPLY**

### SSAW PIPES, H BEAMS & CLUTCHES

ESC was awarded with the supply of SSAW pipe piles (OD1420mm x thk19mm x Length 30.5m) with material API Spec. 5L Grade X65 welded with ESC-C9 clutches and hot rolled H-beam (800mm x 300mm x 14mm in length 26m) with material BS EN 10025 Grade S450J0. Sheet piles were also supplied in singles from Nippon Steel and were type IIIW. The sheet piles were then joined into triples and painted and driven as one 1.8m wide section.



# **SSAW PIPE FORMING**

Pipe piles were manufactured in accordance with ASTM A252 standard. Welding is carried out in accordance with AWS D1.1/D1.1M, 100% VT and 100% UT performed on all full penetration weld seams.







## **CLIENT AUDIT**

Client representatives performed product audits during the manufacturing process. The scope of audit include SSAW pipe production process, clutch welding process, witness clutch pull-out test, and sample selection, cutting, and testing from steel pipe.







## **ESC C9 CLUTCH**

Various pull-out tests are carried out to ensure the reliability of ESC designed hot-rolled C9 clutch.

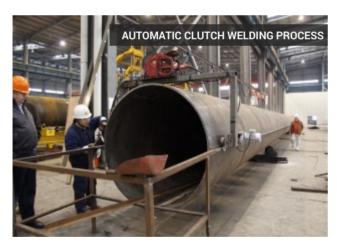


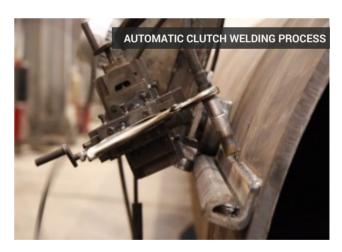


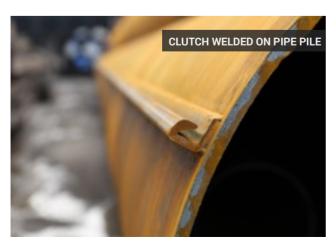














# FINISHED PRODUCT



## **CARGO SHIPPING**









## **ON-SITE BLASTING & PAINTING**

ESC UAE team was responsible to perform on-site blasting & painting for the entire products supplied under this project (Sheet pile, H-beam and pipe pile). Type of paint: Jotamastic 87 (Jotun) Surface cleanliness: Sa2.5 Total DFT: 480 micron.







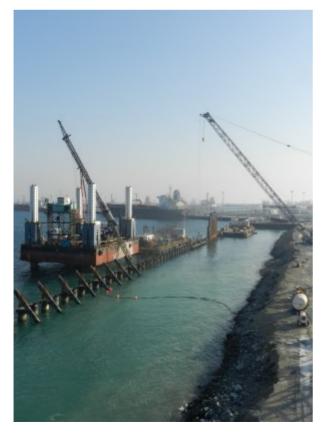
# SHEET PILE THREADING







# ON-SITE INSTALLATION







## **ON-SITE INSTALLATION**









**Project Name** 

Location

**Product** 

**Total Tonnage** 

**Delivery Date** 

Port of Veracruz Expansion

Veracruz, Mexico

King H Pile (with clutches)

1,000 MT

2017

#### INTRODUCTION

The Port of Veracruz is located in the Gulf of Mexico off the Atlantic Ocean, its location is strategic for trade between Mexico and the world. It is a leader in cargo movement along with agricultural bulk products and vehicles amongst others.

Additionally, at this moment the first stage of construction is carried out for the expansion of the port of Veracruz, a work of port infrastructure and logistics which will make the zone one of the most important on the American continent. With 54 Maritime Routes, inter-connected with 150 Ports throughout the world Veracruz is a port zone with an ample foreland promoting domestic trades with countries of the 5 continents.

In recent years the Port of Veracruz has undergone modernization of its infrastructure. Having all the necessary infrastructure with perfectly well-designed roadways, lighting, security and access points. They have constructed and put into operation the centre for attention to transport

logistics where transport trucks enter and leave the port zone in a controlled manner. Efficient, secure and offering food and rest stations for transport drivers. The logistics activity zone is a 300-hectare area providing an area for business which give added value to foreign trade goods as well as the distribution centre.

The port of Veracruz is secure have implemented the International Ship and Port Facility Security Code the ISPS Code and have ISO 28000 which provides for the supply chain security.

The Expansion of the Port of Veracruz has begun. The objective is to position it as a modern port zone. According to the new dynamics world trade with first rate infrastructure and equipment, 25 new docking positions will be constructed in two phases, during the first stage the same which is currently under way and which will conclude in 2018 the 4.3 KM long western breakwater will be constructed.

### **ESC SCOPE OF SUPPLY**

### KING H PILE (with clutches)

ESC supplied 1000 metric tons of clutched King H Pile ESC-H1180B-1-2 for the combined wall system Grade S430 in 32metre lengths.

The Veracruz Port had purchased several thousand tons of Z profile sheet piles but due to design changes they needed to

convert the sheet piles into a high section profile (due to increased dredge depth of the berth) so the system was converted to a H Pile combi wall. ESC was contacted to manufacture and supply to site the H Pile with clutches that could interlock with the existing hot rolled Z sheet piles.

## PROJECT MATERIALS

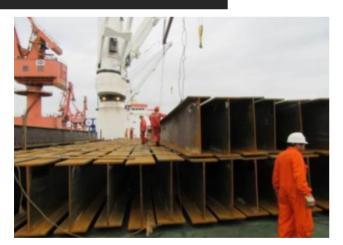


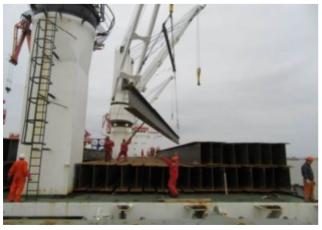






# **SHIP LOADING**

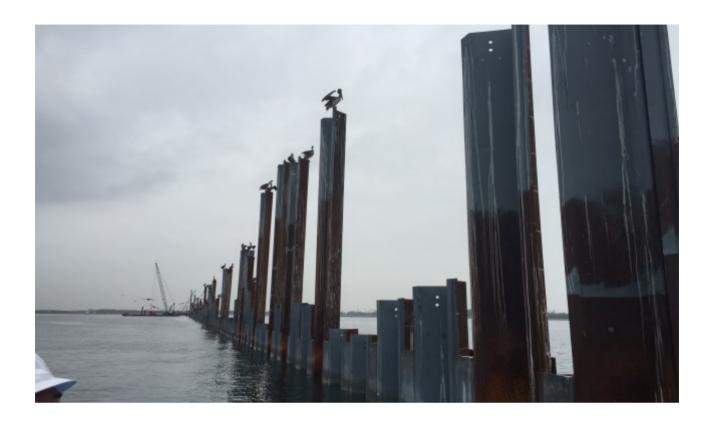






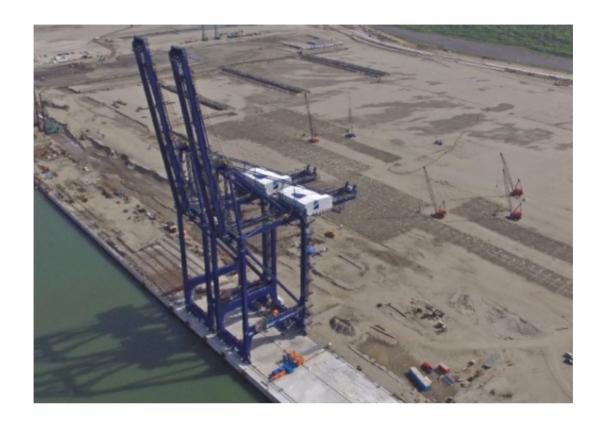


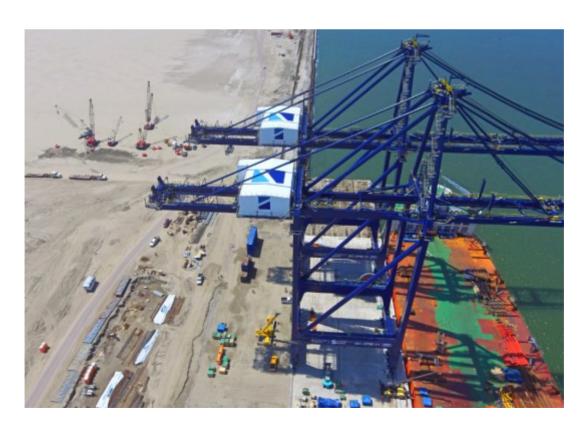
# ON SITE INSTALLATION





# **NEARING COMPLETION**







Project Name

South Breakwater Berths

Client

Athena SA

Engineer

Moth MacDonald

Location

Port of Fujairah, UAE

Product

Sheet Piles, H Pile & Tie Rods

**Total Tonnage** 

8,903 MT

#### INTRODUCTION

ESC was asked to look into the alternative for a design that proposed using an H Pile and sheet pile system from Europe for the construction of this vital part of the Port of Fujairah.

Working closely with Athena SA, ESC proposed the ESC H Pile system which eventually won the award from the Port of Fujairah and their Engineer's Mott MacDonald of the United Kingdom. During the course of the design stage of the project ESC held site meetings in the UAE and video conferencing calls with Mott MacDonald's geotechnical and structural team in London, England. ESC ensured that all facets required by the Client and their Engineers were able to be met.

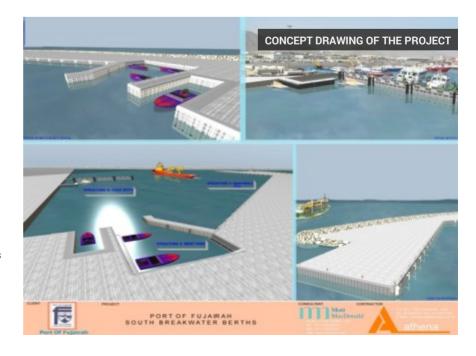
ESC not only worked with the owners but the contractor Athena SA had constant site visits and communication from ESC both during the design stage and the implementation stage of the project. Designs of the wall system took into account the preferred method of construction detailed by Athena SA and were adapted accordingly whilst at the same time ensuring the stringent safety factors of the Clients Engineers were followed in terms of the seismic and structural conditions.

The Port of Fujairah proposed to construct a new quay wall and associated works at the existing facility. The type of wall to be used will be an embedded sheet pile wall, restrained by tie rods to a buried sheet pile anchor wall. The scope of works covered the following structures;

STRUCTURE 1: South Breakwater Berth Quay Wall

STRUCTURE 2: West Port Craft Dock

STRUCTURE 3: Tugs Jetty



### **ESC SCOPE OF SUPPLY**

### SHEET PILES, H PILES, TIE RODS

The scope of the design covered;

- Evaluation of geological data and existing site conditions to determine a range of geotechnical parameters for use in the designs.
- Analysis of the retaining wall and restraint system given the geotechnical parameters, site requirements and loading considerations, including seismic design.
- Specification and design of necessary sheet pile and tie rod components to withstand the calculated geotechnical and imposed loads
- Evaluation of the corrosion conditions, and design of the sheet pile system components to accommodate these conditions, including specification of protective coatings

### PROJECT DETAILS

The British Standards were used as the basis for the design, unless specifically stated otherwise by the Engineer. These standards will include, but not be limited to the following:

Code Title

BS5950 Structural Use of Steelwork in Building

BS6349 Marine Structures

BS8002 Earth Retaining Structures

BS8081 Ground Anchorages

BS EN 10249 Cold Formed Sheet Piling of Non Alloy Steels

BS EN 12063 Execution of Special Geotechnical Worl—Sheet Pile Walls

Other publications that were referred to were;

PIANC – "Seismic Design Guidelines for Port Structures"

Global Seismic Hazard Assessment Program – Global Seismic Hazard Map 1999

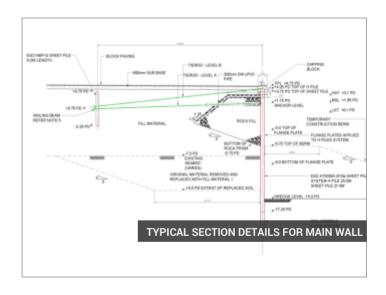
#### COATING REQUIREMENTS

The specified coating for the sheet piles is for shot blasting followed by 2 layers of 250 micron Jotamastic 87. The coating is to be applied to the top 5.5m front and back surface for main wall; while for anchor wall, the coating is applied to whole length both sides of piles.



#### STRUCTURAL SPECIFICATIONS FOR SHEET PILES

WALL TYPE	PILE TYPE	PILE LENGTH (m)	MAX. SECTION MODULUS cm³/m	DESIGN STRESS N/mm <sup>2</sup>
Main Wall	ESC H70/30A-2/10a-F	25.0m	6,795	345
Anchor Wall	ESC14BP-6157	6.0m	1,815	345



All calculations for structural capacity of the sheet pile systems were performed post corrosion loss.

The tierod system was designed based on the loads calculated in R 05. Design loads for the tie rod calculations were taken as the working loads with a factor of 2.0, or the seismic loads with a factor of 1.0, whichever is greater. All components of the tie rod system including connections and waling were designed to have to have at least the same capacity of the tierod itself. All calculations were performed post corrosion loss to the tie rod system and its components.

## **PROJECT MATERIALS**





## **ON-SITE INSTALLATION**







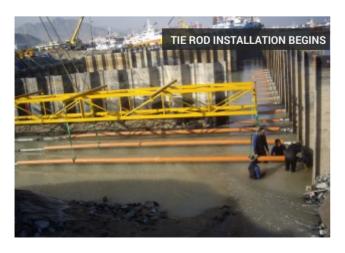


# **ON-SITE INSTALLATION**





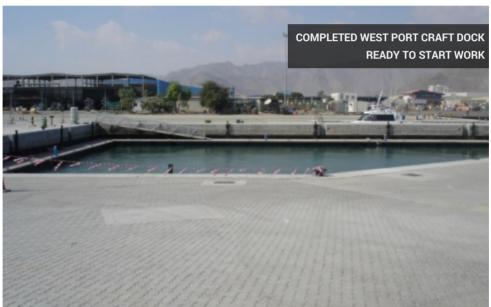


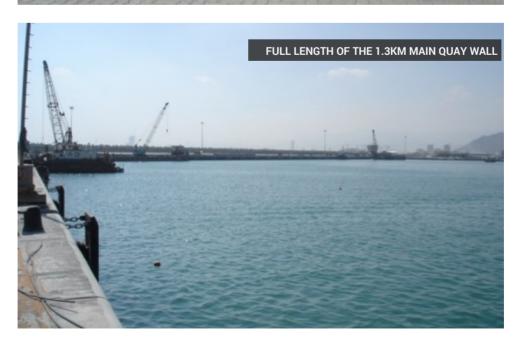




# PROJECT COMPLETED









Project Name

Tuen Mun — Chek Lap Kok Link TMCLK Seawall for Northern Reclamation, HZMB Bridge Project

**Contractor** Dragages – Bouygues Joint Venture

**Location** Hong Kong

**Consultant** Ove Arup & Partners, Hong Kong Limited

Project Owner Hong Kong Highways Department

### INTRODUCTION

The proposed RMB¥15.73 billion HZMB Bridge project, being situated at the waters of Lingdingyang, Pearl River, is a mega-size sea crossing linking Hong Kong , Zhuhai City of Guangdong Province & Macao.

The project that started on design works since 2009, consist of:

- a 29.6 km dual 3-lane carriageway in the form of bridge-cum-tunnel structure comprising a tunnel of about 6.7 km
- two artificial islands for the tunnel landings west of the HKSAR boundary
- boundary crossing facilities and link roads within the three places, including TMCLK Subsea Tunnel

## **ESC SCOPE OF SUPPLY**

Supply of H-Pile, sheet pile combined wall, upset threaded tieback and UB strut, for TMCLK Northern Landfall Subsea Tunnel TBM entrance area, to act as:

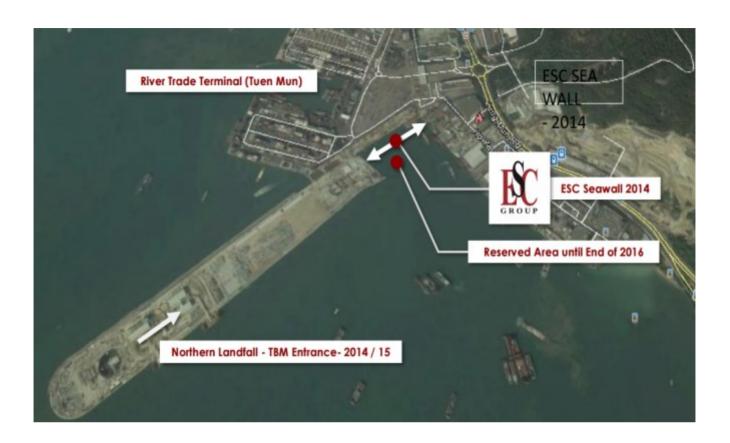
- (a) Reclamation retaining wall, phase 1.
- (b) Water cut off wall for box culvert construction, phase 2.





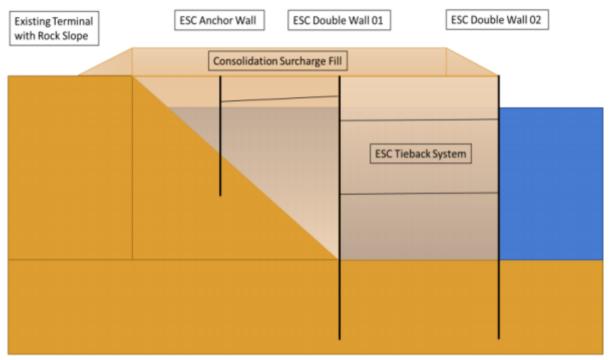


# PROJECT LOCATION

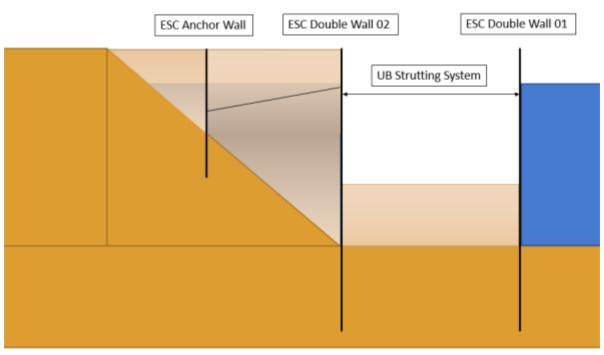




## PROJECT DETAILS



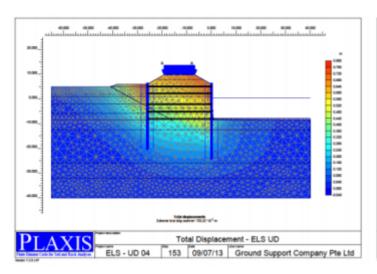
Phase 1 – Reclamation works with Combination Wall and tieback system.

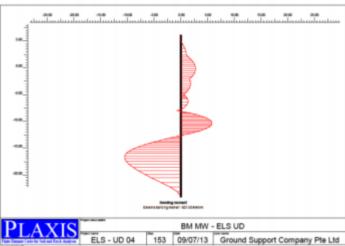


Phase 2—Excavation & Dewatering Works with Double Wall and Strutting System

## **PROJECT DETAILS**

**Plaxis. Geotechnical Design of System.** ESC's professional engineering team completed the retaining wall design of the system using finite element analysis software.





## **COMBI WALL SYSTEM SPECIFICATION**

ESC specially designed a retaining wall profile with equivalent or superior moment capacity as the original tender specification.

### Double Wall - 01

Item	Series	Grade	Modulus	Inertia	Moment Capacity
			cm³/m	cm⁴/m	kNm/m
Tender	FSP IV	S275JR	2,270	38,600	624
Spec.					
ESC Spec.	ESCH50/20B1/9.75	Q345B	1,861	59,195	642

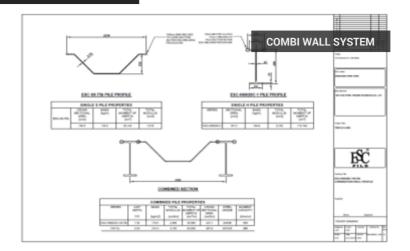
### Double Wall - 02

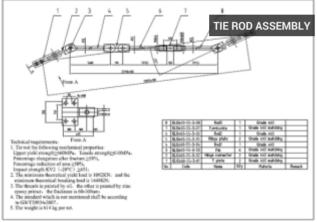
Item	Series	Grade	Modulus	Inertia	Moment Capacity
			cm³/m	cm⁴/m	kNm/m
Tender	FSP VL	S275JR	3,150	63,000	866
Spec.					
ESC Spec.	ESCH60/20C1/9.75	Q345B	2,489	95,560	859

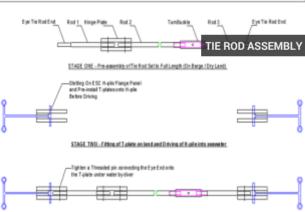
#### Anchor Wall

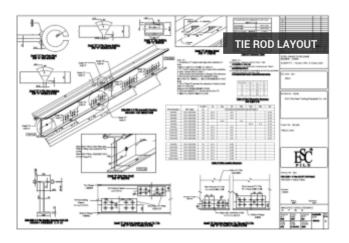
Item	Series	Grade	Modulus cm³/m	Inertia cm <sup>4</sup> /m	Moment Capacity kNm/m
Tender Spec.	FSP III	S275JR	1,340	16,800	369
ESC Spec.	ESCH50/20B1/6.5	Q345B	1,099	36,935	379

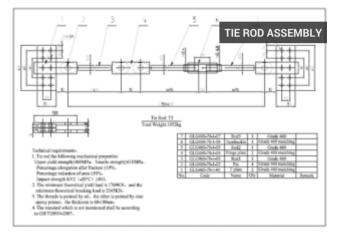
## **PROJECT DETAILS**

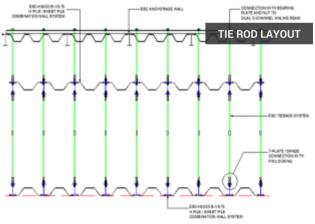


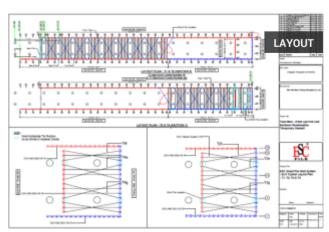












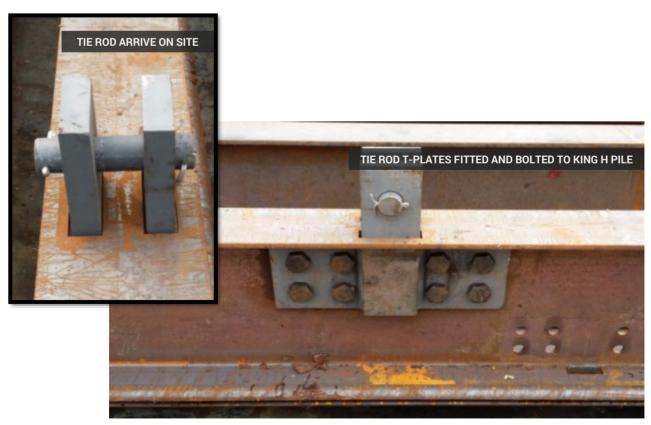
## **TIE ROD SYSTEM**







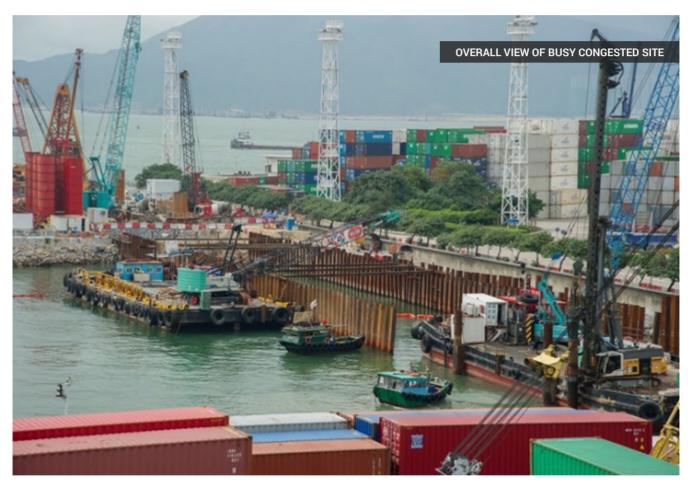


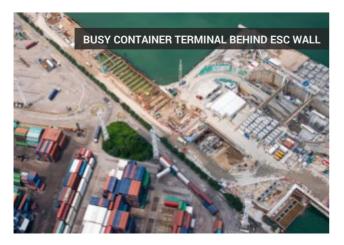


## **INSTALLATION UNDERWAY**













Project Name Victoria Harbour

Main Contractor Lend Lease Engineering(Developer)

Engineer GHD

Location Melbourne, Australia

**Product** Pipe Piles and Sheet Piles

Total Tonnage 1,465 MT

Delivery Date 2015

#### INTRODUCTION

Victoria Harbour, located on the Western edge of Melbourne's CBD within the Docklands Area, Victoria Harbour is a unique peninsula landform extending west from Docklands Park to the base of the Bolte Bridge. The 30 hectare site is bounded by the Yarra River and the Victoria Harbour Dock. The site has two distinct 'base' conditions – wharf structure on the edges, and terra firma (solid ground) in the centre.

A superb extension to Melbourne's CBD, Victoria Harbour has been labelled 'the jewel in the crown' of Melbourne's Docklands. Vibrant promenades with inviting restaurants and cafes, and walking and cycling paths entwine with some of Melbourne's most indulgent residential offerings.

Encompassing Melbourne's newest collection of beautifully appointed apartments, premium penthouses, marina and wharf side homes, upon completion proposed for 2021, Victoria Harbour will undoubtedly become Melbourne's most exclusive new waterfront address.

ESC's involvement with the project began with a series of meetings with GHD and Lend Lease Engineering (Developer) during which some alternative design options were proposed by ESC which eventually resulted in the design being changed from Hot rolled Sheets (Arcelor AZ19) to a totally Cold Rolled

Sheet and Clutch design, thus saving the client in valuable time and money, whilst still achieving all the design criteria set by the designers.

The project involves construction a new 240 metre long Combi-Wall on the river, which forms the supporting structure for the new deck and platform, atop which will be built the Podium and 2 Tower Buildings forming part of Zone 1 and Zone 2 of the total site.

The materials supplied by ESC comprised of Spiral Submerged Arc Welded (SSAW) pipes and Cold Rolled Clutches and Sheet Piles, all with a High Build Epoxy Marine Coating, which was applied to 10metres of the Tubes and 7 metres of the Sheets.

ESC staff along with the client's representatives conducted inplant inspections and surveillance activities at all facilities used in the manufacture to ensure the agreed ITP and Quality Plans were strictly adhered to.

The levels of cooperation and the focus on client objectives and outcomes by ESC on this project, as well as our ability to provide high quality products and technical support were of critical importance to Lend Lease.

## **ESC SCOPE OF SUPPLY**

### **TUBULAR PILES & SHEET PILES**

#### ESC's scope of products

- Gr Q345B SSAW Pipe Piles, including clutches, 501.41MT
- Gr. Q345B SSAW Pipe Piles, 473.38
- Gr. Q345B SSAW Pile Shoes, 4.96MT
- ESC-S-CRZ20-700 Gr. Q345B CR sheet piles, 484.3MT



# PAINTING OF PIPES







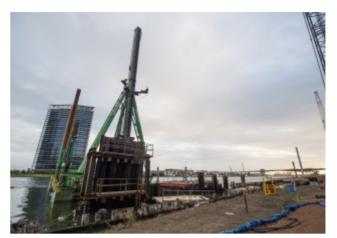


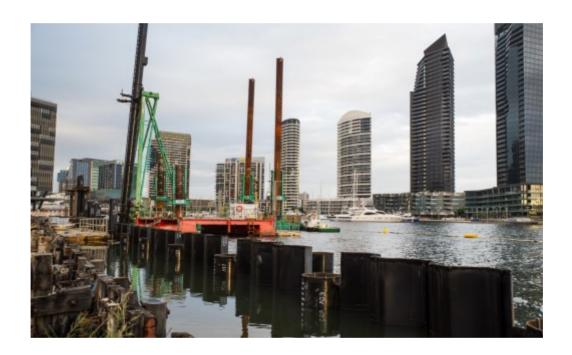




## **ON-SITE INSTALLATION**



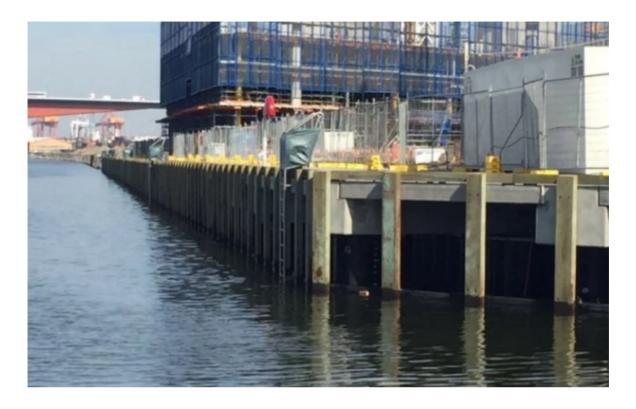


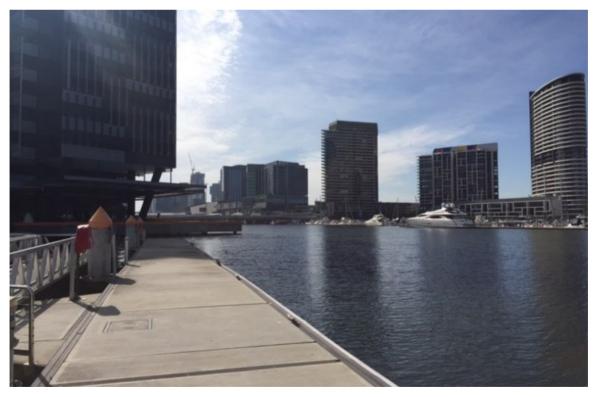






## PROJECT COMPLETED







Project Name WATCO Breakwater (Berths 3 & 4)

Client WATCO Companies

Main Contractor Russell Marine

Engineer Lainer & Associates

**Location** Greensport Facility, Texas, USA

**Product** Sheet Piles, Pipe Piles, Bollards, Tie Rods

**Delivery Date** 2014

#### INTRODUCTION

Greens Port Industrial Park is located at the eastside of the Houston heavy industrial zone, along the Houston Ship Channel in Harris County, Texas. Greens Port offers deep water barge docks along the channel with approximately 3 million square feet of indoor warehousing and numerous cranes ranging from 5 to 125 ton capacity.

Due to the existence of a very dense sand layer in various

thicknesses along the



### **ESC SCOPE OF SUPPLY**

### **TUBULAR PILES & SHEET PILES**

Midyear 2014, ESC Steel Inc was engaged by WATCO Companies Inc for material supply and assist on geotechnical & structural design for Berth 3 and Berth 4 as an extension to the existing bulkhead that in service, in order to provide greater port capacity.

The design brief was as follows:-

Proposed bulkhead top at +12' above MSL

Existing platform ranging +9.5' to +13.5' above MSL

proposed bulkhead line, there were certain areas with hard driving

contractor onsite and site advice from the ESC team, Russell Marine

managed to achieve full pile penetration nicely using a driving guide,

condition that had been encountered. With the expertise of the

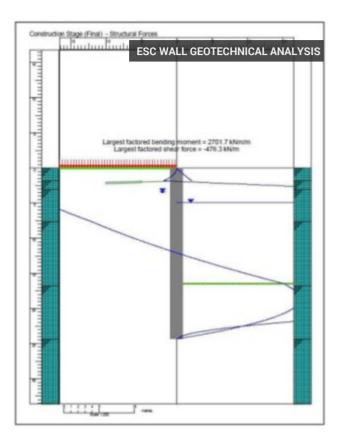
pre-boring method and then a combination of a hydraulic

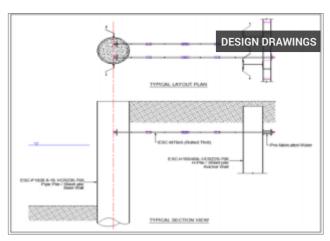
vibrohammer combined with a diesel drop hammer.

- ▶ Design scour depth -42′ below MSL
- Total exposed height at 54' (16.459m)
- ► Surcharge 1000 psf (48kPa)
- Average water elevation at +1' above MSL

ESC conducted face to face meetings with Lainer & Associates as well as Watco in New Orleans & Houston to get all design & pricing aspects satisfactorily.

## PROJECT DETAILS & MATERIALS

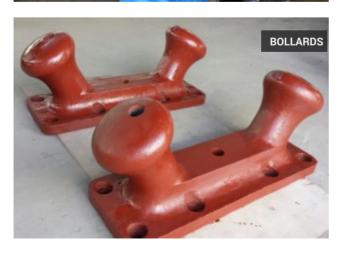














# WELDING OF CLUTCH







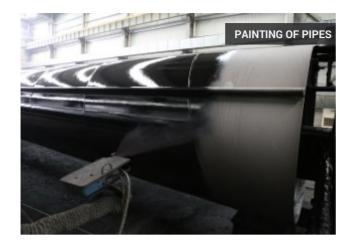


## **BLASTING OF PIPES**





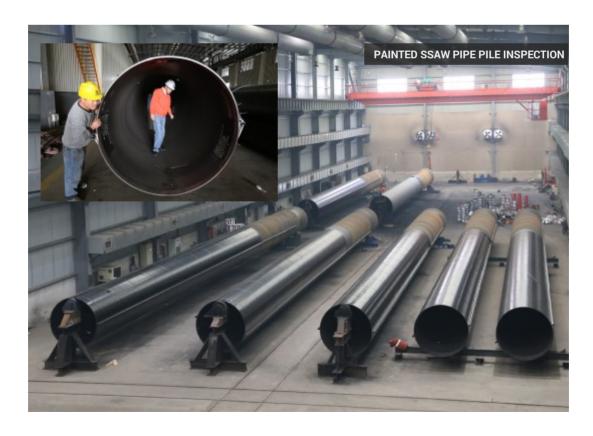
## **PAINTING**







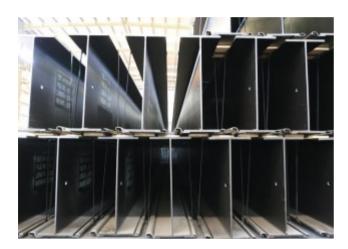




## STACKING











## SHIP LOADING

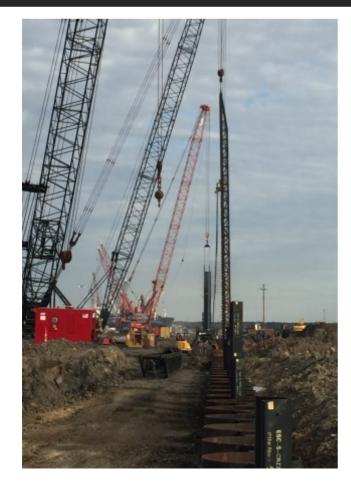








## **ON-SITE INSTALLATION**







## **ON-SITE INSTALLATION**





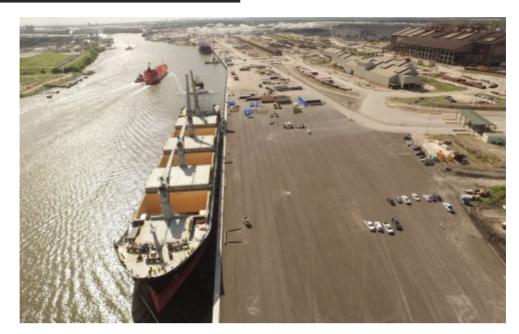








## PROJECT COMPLETED









Project Name Seawall Protection Project

Client Indeco Nigeria
Location Lagos, Nigeria

Product H Pile, Sheet Piles with Protective Coating

Total Tonnage 1,351 MT

Delivery Date 2019

## **INTRODUCTION**

The outer marina in Lagos, Nigeria, is an essential hub for maritime ventures, serving as an avenue for trade and commerce. Due to the busyness of the area the seawall has deteriorated over time because of natural wear and tear and increasing sea levels, prompting authorities to embark on the replacement and expansion of the seawall protection.

The project will boost the performance, safety, and economic capability of the port. The improved outer marina will provide robust protection against environmental hazards, and harbor the growing demand for maritime activities, generating additional revenue for the region. As such, a significant investment in the future of Lagos and Nigeria as a whole.



Outer Maria, Lagos, Nigeria ctto: nairaland.com

## **ESC SCOPE OF SUPPLY**

## H-PILES, SHEET PILES WITH PROTECTIVE COATING

ESC was awarded with the supply of 916.012MT H Piles (ESC-880C-1H) with material Grade S355 19.5 meter in lengths, and 435.561MT hot rolled sheet piles (ESC-HRZ19-700) with material Grade S355GP in 17 meter lengths. Both are provided with Corrosion protection SA2.5 Interzone 278, total DFT of 500 um  $\,^{5}$ 639 m $^{2}$ .

## **RAW MATERIAL INSPECTION & PREPARATION**



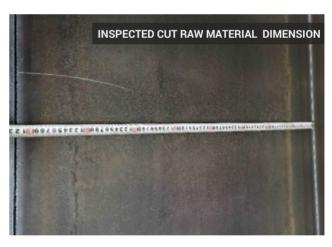




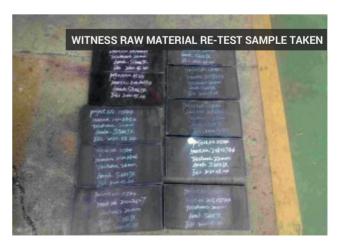












## **PRODUCTION**











# BLASTING & COATING















## PACKING AND SHIP LOADING

















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