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ESC PROJECT CASE STUDIES

BOOK II (2014-2016)

Global Foundations, Steel Structures, Flood Mitigation, Ports, Retaining Walls and Retention Projects

About ESC

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.

COMPANY CERTIFICATION

ESC products are produced & designed in accordance with the latest international standards 9001:2015, ISO 14001:2015, ISO 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 serves the global market from a range of strategic locations. ESC Group operates with over 15 agent and ESC offices around the world. Highlighted on the left are the representative offices for the steel structures division.

ESC Project Case Studies Index

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BHP TUG HARBOUR , AUSTRALIA

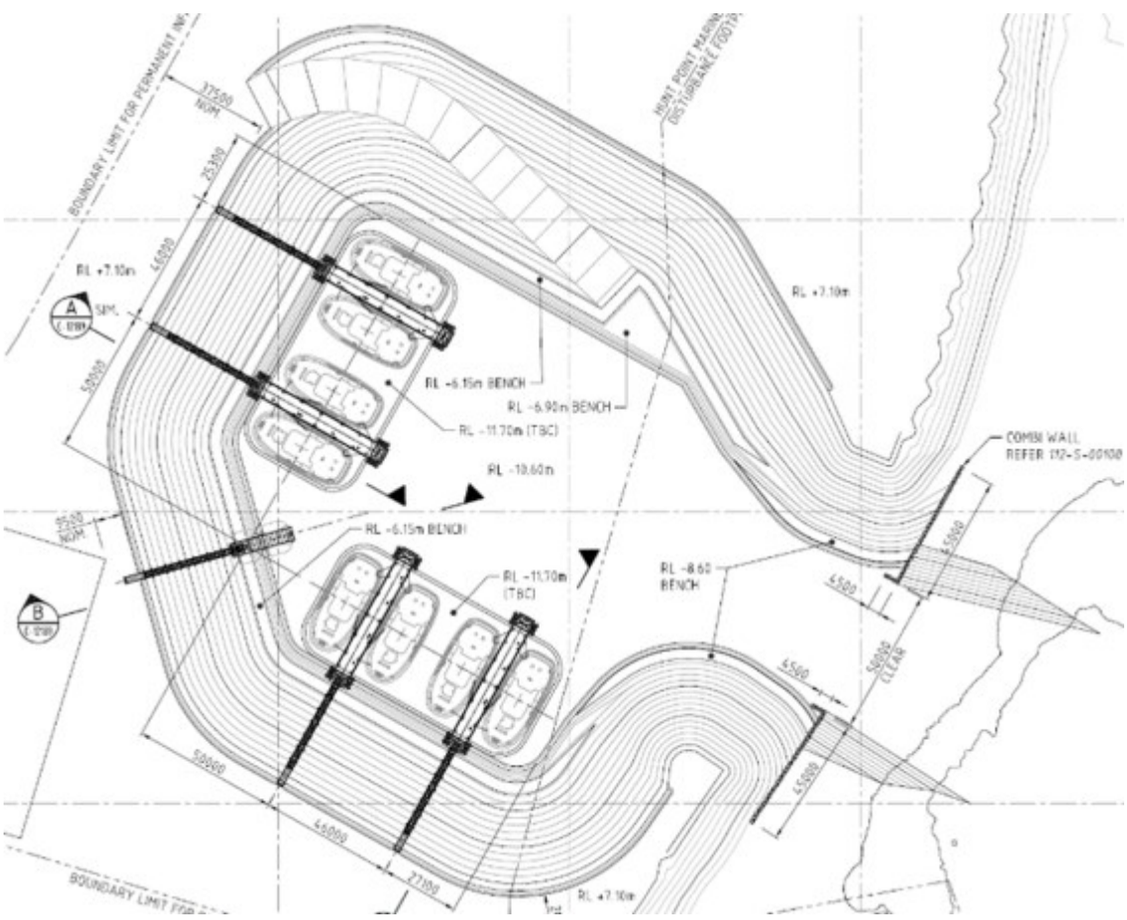
TUG HARBOUR PROJECT

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

The project covered two aspects:

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

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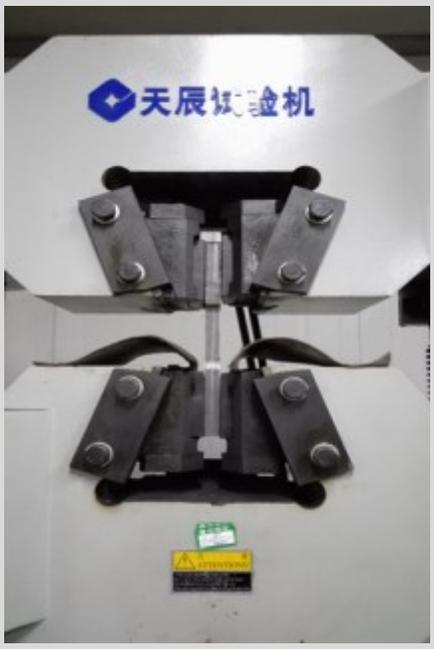
RAW MATERIAL RETEST

INSPECTION



PIPE INSPECTION PRIOR TO COATING

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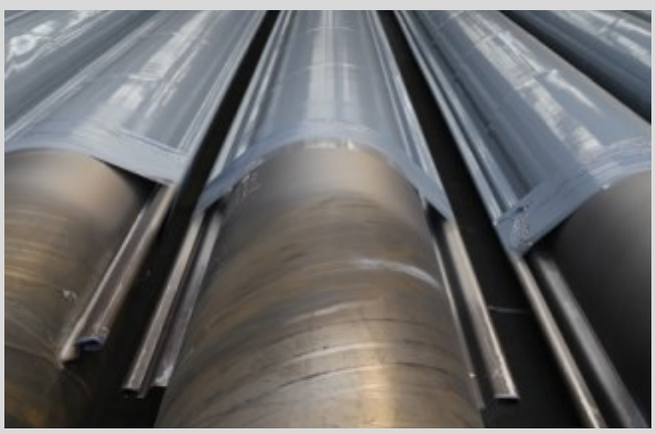
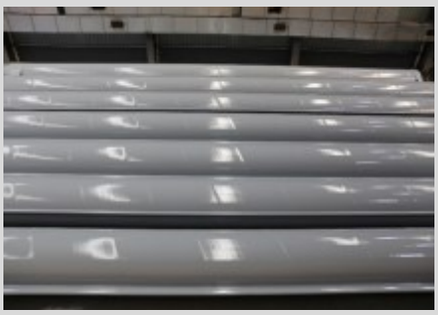
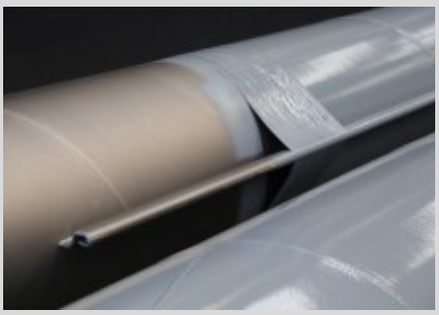
SURFACE PREPARATION

BLASTING

PAINTING OF PIPES







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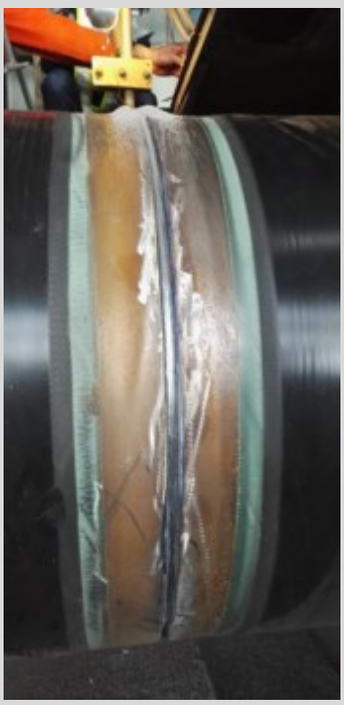
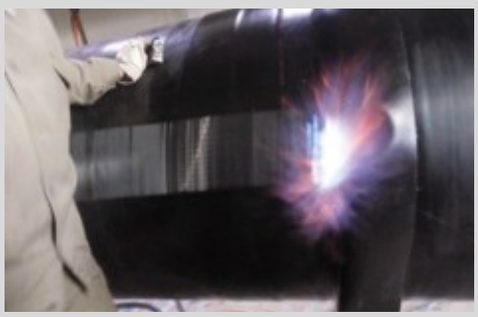
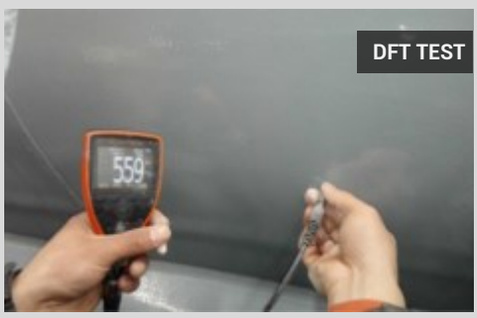
MDPE COATING

HEAT SHRINK SLEEVE INSTALLATION





PAINTING INSPECTION



PACKING & STACKING

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CARGO STACKING

TOOLBOX MEETING BEFORE LOADING

CARGO LOADING

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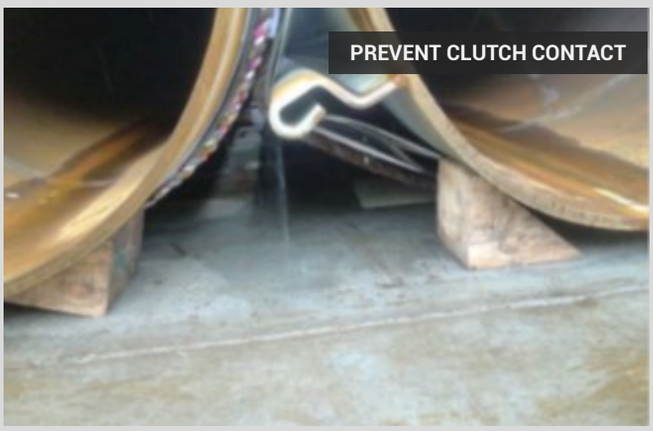
CARGO LOADING PROTECTION



CARGO LOADING PROTECTION

SHIP LOADING

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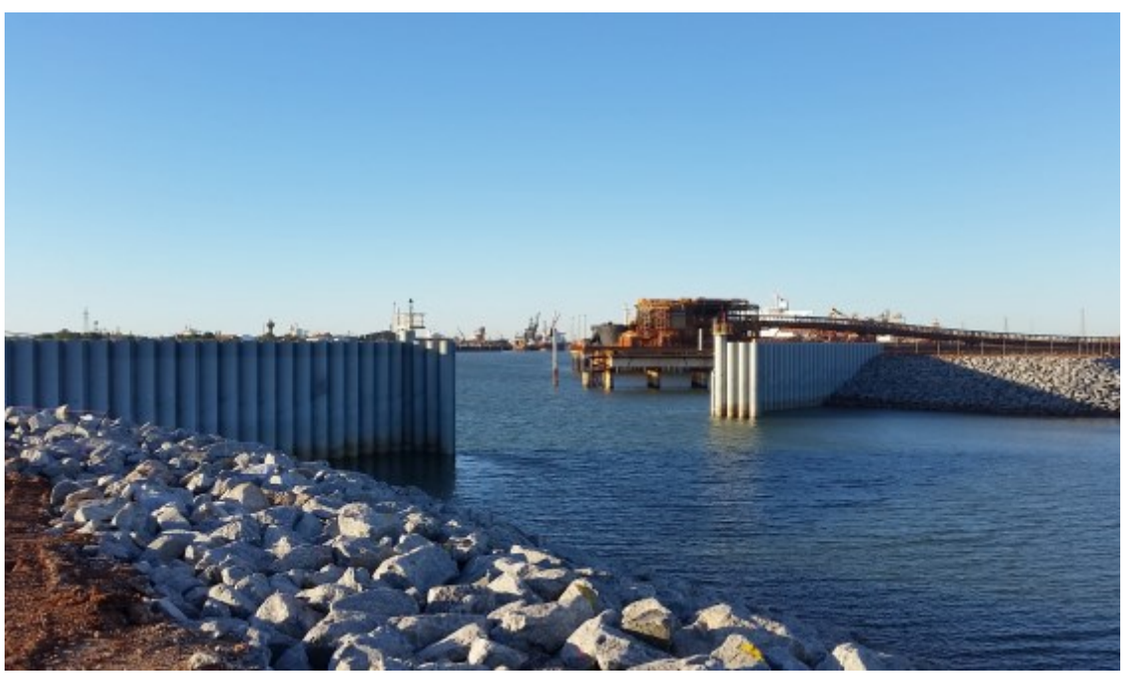
ON-SITE INSTALLATION

PROJECT COMPLETED



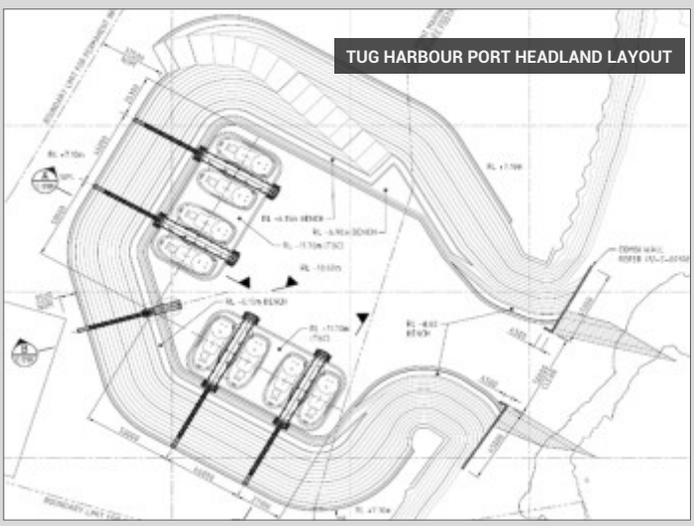
BHP TUG HARBOUR , AUSTRALIA

TUG HARBOUR PROJECT

Project Name	BHP Tug Harbour,
Project Owner	BHP Billiton Irion Ore Pty. Ltd
General Contractor	Lend Lease Engineering Pty. Ltd.
Project Location	Port Headland, Australia
Product	Pontoon / Steel Structure
Total Tonnage	3,200 MT
Year	2016

INTRODUCTION

BHP Billiton purchased an additional six tugs and therefore needed to construct a new eight pen Tug Harbour at Hunt Point and two small boat moorings at the existing Nelson Point Tug Harbour. This project will mitigate the risk of a channel blockage by ensuring the continued safe escort of vessels in and out of the Port Hedland Inner Harbour.

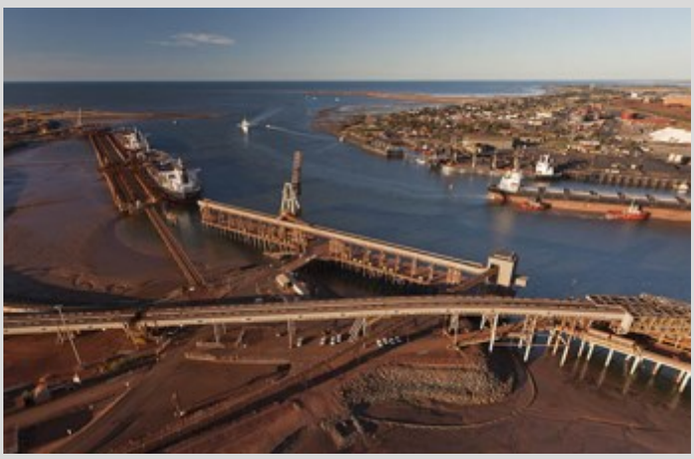


TUG HARBOUR PORT HEADLAND LAYOUT

ESC SCOPE OF SUPPLY

PONTOONS

ESC has been awarded the contract to supply a total of 850MT of pontoons and gangways - 5 units of pontoons (the largest pontoon, Hunt Point tug mooring pontoon with a size of L52.55m x W6.8m x H5.2m), 6 units of gangway, 6 units of gangway platform, 1 unit of line berth, and 1 unit of line boat stair tower for BHP Tug Harbour Project in two different locations, namely Hunt Point and Nelson Point.



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MATERIAL PREPARATION

CNC PLASMA CUTTING OF STEEL PLATE

WELDING OF COMPONENTS

GANGWAY

FENDER BRACKET

BRACING

All welding performed in accordance with AWS D1.1/D1.1M standard. Welding inspection with the following frequency:

- 100% VT
- 100% UT for full penetration butt weld.
- 10% MT for fillet weld.

WELDING & ASSEMBLY

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ESC assigned a fulltime qualified inspector (AWS CWI and NACE II inspector) at the fabrication mill during the entire fabrication process to ensure the project meets the quality requirements as well as schedule.

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PAINTING

The coating system varies depends on the application of the material. All materials are blasted to surface cleanliness level of Sa2.5 as per ISO 8501 before the coating application. All coated surface are tested with 100% of holiday test as per AS3894.1 at a test voltage recommended by the paint manufacturer.

- **Pontoon (Exterior and Interior)**
  First coat: Sigmashield 880 (300 microns)
  Second coat: Sigmashield 880 (300 microns)

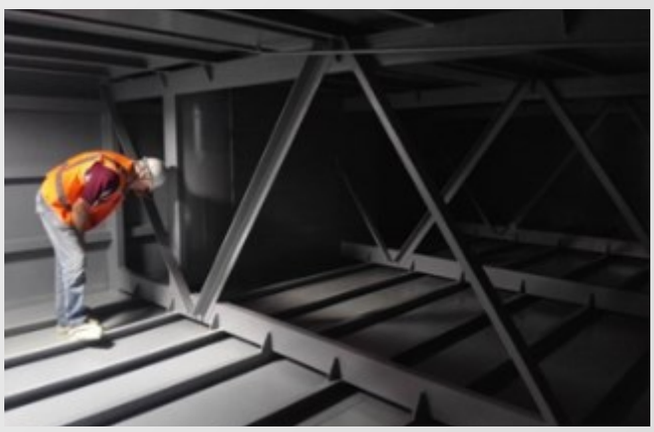
- **Steelwork and Gangway above Water**
  First coat: Sigmazinc 109HS (75 microns)
  Second coat: Sigmacover 456 (200 microns)
  Third coat: Sigmazinc PSX700 (75 microns)

- **Pile Cap Plates, Gangway Platforms, Pile Bracing or Components that are fixed to the Pile Structure**
  First coat: Interzone 954 (250 microns)
  Second coat: Interzone 954 (250 microns)

- **Handrails**
  First coat: Hot dip galvanize as per AS4680.
  Second coat: Sigmacover 280 (50 microns)
  Third coat: Sigmazinc PSX700 (75 microns)

INTERNAL AREA OF PONTOON

The entire internal surface of the pontoon is coated. The beams and stiffener plate welded inside the pontoon serve to reinforce the overall strength of the pontoon (prevent deformation of the pontoon during its application).



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FINISHED PRODUCTS & COMPONENTS

Fiberglass reinforced plastic grating (FRP) is selected due to the advantages that it is rustproof, slip-resistant, lightweight, and easy to install.

All loose components including fender component are trial assembled before packing and delivery to ensure that the site assembly process is smooth without any quality issues.

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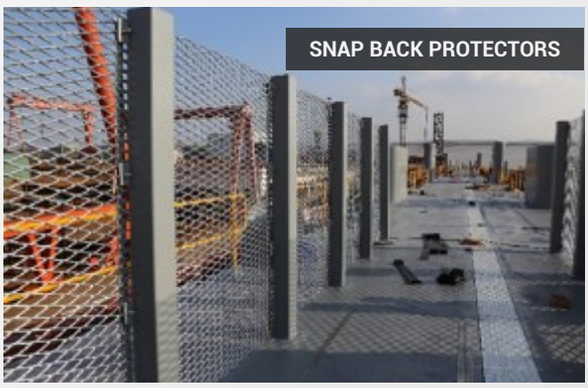
COMPONENTS



Anti-skid dressing is applied to the entire pontoon deck surface for personnel safety purpose (anti-skid).

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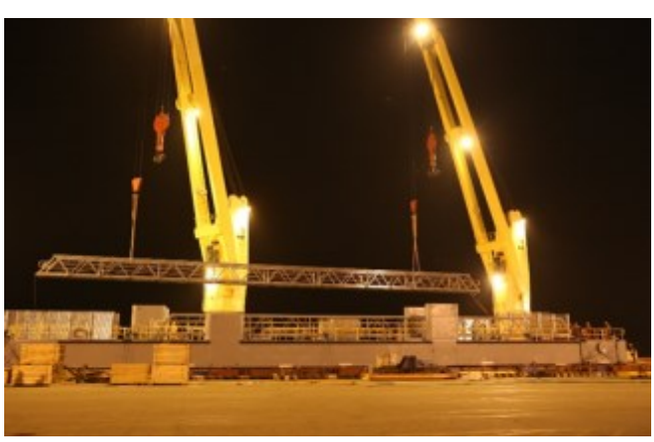
SHIP LOADING

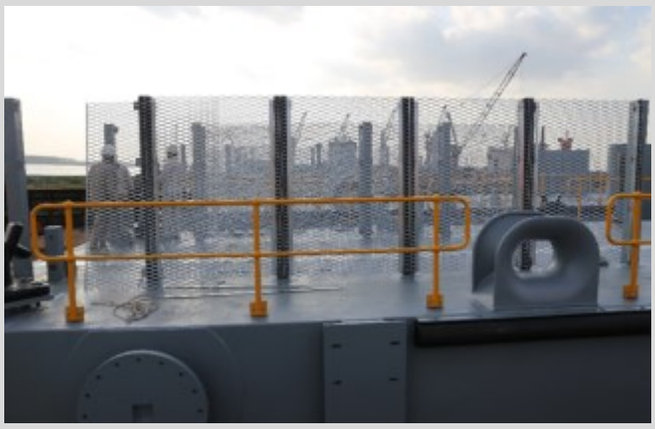
ESC inspectors are assigned full-time in the port and performing loading inspection to ensure each components are properly handled, secured and stacked. ESC committed to minimize the risk of shipping damage.

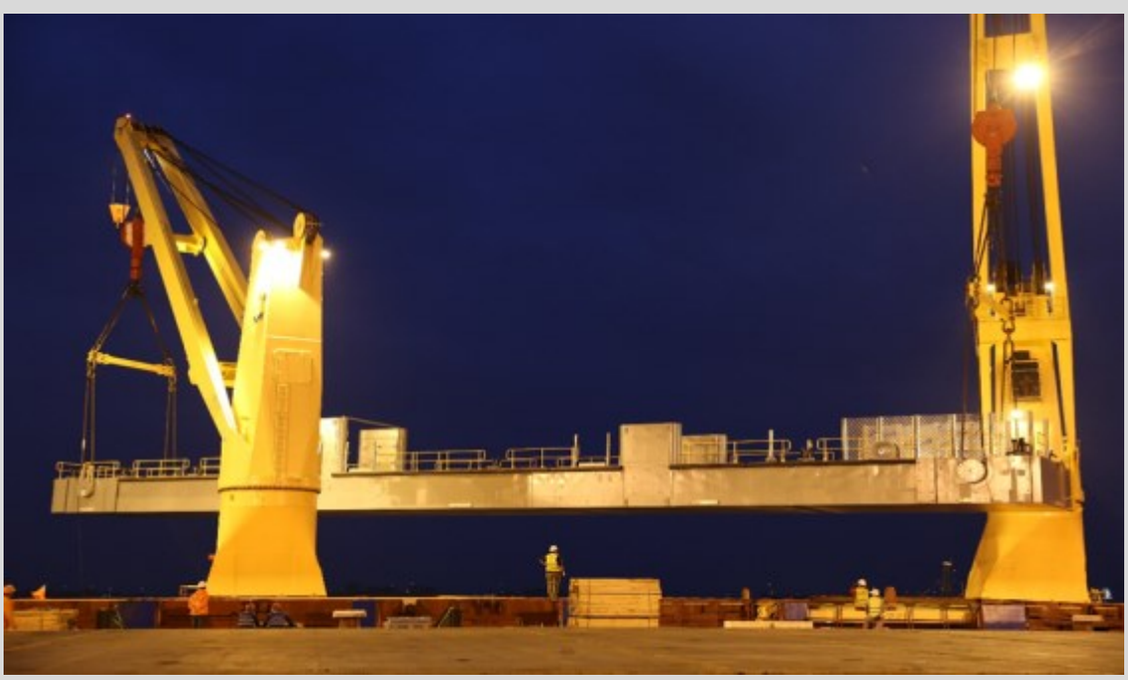
Lifting slings are used to prevent deformation as well as paint damage. The lifting point for each product and component have been properly analyzed to ensure not only a safe lifting process but also to ensure the product will not deform during the lifting process. The surface underneath the pontoon is padded to prevent direct the contact of painted surface with a hard surfaces. No hard surfaces are in contact with painted surface at any point.



TRELLEBORG DC200 FENDER

SHIP LOADING





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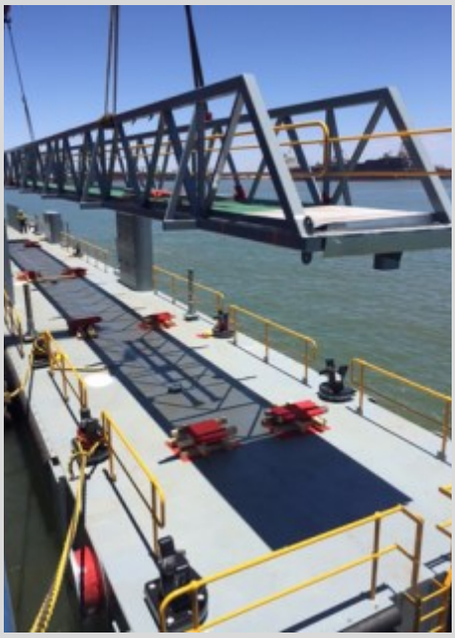
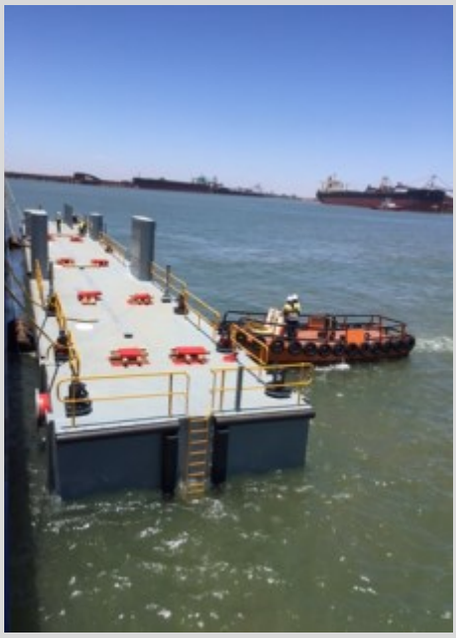
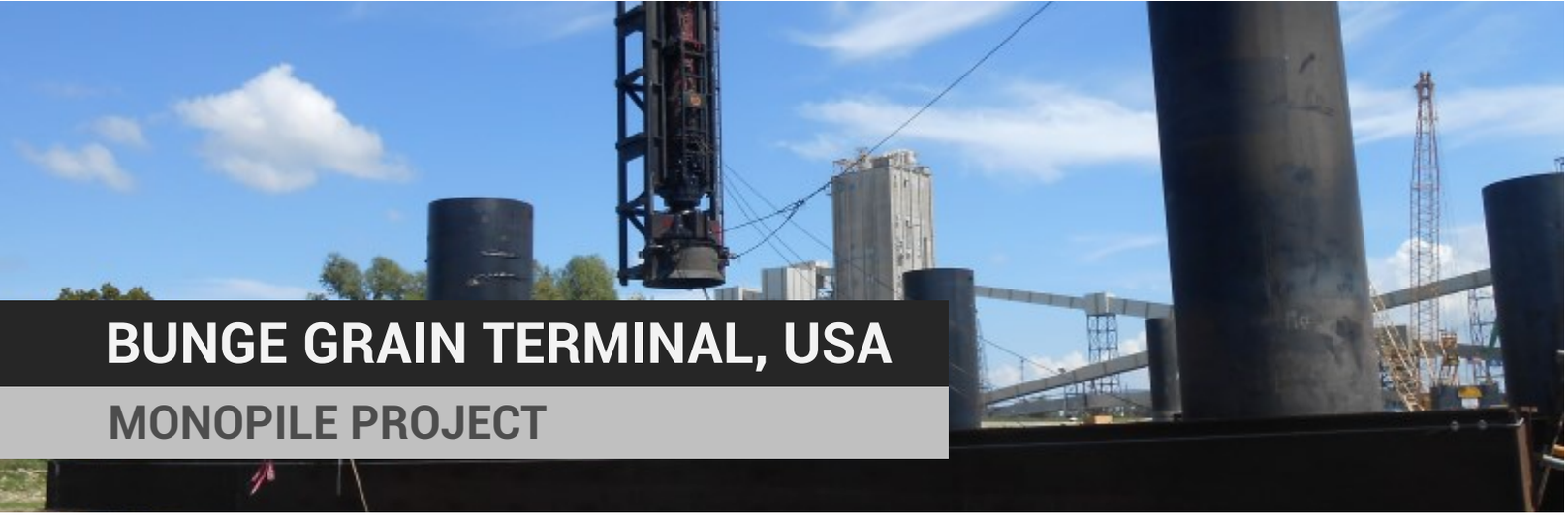
PONTOON AT SITE







BUNGE GRAIN TERMINAL, USA

MONOPILE PROJECT

Owner	Bunge Grain Terminal, Louisiana
Consultant	River Consulting
Contractor	Kiewit Infrastructure South Co.
Location	Louisiana, United States of America
Delivery Date	Nov 2014
Total Tonnage	2,213 MT

ESC SCOPE OF SUPPLY

LSAW PIPE

ESC was awarded the job to supply painted LSAW pile for Bunge North America Project. The product includes steel pipe in various sizes up to OD2438mm, thickness 63.5mm, and length 49m. All steel pipes with steel grade of ASTM A252 Gr.2 and are manufactured in accordance with API Spec. 2B.

Opening meeting with client representatives.

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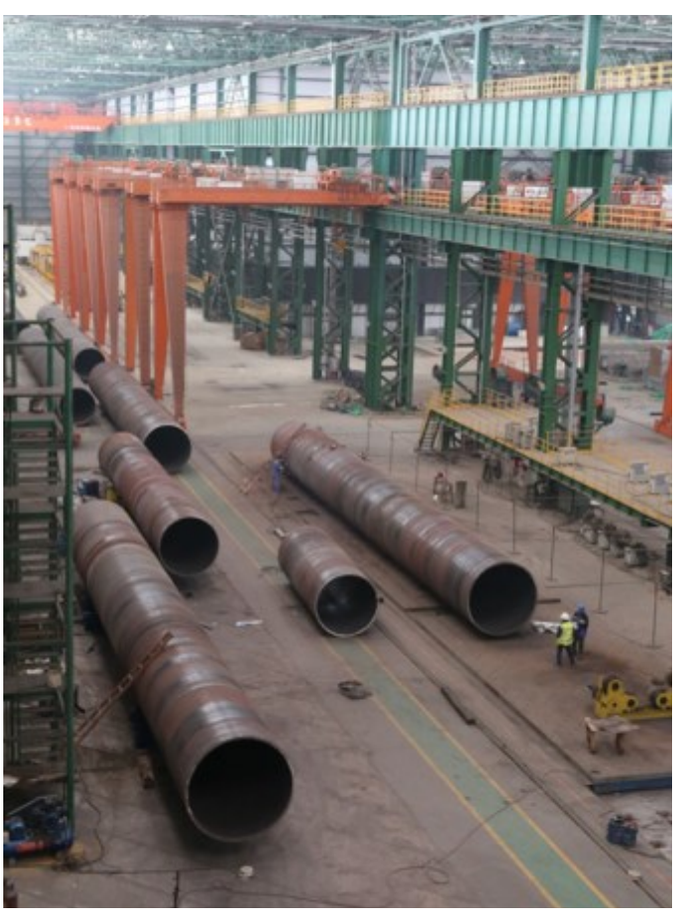
MONOPILE ROLLING PROCESS

PILE FORMING PROCESS

Preheat of weld to 110°c in accordance with AWS D1.1



AUDIT & INSPECTION

The project processes and products were audited by AWS D1 committee member - James K Merrill and Chairman of ASNT Certification Management Council Level III Division - John Kinsey.

The project is fully monitored and inspected by Third Party Company (Caltrop) from incoming raw material to ship loading process.

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BLASTING & PAINTING

MONOPILE BLASTING PROCESS

NORMAL PILE BLASTING PROCESS

AUTOMATIC PAINTING TO REPLACE THE MANUAL PAINTING PROCESS PRODUCED VISUALLY CONSISTENT SURFACE AND PAINTING DFT WITH VERY SMALL VARIATION.

FINISHED PRODUCT

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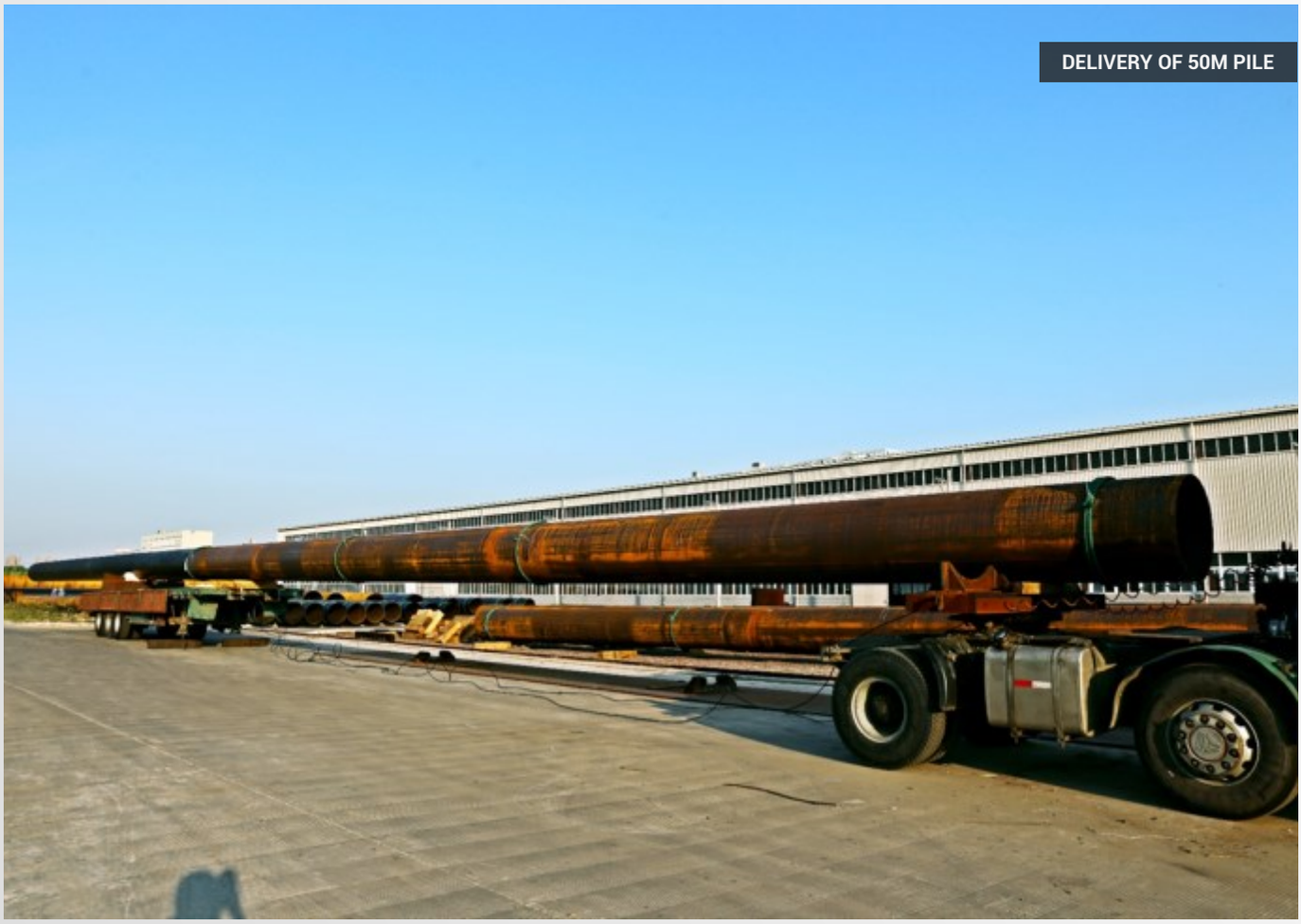
DELIVERY & SHIP LOADING



DELIVERY OF 50M PILE

DELIVERY OF MONOPILE FROM FACTORY TO SHANGHAI PORT

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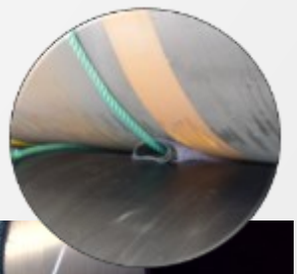
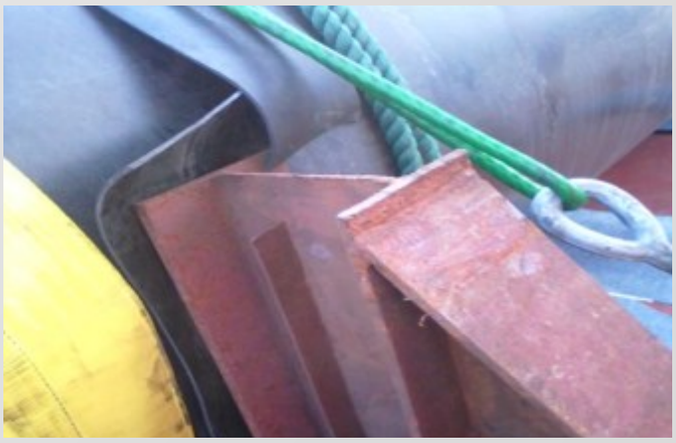
DELIVERY & SHIP LOADING

PROTECTION OF PIPE DURING SHIPMENT TO PREVENT DAMAGE

The pipe is protected to ensure that there is no direct contact of the pipe surface with other metallic (or hard) surfaces. The pipe is properly secured to ensure safety and prevent damage during the shipping process.





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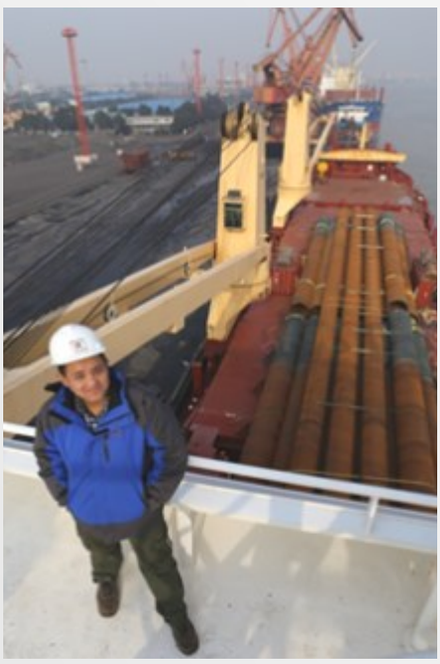
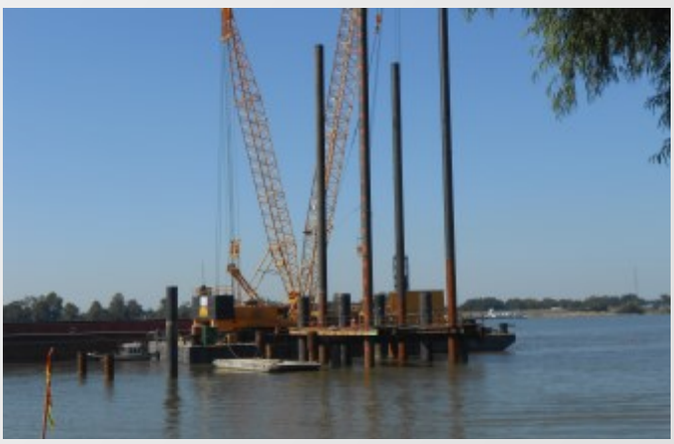
DELIVERY & SHIP LOADING



ON-SITE INSTALLATION



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HINKLEY POINT C – AGGREGATE JETTY PROJECT

AGGREGATE JETTY PROJECT

Project Name	HPC – Hinkley Point C – Aggregate Jetty Project
Client	NNB GenCo
Main Subcontractor	Costain Group PLC
Location	Somerset, England
Product	LSAW / SSAW Pipe
Total Tonnage	3,990 MT
Delivery Date	Oct 2016

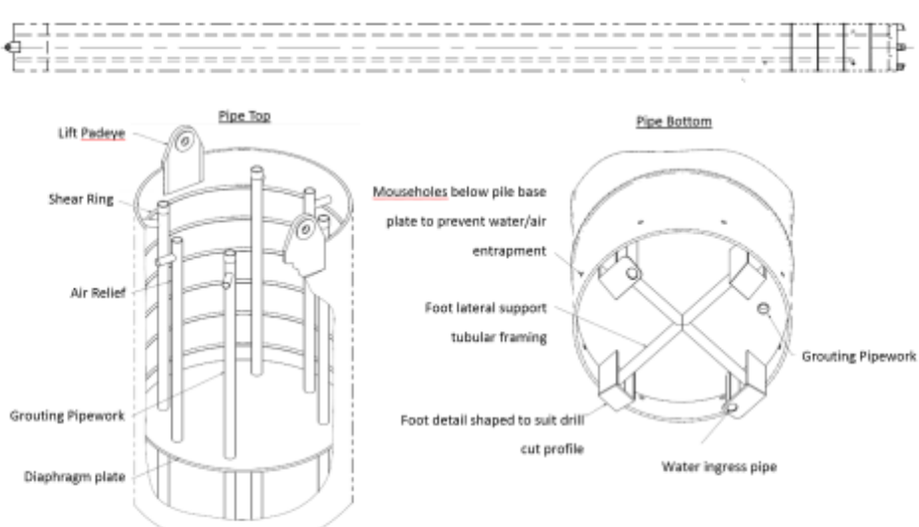
INTRODUCTION

UK EPR is located at Hinkley Point, on the bank of Bristol Channel in Somerset. Two nuclear power stations are currently located on the site: Hinkley Point A (currently decommissioning) and Hinkley Point B (Operating). The new planned power station is Hinkley Point C (HPC).

ESC SCOPE OF SUPPLY

LSAW PIPE

ESC has been awarded with the contract to supply 3,990MT of pipe pile for the HPC temporary aggregate jetty (Berthing Island, Dolphins, and Jetty Bridge). The pipe piles outside diameter varies from 914mm to 3,600mm and various steel grades (S460M, S420MH, and S355J2).



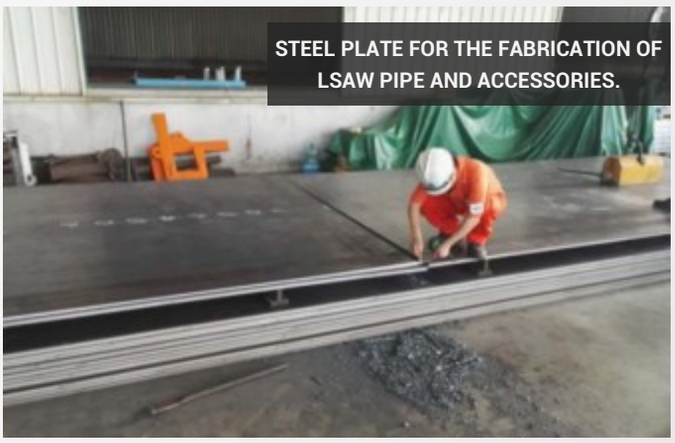
INCOMING RAW MATERIAL

Berthing Island – Consists of SSAW pipe pile with LSAW pile head.

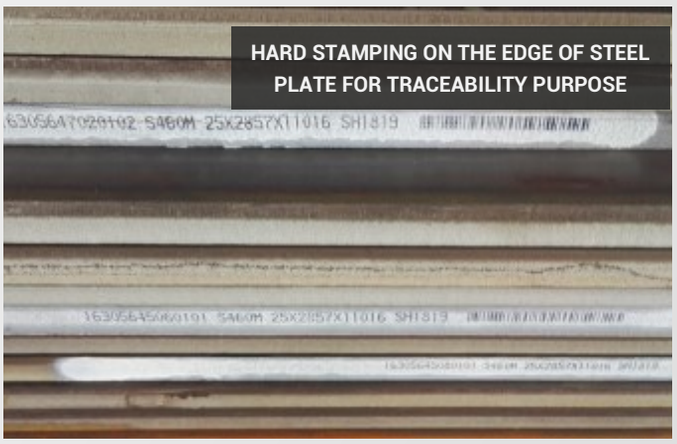
Dolphin – Consists of LSAW pipe pile.

Jetty Bridge – Consists of a mix of SSAW pipe pile with LSAW pipe pile.

STEEL COIL FOR THE FABRICATION OF SSAW PIPE



STEEL PLATE FOR THE FABRICATION OF LSAW PIPE AND ACCESSORIES.



HARD STAMPING ON THE EDGE OF STEEL PLATE FOR TRACEABILITY PURPOSE

SEAMLESS PIPE FOR THE FABRICATION OF GROUT PIPE

ELBOW

HEX HEAD PLUG

FITTINGS FOR GROUT PIPE OUTLET

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PIPE FORMING

PIPE FORMING

Sample test plates are taken from each heat number for mechanical properties and chemical composition retest prior to the production process being started.


RAW MATERIAL RETEST


RAW MATERIAL RETEST

SSAW PIPE FORMING

Production for the SSAW pipe forming process includes coil feeding, beveling, welding, and online Ultrasonic Test.

LSAW PIPE FORMING


PRE-BENDING


ROLLING


FORMED PIPE CAN

FORMING & WELDING ACCESSORIES

FABRICATION OF ACCESSORIES

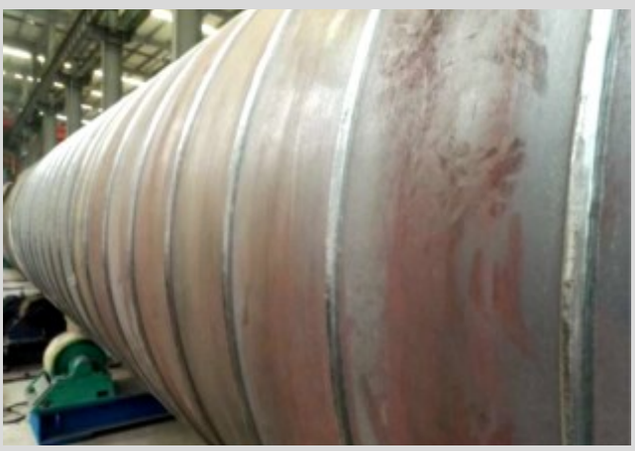

PIPE FOOT


GROUT PIPE SUPPORT


ASSEMBLY OF GROUT PIPE

WELDING OF SHEAR RINGS

There are two types of shear ring applicable to this project: Shear ring formed by using surface weld of height 15mm x width 30mm. Shear ring formed by fillet weld at a height 20mm x width 25mm square bar.



WELDING OF GROUT PIPE, LIFT PADEYE, FOOT AND DIAPHRAGM PLATE

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WELDING INSPECTION, TRACEABILITY AND OTHER TESTING

The production and inspection process is carried out in accordance with EN 1090-2 class EXC3. Generally, 100% of ultrasonic test and 20% of magnetic particle inspection performed on full penetration butt weld; 10% of magnetic particle inspection performed on fillet weld of ancillaries.



Hydrostatic test performed on each grout pipe and grout hose. The test was carried out with the water pressure of 1.5MPa with a holding time of 15 seconds.



During the production process the welding and inspection information are stenciled on the pipe body. A final product stencil marking will be made at the end of the internal surface for each pipe.

FINISHED PRODUCT

ESC assigned a fulltime qualified inspection QA/QC staff member (AWS CWI) to monitor, witness, and perform inspection in the factory throughout the production process (from incoming raw material to ship loading process) to ensure all products were delivered as per project requirements.

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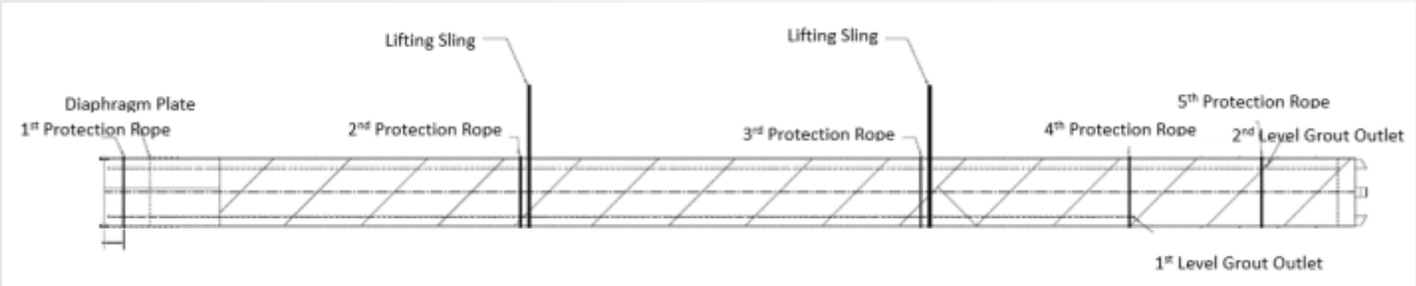
PACKING & STACKING



Careful consideration was made when designing the packing method to prevent damage to the pipe and welded components. Each pipe is protected with protection ropes and two lifting slings are provided.

SHIPPING, STACKING & LOADING

There are a total of two shipments, both shipments carried out in Taicang wharf of Jiangsu at 14th September 2016 (1st shipment) and 15th ~ 17th October 2016 (2nd shipment).

The entire loading and stacking process is fully witnessed by ESC representatives and a third party inspector to ensure products are properly loaded, stacked, and secured to prevent damage during the shipping process.

All products stacked in the wharf yard are padded and stoppers used to prevent damage and sliding. Two different loading processes used: 1) Directly from barge to ship, 2) From wharf yard to ship.

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SHIPPING OF LOADED PIPES

PORT LAFITO

PORT CONSTRUCTION PROJECT

Project Name	Port Lafito
Contractor	Agro Products and Services
Client	Port Lafito partnered with SSA Marine
Location	Haiti
Product	Sheet Piles, Tie Rods & Mooring Bollards
Total Tonnage	2,660 MT
Delivery Date	2014

INTRODUCTION

Port Lafito is Haiti's first Panamax Port with state of the art equipment and technology. Port Lafito will breathe new life into Haiti by creating new jobs, training for skilled labor, and encouraging foreign investment and development. This project will make a significant impact on the national economy and have a beneficial impact on the more than 10 million people living in the area.

In addition, an International Sister Seaport agreement was signed between Port Lafito and Port Miami in order to collaborate on the exchange of information and ideas, with the aim to increase cargo and trade between ports. Port Lafito partnered with SSA Marine, the world's largest independent and privately-held marine terminal operator, to oversee the port and terminal operations.

The opening of Port Lafito is one step toward the larger development of Lafito Global, an economic zone which will include the international port & terminal, an industrial free zone, a business park and residential area among more. The development of Lafito Global will drive the creation of more than 25,000 new jobs in Haiti by 2020, foster a new vibrant economic social center, establish attractive regional logistics and become an industrial hub for the Caribbean.

The efficiencies and modern capabilities provided at the newly built Port Lafito will enable Lafito to improve and broaden the level of service to the Haitian customers. And increase business opportunities in Haiti.

ESC SCOPE OF SUPPLY

SHEET PILES, TIE RODS & MOORING BOLLARDS

Agro Products and Services from the US has ordered a significant sheet piling solution for its GB Group Port Lafito in Haiti. The order is for 2,410 tons of ESC-CRZ26-635 sheet piles in ASTM A572 Grade 50. The lengths will vary from 12 to 25m including three custom made corner piles. In addition, ESC will manufacture 193 sets of 20.9m tie rods and 136 sets of 6.5m tie rods. They will be in Grade 700 and M85. Hot rolled C Channel for the waling beams are to be supplied in 12m lengths to the amount of 191 tons. ESC supplied 8 pieces of 50 ton SWL cast T-Horn mooring bollards.

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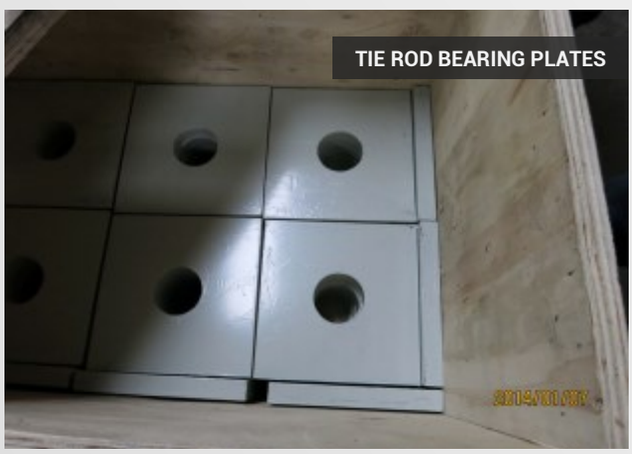
PROJECT MATERIALS


T-HORN MOORING BOLLARDS


FABRICATED CORNER PILE


TIE ROD BEARING PLATES

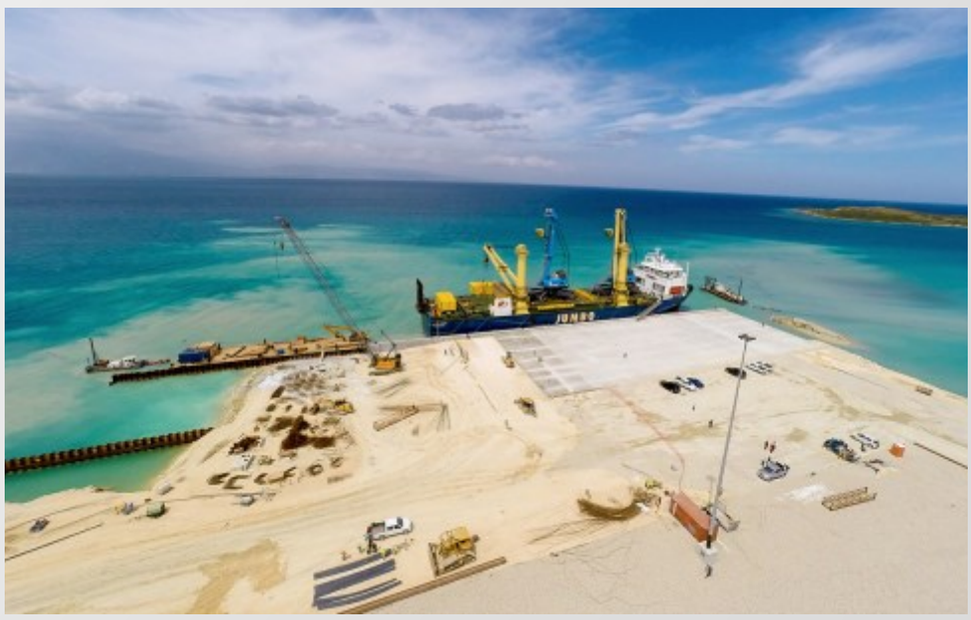

TIE ROD COUPLER


SHEET PILES PAIRED


COATED TIE RODS WITH COUPLER


ESC CRZ26-635

ON-SITE INSTALLATION



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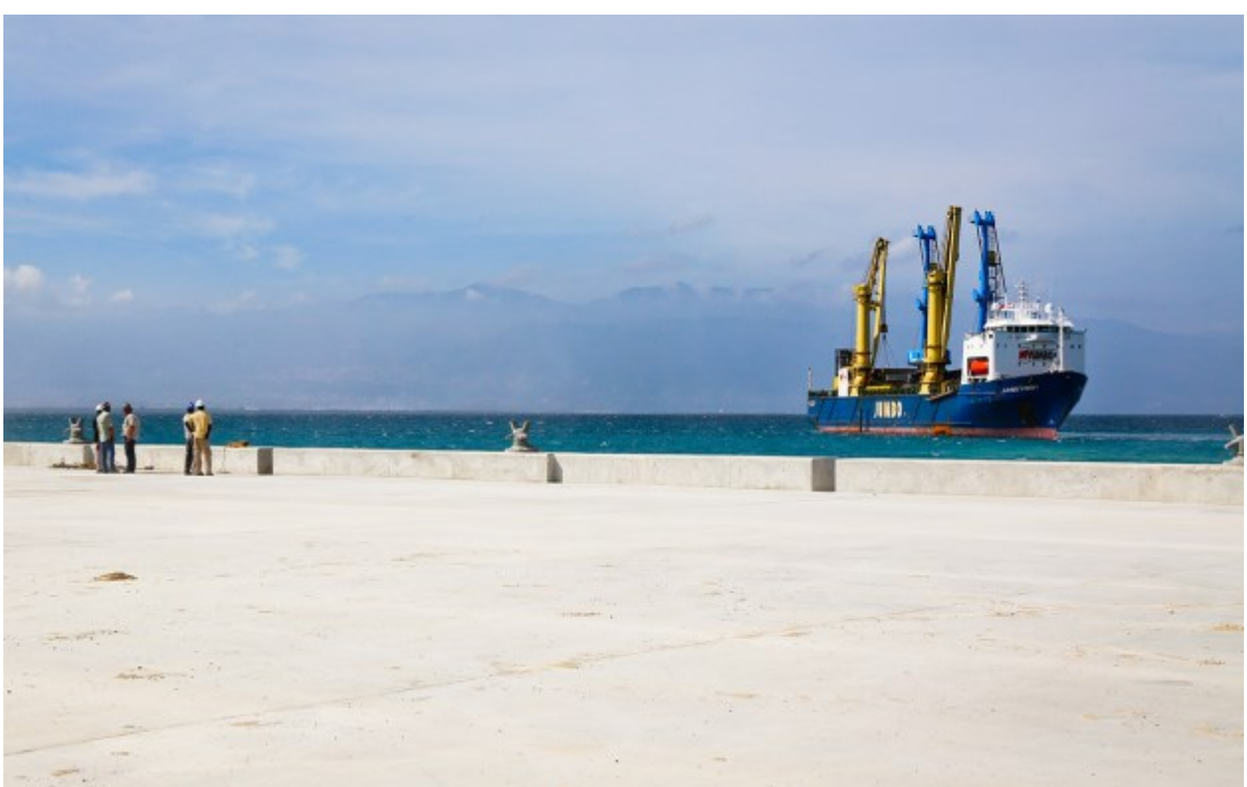
PROJECT COMPLETED



PORT OF EVERETT

PORT CONSTRUCTION PROJECT

Project Name	Port of Everett
Client	Bergerson Construction, Inc.
Location	Washington USA
Product	Hot Rolled Z Piles & Custom Tubular Piles
Delivery Date	2016

INTRODUCTION

Each year, the Port Commission adopts a Capital Improvement Project budget that enhances the Port of Everett's business lines and supports jobs, trade, commerce and recreation. These Capital Improvement Projects grow the economy by creating good paying jobs, leveraging private investment, and creating revenue generating industries.

Port of Everett Seaport stability and growth lies in the potential of its current infrastructure. As the shipping industry continues to see a trend of larger vessels, the Port of Everett looks to infrastructure opportunities to stay competitive and support 34,000+ regional jobs. Per the Port Commission's direction, Port staff are working toward implementation of the Marine Terminals Master Plan (2008), which includes strengthening and expanding docks to add a minimum of 300 feet of capacity in the next five years to meet 21st Century shipping demands.

ESC SCOPE OF SUPPLY

SHEET PILES & CUSTOM TUBULAR PILE

ESC carried out the supply, Blasting and Painting of Sheet Pile, tubular pile, and corner piles for this project.

Sheet Pile supply was 108 ESZ26-700 Sheet Pile Pairs 16m length Grade S430GP and a 609mm tubular corner pile 21 meters long.

The project was all carried out in the ESC fabrication yard in Abu Dhabi, UAE.

BLASTING AND PAINTING

In order to prepare the pile surface, piles were shot blasted to SA2.5 standard as specified by ISO 8501 and ISO 8503 using ESC's portable dry steel shot blasting machine, with compressed air supply of 0.7N/mm2.

After completion of blasting, all dust and abrasives were removed from the piles by brushing and blowing.

The specified paint system used was Carboline Carboguard 890 Coating System. All the sheet piles and tubular piles were painted in accordance with C5-M specification “Very high corrosivity marine atmospheric environment".

QUALITY CONTROL

Paint inspection are conducted by a certified NACE inspector. NACE Coating Inspector Program has set the standard for inspections in the protective coatings industry and is the world's most recognized coating inspector certification program.

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PROJECT MATERIALS


CUSTOM CORNER TUBULAR PILE


PACKAGING PREPARATION

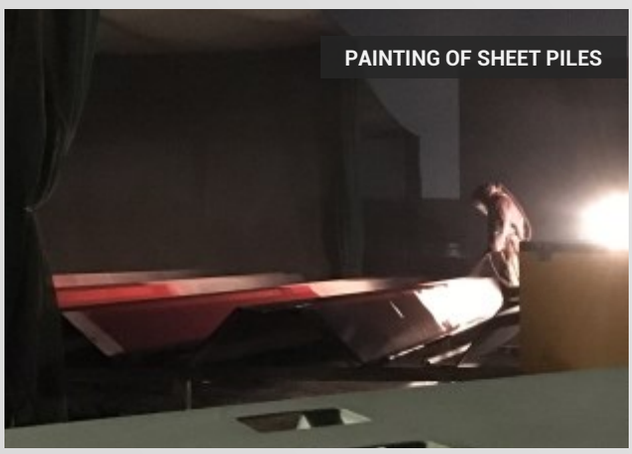

WELDING OF SHEET PILES INTO PAIRS


INSPECTION OF WELDED PAIRED PILES

BLASTING & PAINTING


BLASTING OF SHEET PILES


PAINTING OF SHEET PILES


PAINTING OF SHEET PILES


PAINTING INSPECTION

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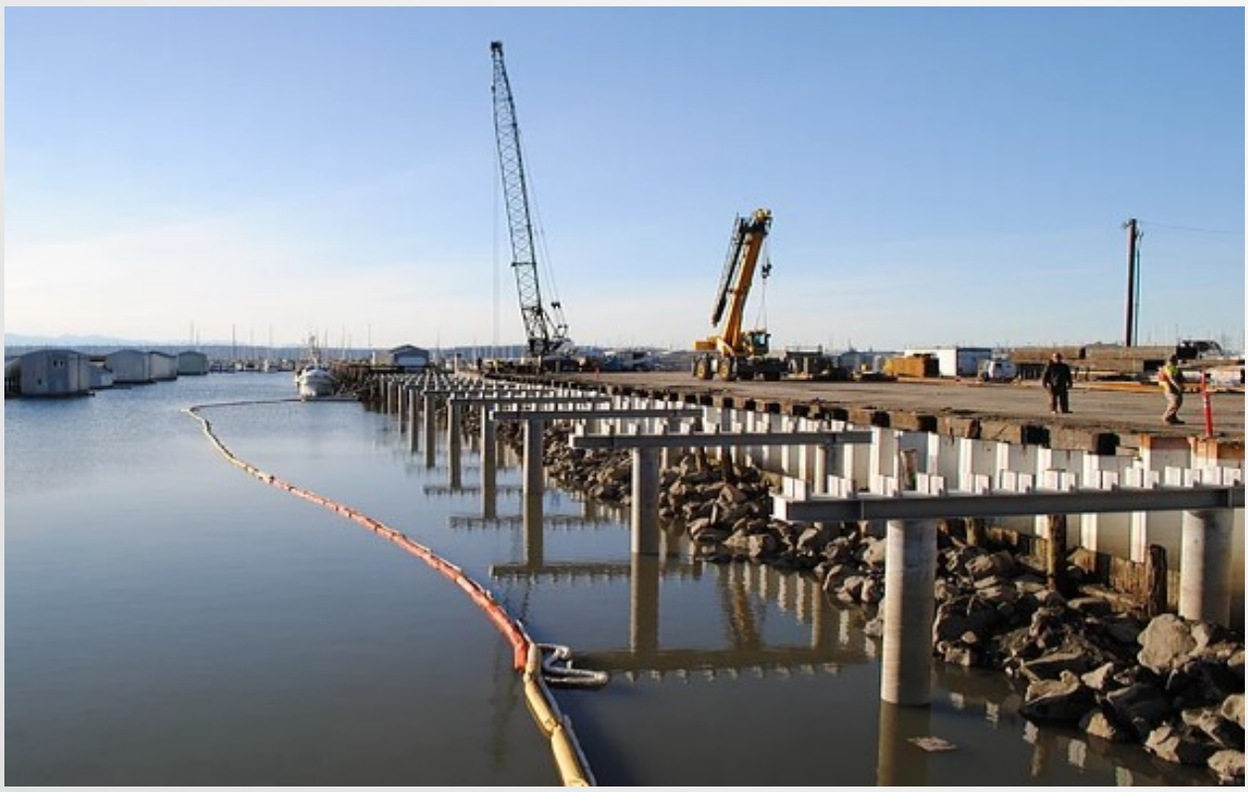
Website: www.escglobalgroup.com

PACKING, STACKING & DELIVERY

Email: escglobal@escpile.com
Website: www.escglobalgroup.com

ON-SITE INSTALLATION



PROJECT COMPLETED

STEVIN ROCK BERTH—NEW QUAY WALL, UAE

NEW QUAY WALL PROJECT

Project Name	Stevin Rock Berth New Qual Wall, UAE
Main Contractor	MUC Engineering
Location	Ras Al Khaimah, UAE
Product	Sheet Piles
Total Tonnage	3280 MT
Delivery Date	2016

INTRODUCTION

The previous berth consisted of 4 staggered berths in sequence. Revised requirements by the owner meant that one continuous wall would be preferred with 5 berths between 117 to 134m length.

MUC Engineering, one of the leading multi-disciplinary engineering consultancies in the Middle East completed the design of the new quay wall. The sheet piling system was designed with an increased loading surcharge of 20kPa and a seismic rating of Zone 2A.

A cathodic protection was incorporated to act together with the corrosion protection coating to meet the 50 year design life. This decreased the sacrificial thickness of the sheet pile for the residual bending capacity at the 50 year design life.

The tie rods were wrapped in anticorrosion tape. The design of the tie rod connection to the main wall consisted of a waling beam with a mounting bracket for the eye of the tie rod, which could be mated after the reinforced capping beam was installed and cast. An oversized 225mm diameter PVC pipe sleeve was placed over the tie rod, to compensate for any ground settlement without imparting significant vertical loads on the tie rods which would have compromised its structural integrity.

All construction works were completed while keeping the facility working. This allowed the client to continue operations at full or near full capacity.

Some of the existing sheet piles had to have 1.5m of its top cut off to allow the tie rods to pass through to the new anchor wall. The sheet piles were driven to -13.0m, 6m below the existing channel level.

ESC SCOPE OF SUPPLY

COATED SHEET PILES

ESC Middle East was awarded the contract for the supply of a new quay wall that spanned over 600 metres for one of the largest quarrying companies in the Middle East to replace an the existing quay wall system that was heavily corroded and collapsing. ESC supplied over 3000 tons of sheet piling material for this project which was integral to keeping the leading quarry operator in the Middle East with capacity of producing and exporting 45 million tons per year of high grade limestone, gabbro rock, concrete and asphalt aggregates in the Gulf Region and Asia.

ESC's scope of products:

- ESC-CRZ42-700 in 19.65m lengths in Grade Q345B (2930 tons)
- ESC-CRZ14-770 in 5.5m lengths in Grade S430GP (350 tons)
- Jotamastic 87 coating of main sheet pile wall on top 7.0m both sides

The sheet piles were painted in the UAE facility with Jotamastic 87 to a 500 micron DFT (dry film thickness) in compliance with IM2 and C-5M of ISO 12944 for a 15 year durability rating. The total design life of the quay wall structure was 50 years.

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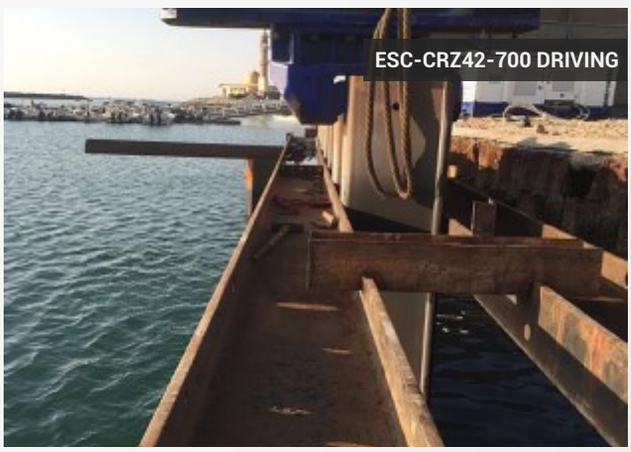
FABRICATION OF SHEET PILES

SHIP LOADING

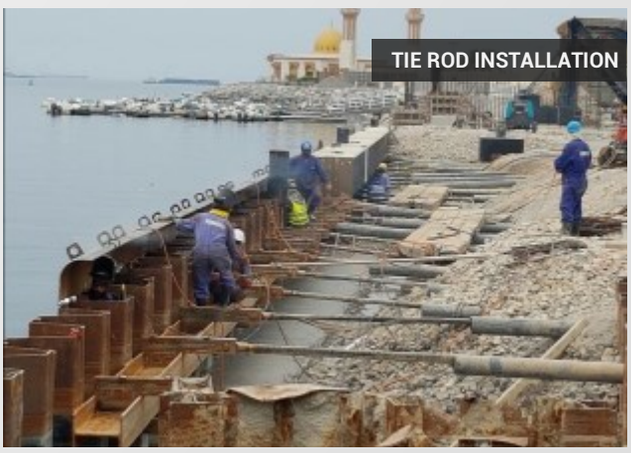
ON-SITE INSTALLATION

ON-SITE INSTALLATION


ESC-CRZ42-700 DRIVING


FINAL SHEET PILE INSTALLATION


CAPPING BEAM CASTING


TIE ROD INSTALLATION


TIE ROD INSTALLATION COMPLETE


MAIN WALL INSTALLATION COMPLETE

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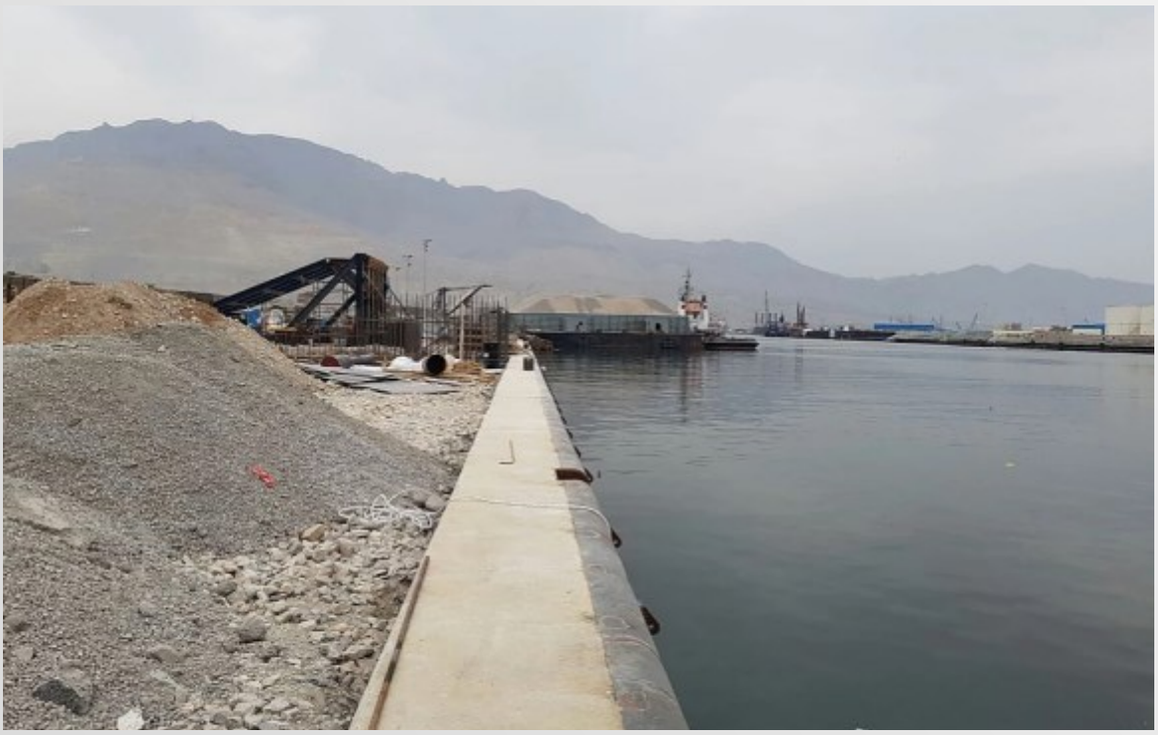
PROJECT COMPLETED



TMCLK SEAWALL FOR NORTHERN RECLAMATION PROJECT

BRIDGE PROJECT

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.

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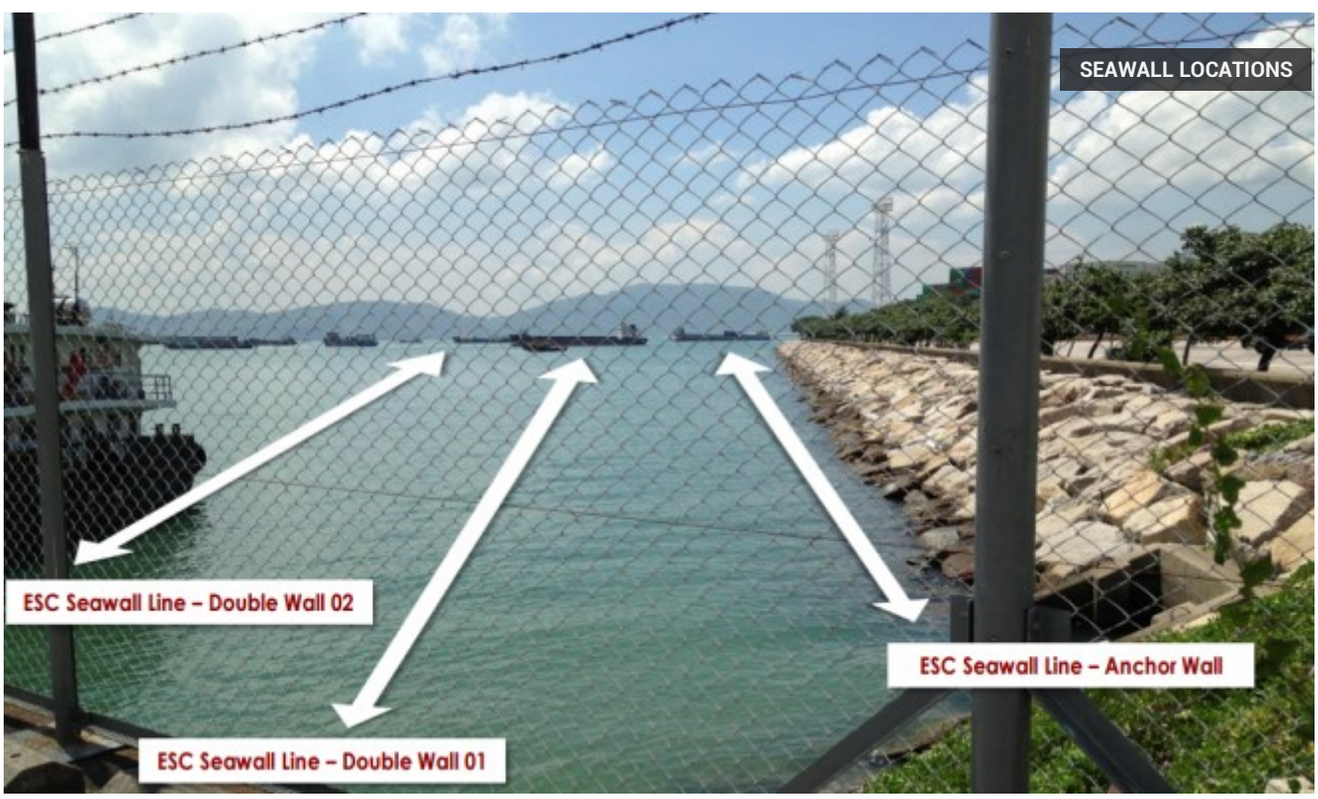
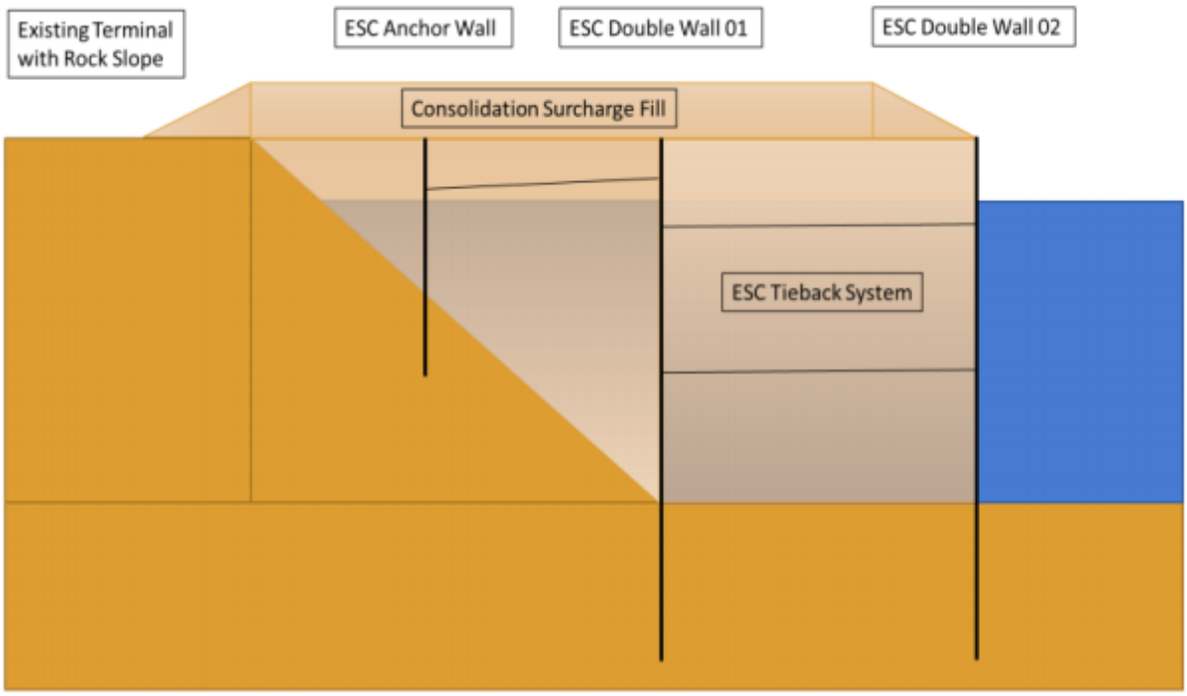
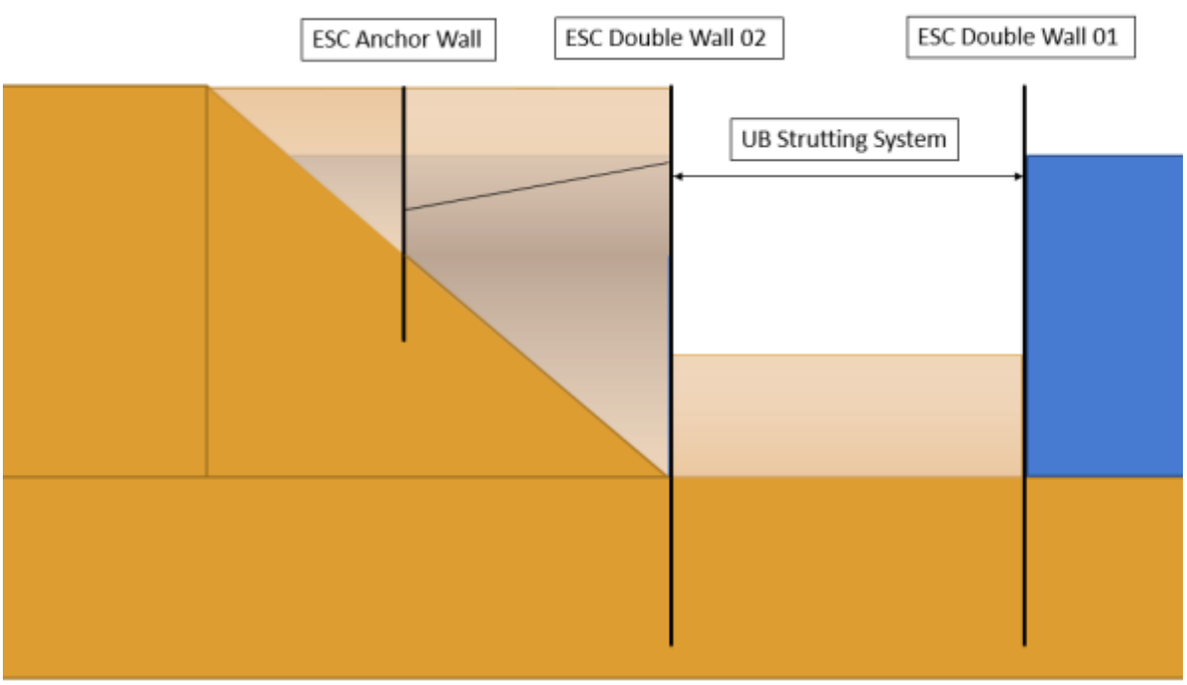
PROJECT LOCATION



PROJECT DETAILS



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



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

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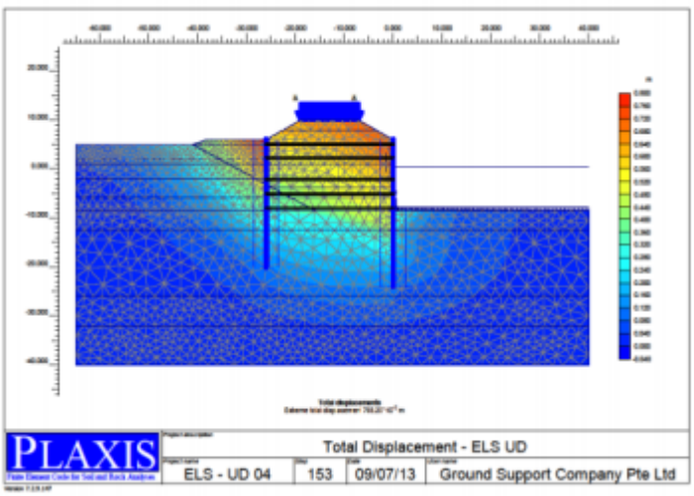
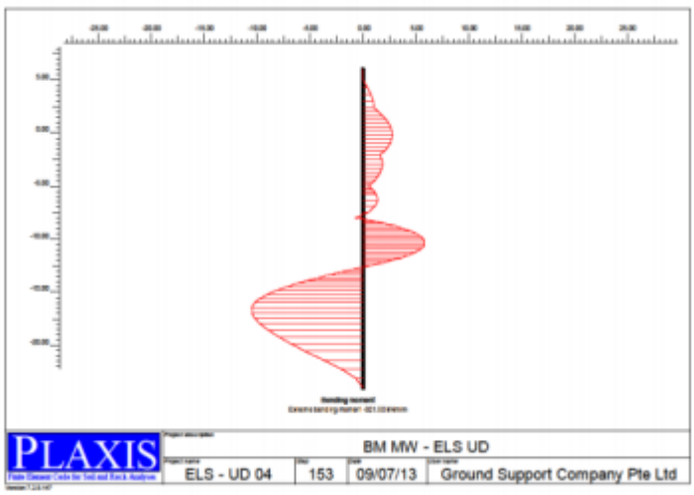
PROJECT DETAILS

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 cm^3/m	Inertia cm^4/m	Moment Capacity kNm/m
Tender Spec.	FSP IV	S275JR	2,270	38,600	**624**
ESC Spec.	ESC-H50/20B1/9.75	Q345B	1,861	**59,195**	**642**

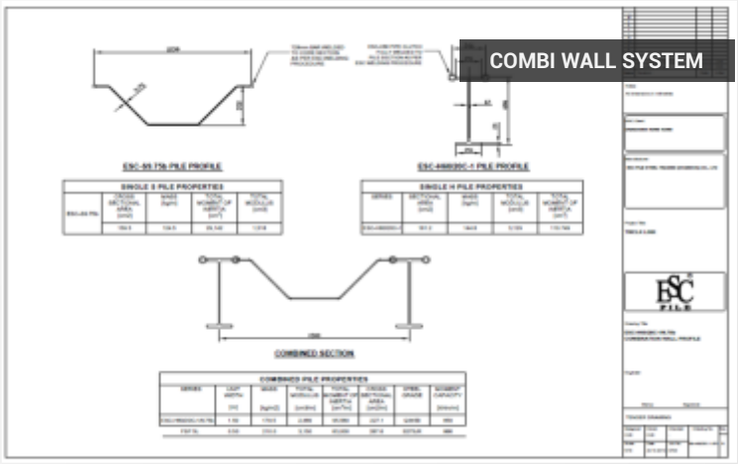
Double Wall - 02

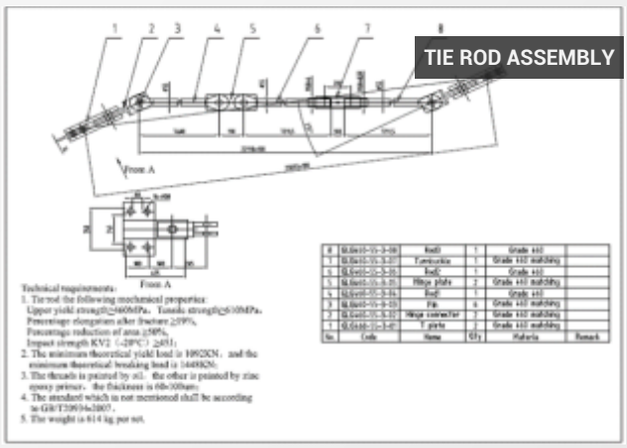
Item	Series	Grade	Modulus cm^3/m	Inertia cm^4/m	Moment Capacity kNm/m
Tender Spec.	FSP VL	S275JR	3,150	63,000	**866**
ESC Spec.	ESC-H60/20G1/9.75	Q345B	2,489	**95,560**	**859**

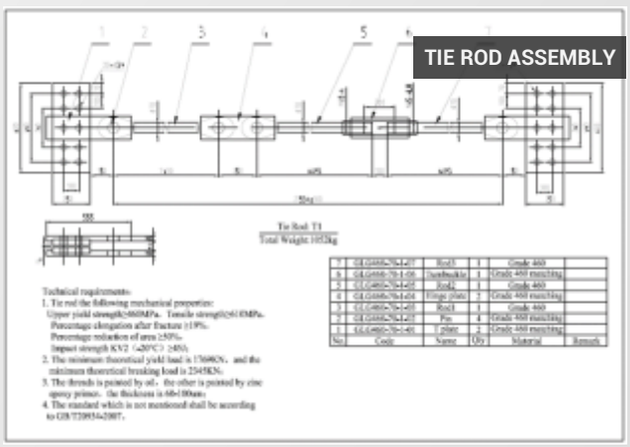
Anchor Wall

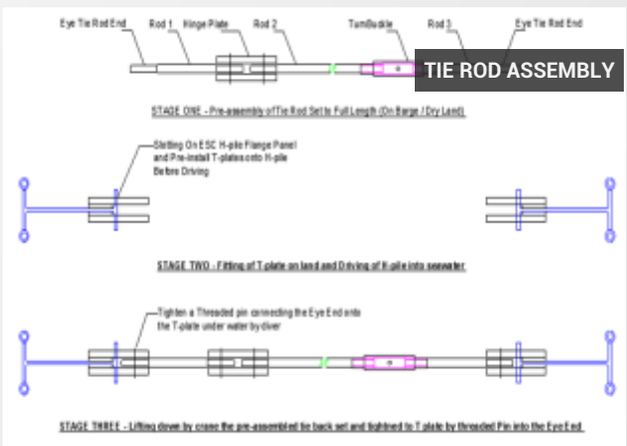
Item	Series	Grade	Modulus cm^3/m	Inertia cm^4/m	Moment Capacity kNm/m
Tender Spec.	FSP III	S275JR	1,340	16,800	**369**
ESC Spec.	ESC-H50/20B1/6.5	Q345B	1,099	**36,935**	**379**

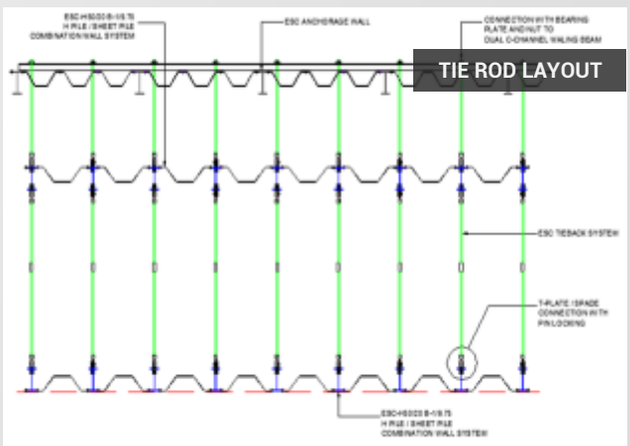
PROJECT DETAILS

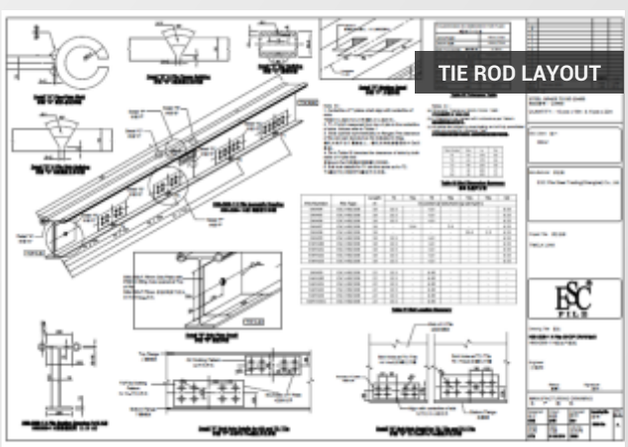


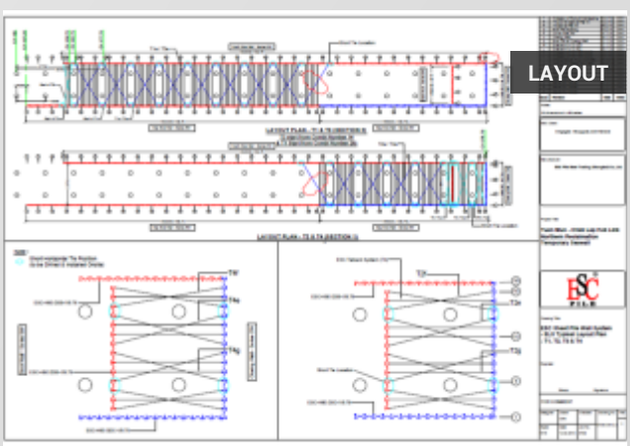












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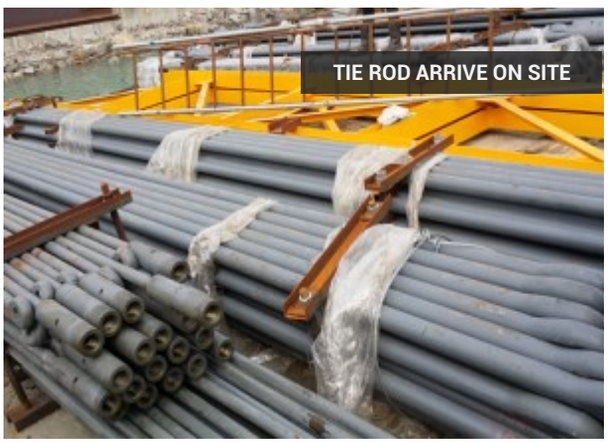
TIE ROD SYSTEM


TIE ROD ARRIVE ON SITE

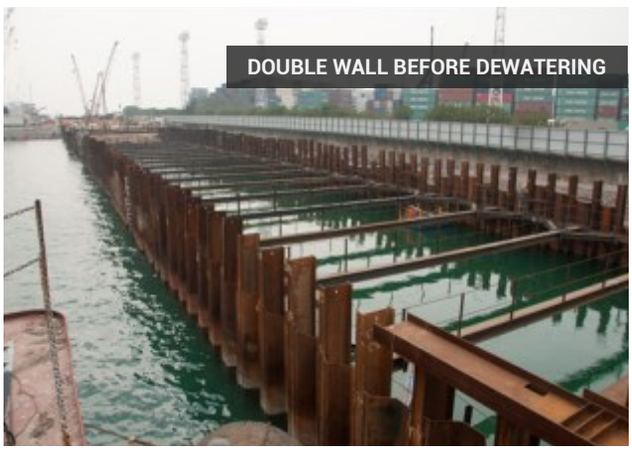

TIE ROD ARRIVE ON SITE


TIE ROD T-PLATES TO KING H PILES


TIE ROD ARRIVE ON SITE

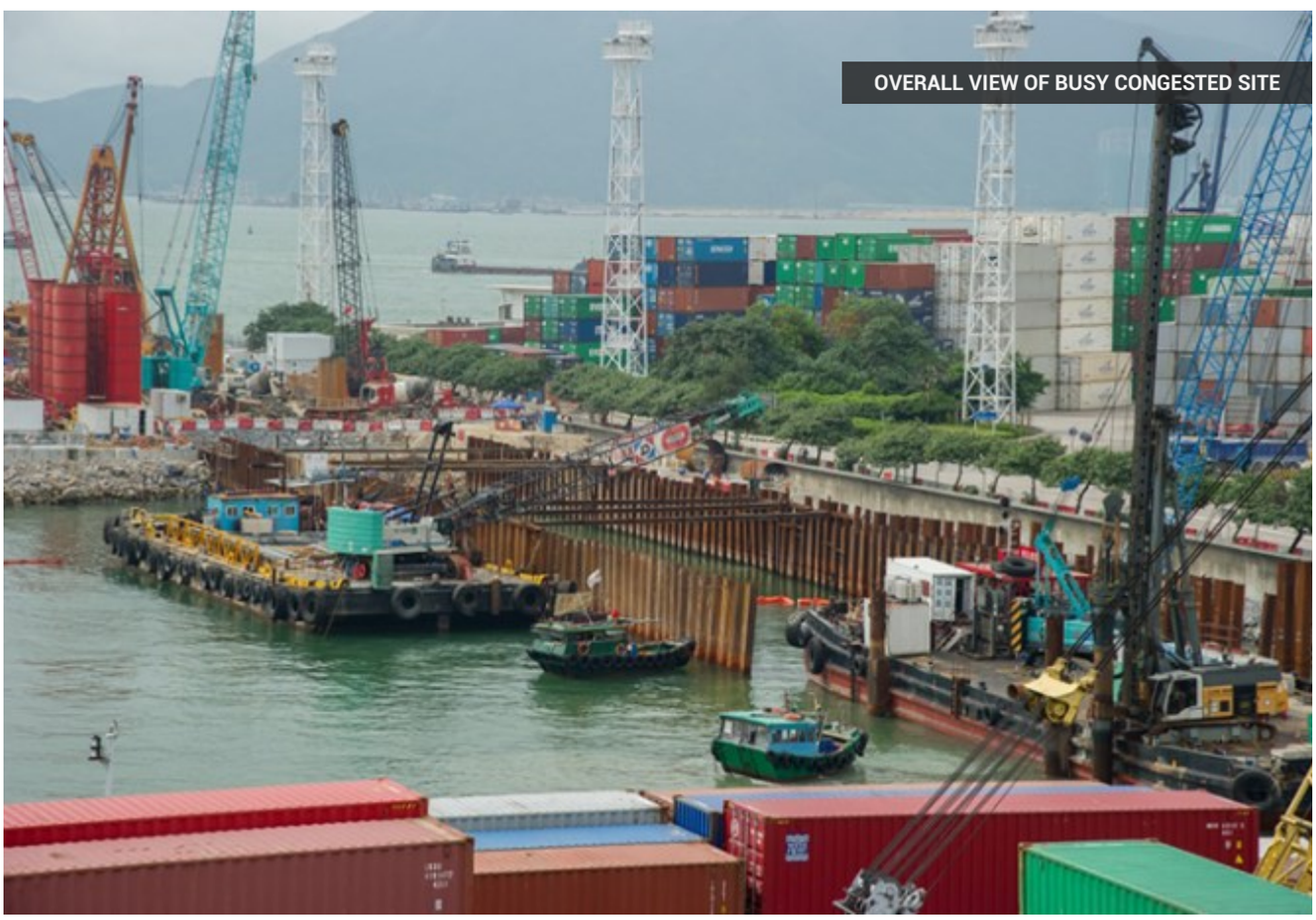

TIE ROD T-PLATES FITTED AND BOLTED TO KING H PILE

INSTALLATION UNDERWAY

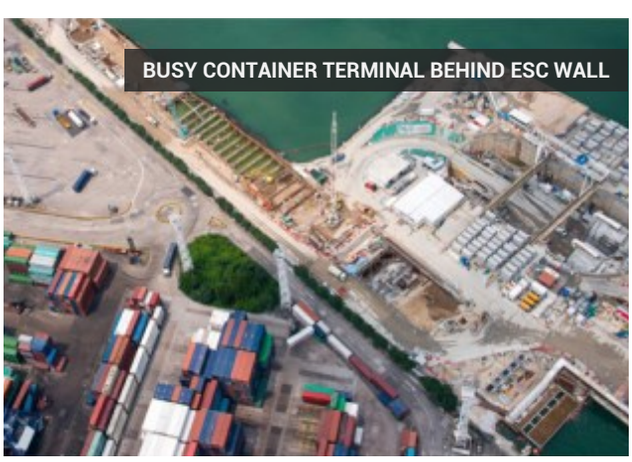


DOUBLE WALL BEFORE DEWATERING

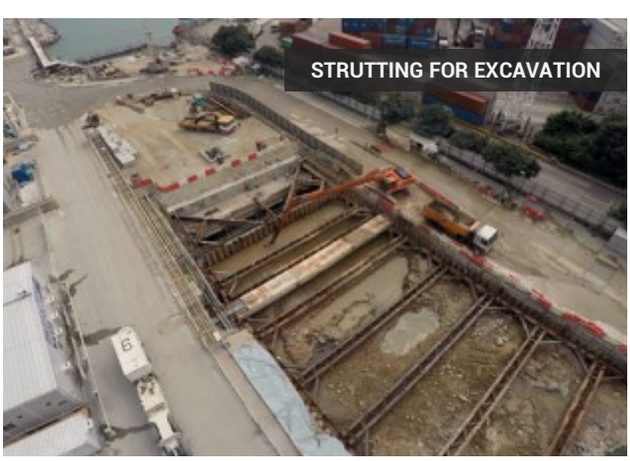
COFFERDAM BEFORE EXCAVATION FOR CULVERT



OVERALL VIEW OF BUSY CONGESTED SITE



BUSY CONTAINER TERMINAL BEHIND ESC WALL



STRUTTING FOR EXCAVATION

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VICTORIA HARBOUR

HARBOUR EXTENSION PROJECT

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 in-plant 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

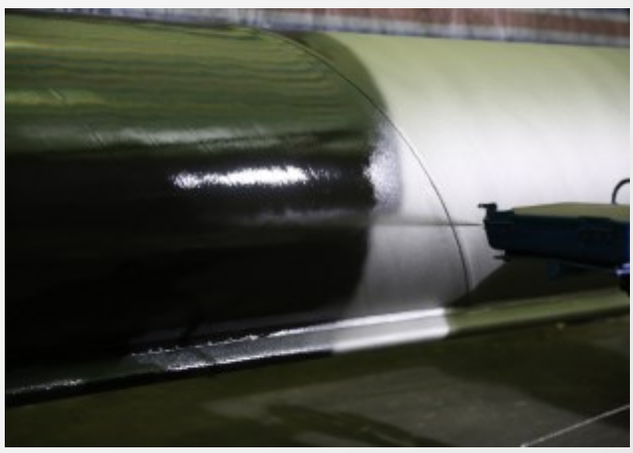
TUBULAR PILES & SHEET PILES

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


ESC GR Q345B SSAW PIPE PILES

PAINTING OF PIPES



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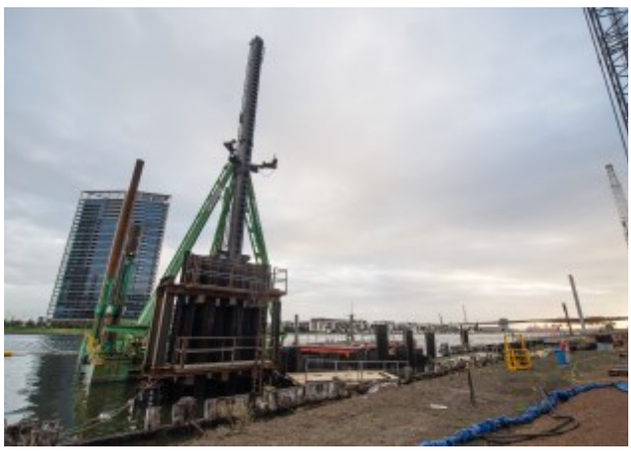
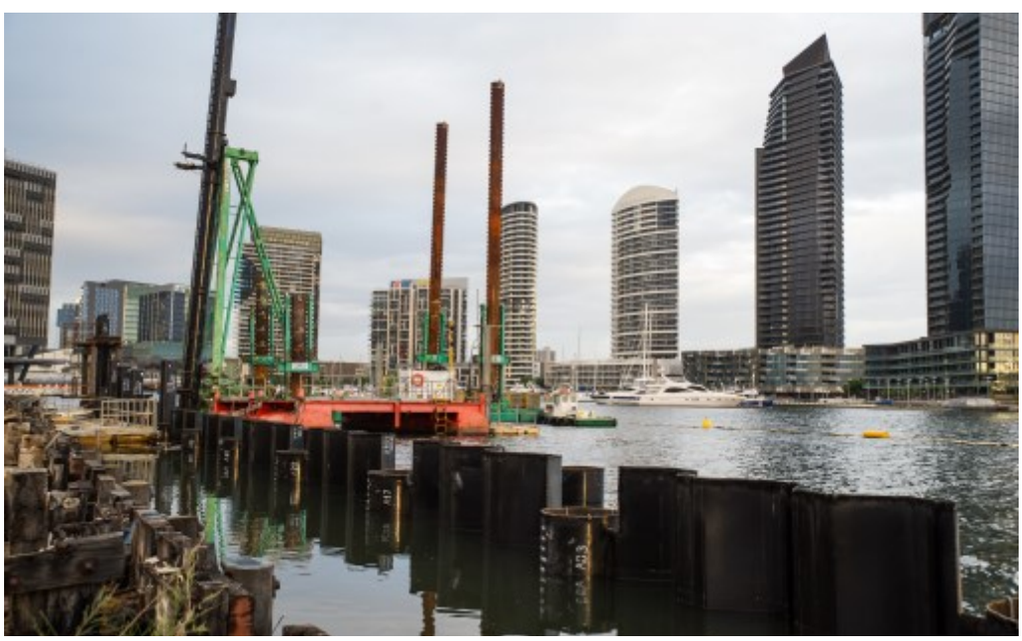
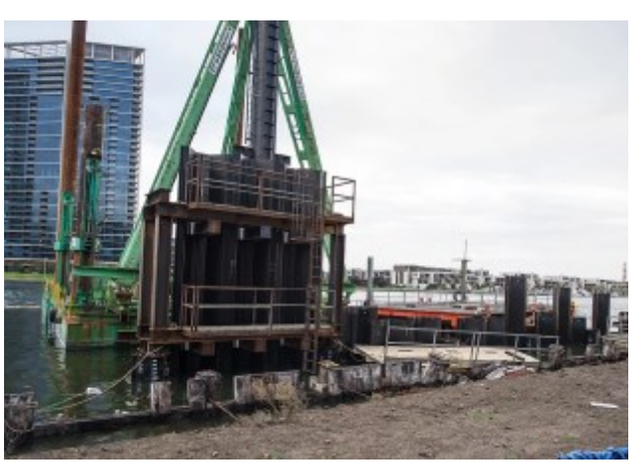
ON-SITE INSTALLATION







PROJECT COMPLETED

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WATCO BREAKWATER (BERTHS 3 & 4)

BULKHEAD CONSTRUCTION PROJECT

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 proposed bulkhead line, there were certain areas with hard driving condition that had been encountered. With the expertise of the contractor onsite and site advice from the ESC team, Russell Marine managed to achieve full pile penetration nicely using a driving guide, pre-boring method and then a combination of a hydraulic vibrohammer combined with a diesel drop hammer.

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
- 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.

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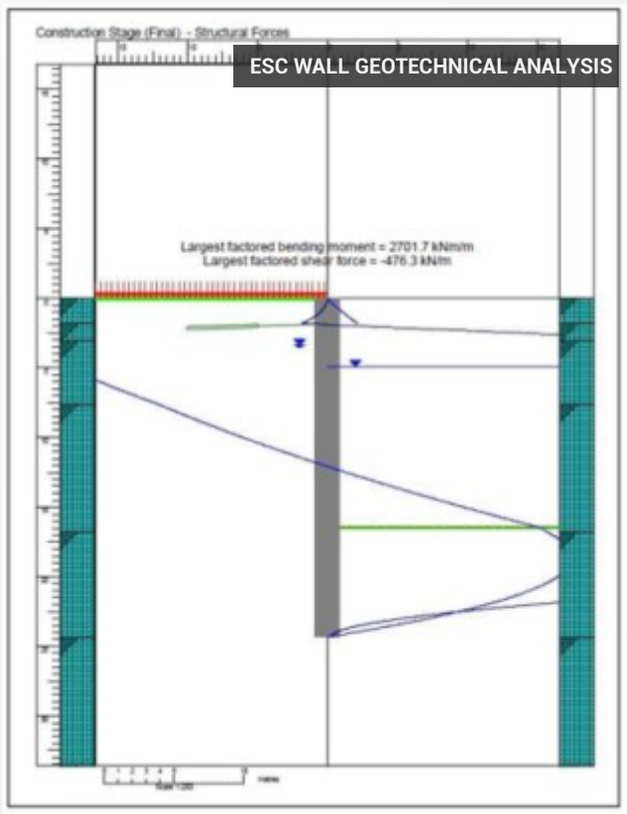
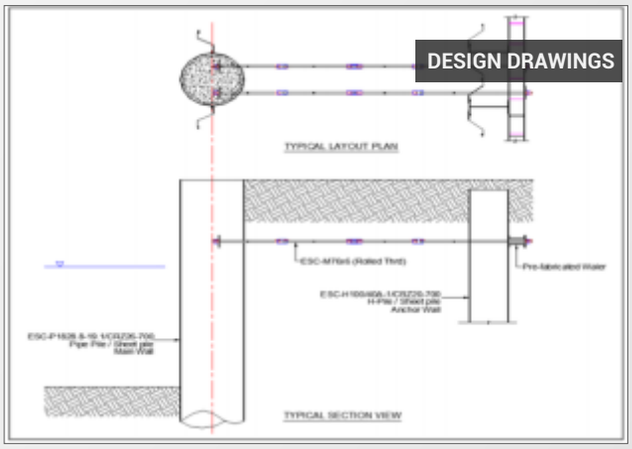
PROJECT DETAILS & MATERIALS

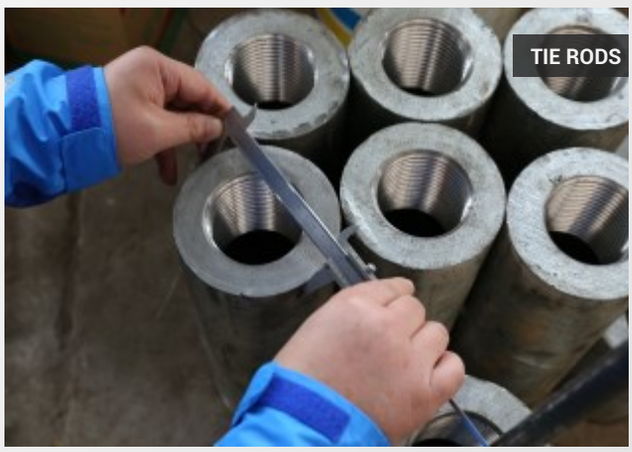


ESC WALL GEOTECHNICAL ANALYSIS



DESIGN DRAWINGS


PRE-FABRICATED WALERS & STIFFENERS


TIE RODS


CLUTCH


BOLLARDS


PIPE PILES

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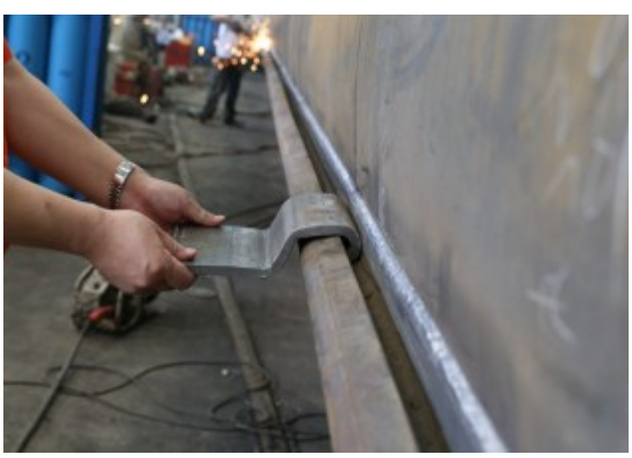
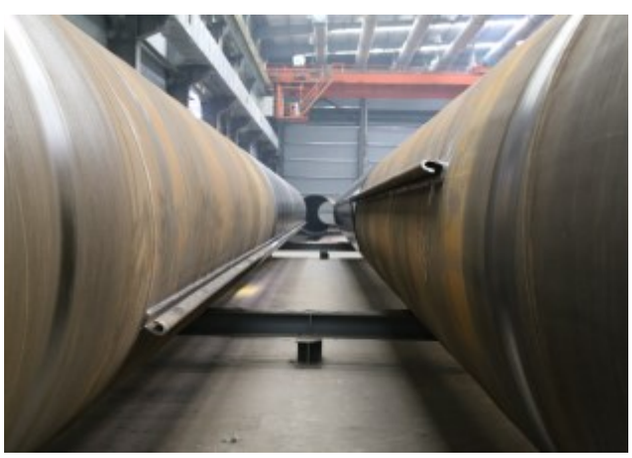
WELDING OF CLUTCH





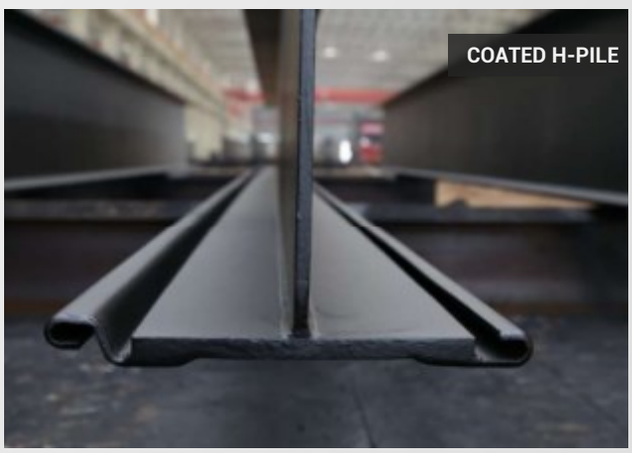
BLASTING OF PIPES

PAINTING


PAINTING OF PIPES


PAINTING OF PIPES


COATED CRZ SHEET PILE


COATED H-PILE


PAINTED SSAW PIPE PILE INSPECTION

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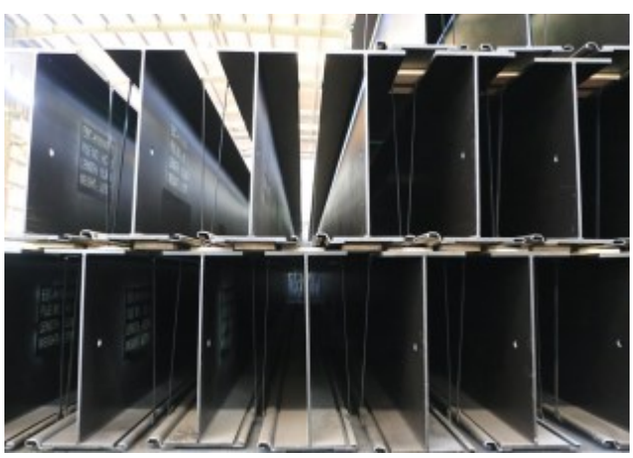
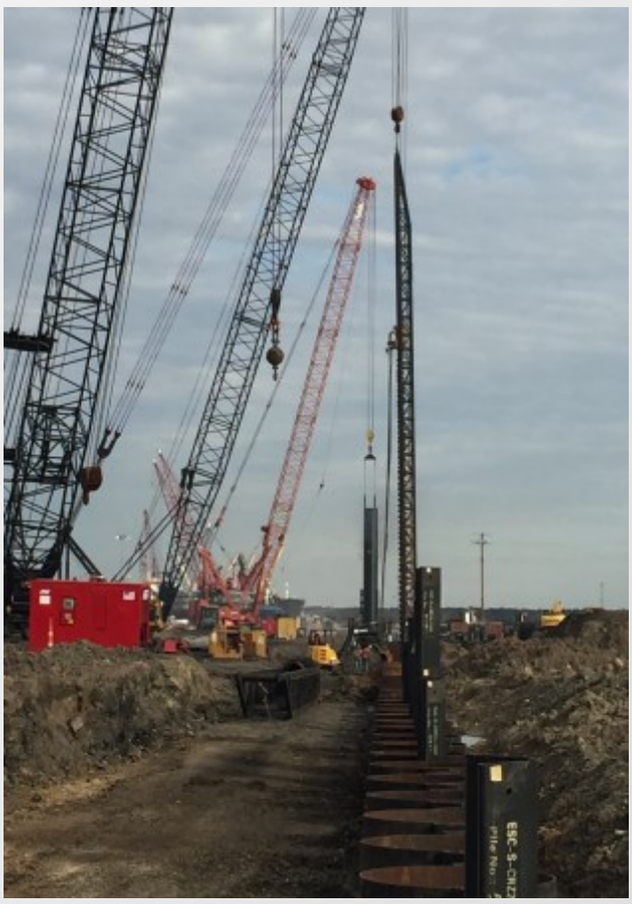
STACKING



SHIP LOADING

ON-SITE INSTALLATION



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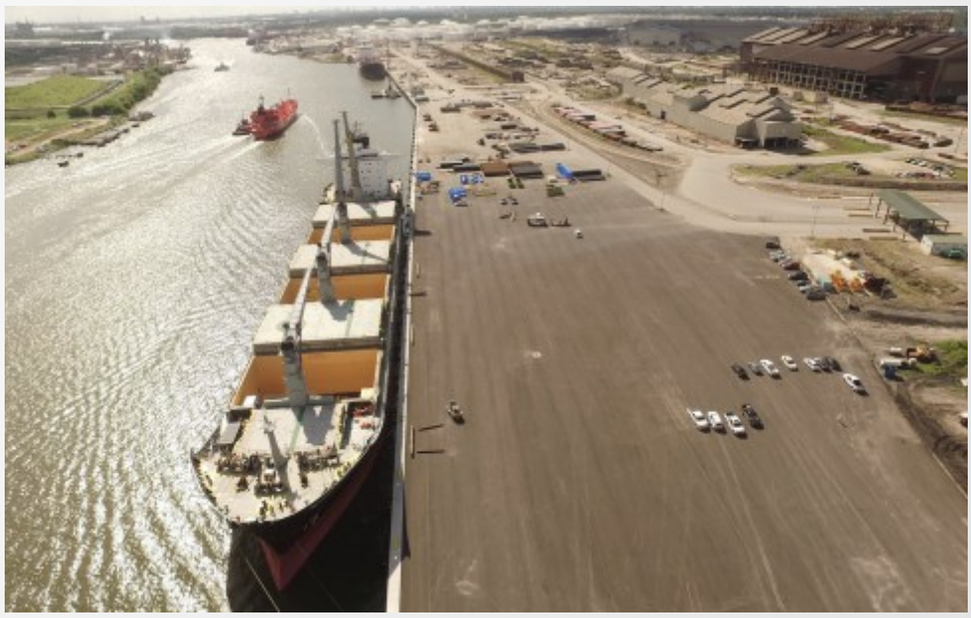
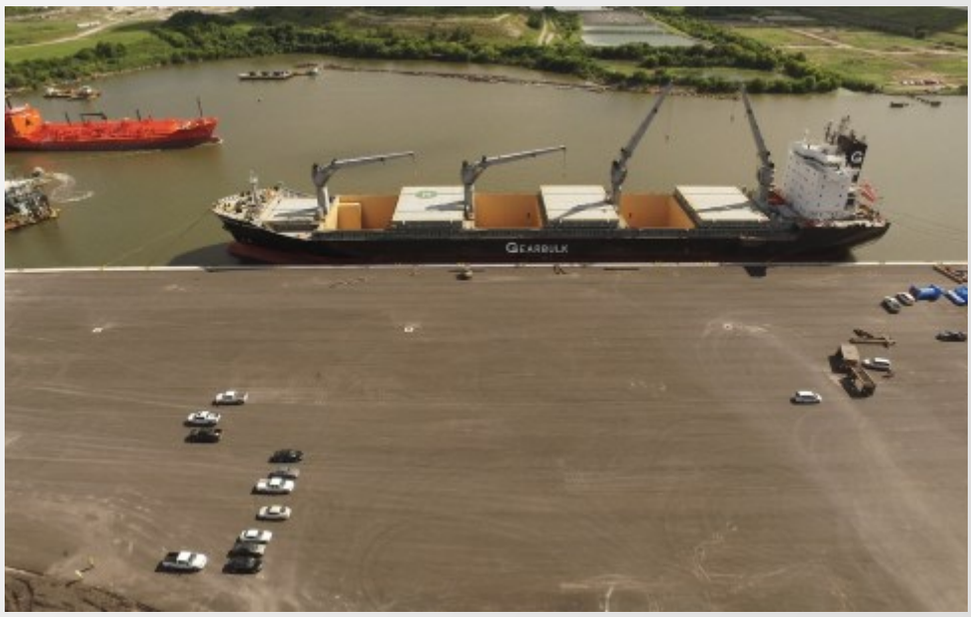
ON-SITE INSTALLATION

PROJECT COMPLETED





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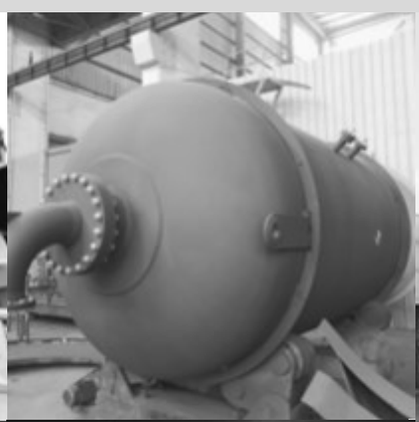





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