



# PORT & OFFSHORE STRUCTURES

Capability Statement

**DELIVERING  
GLOBAL ENGINEERED  
SOLUTIONS SINCE 1986**



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## COMPANY CERTIFICATION

ESC has achieved and maintained ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 certifications for both supply, design and installation scopes related to sheet piling and piling related products.







# INTRODUCTION

## ESC GROUP

### ESSENTIAL INFORMATION

Head Office Address	Acclime Offices 17/F United Centre, 95 Queensway Admiralty, Hong Kong
Turnover of ESC Group up to date	USD 300,000,000 +
Trademarks	ESC & ESC PILE
Products	Sheet Piles, Tubular Piles, H Piles, Combi-walls, Tie Rods, Corrosion Protection, Structural Steel Sections, Trench Boxes, Clutches, Structural Materials & Others
ASIA DIVISION	ESC Pile Trading (Shanghai) ESC Asia Limited
Paid Up Capital	USD 1,150,000
Paid Up Capital:	DHS 5,300,000

# HISTORY OF ESC

The inception of ESC Pile occurred in 1986, when the founding partners envisaged a wide profile sheet pile unlike other traditional sheet piles. ESC's first sheet pile was driven in 1986, in Magnetic Island in the Great Barrier Reef, Australia. Since then, ESC has grown into a global piling company with international locations in almost every continent of the world. ESC Sheet Piles have successfully been used in varying locations, site conditions and design configurations.



# ABOUT ESC

ESC has been designing and producing sheet piles since the late 1980's and is now a leading manufacturer of cold rolled/formed steel sheet piles, supplying a global network. ESC has expanded significantly into hot rolled sheet piles, tubular piles/mono-piles, tie rod systems and structural steel throughout the last 10 years.

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. Also available to the client are corrosion protection options, tie back systems and other items associated with the sheet piling system.

ESC Piles and other products are produced & designed in accordance with the latest international standards as well as ISO 9000 Quality Management Systems. Other specific standards depending on the client's needs can be applied on request.

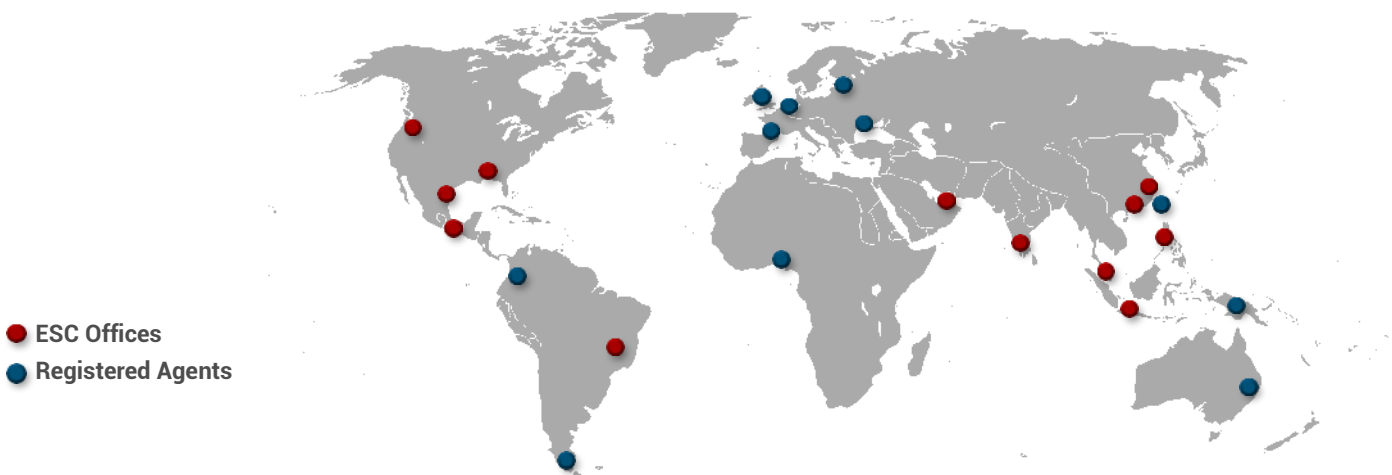
ESC has designed and supplied sheet piles to projects in every continent of the world, including Antarctica. ESC has established strong working relationships with manufacturers of steel, paints, cathodic protection systems and other items associated with piling works, providing a full suite of options to the client.



## COMPANY & PERSONNEL CERTIFICATIONS & MEMBERSHIPS



## ESC GLOBAL LOCATIONS



# ESC ENGINEERING TEAM

## CAPABILITIES

ESC's engineering team provides a responsive service covering various disciplines: from geotechnical engineering, civil engineering, manufacturing engineering and materials engineering. Situated in offices at all continents around the world, with a tight-knit communication network, ESC has grown a highly technical team. The experience range of each ESC engineer varies between 1 year all the way up to over 50 years. Technical qualifications include Professional engineers, quality control and project management certification. ESC maintains up-to-date cutting edge software alongside internal and external training.

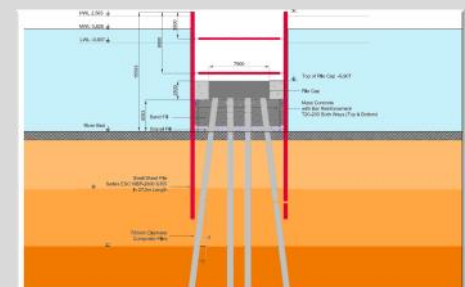
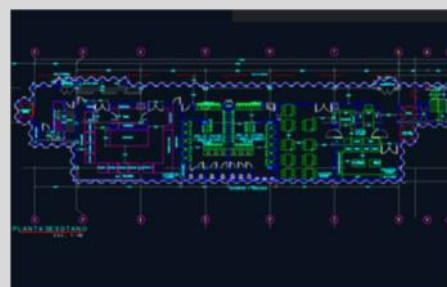
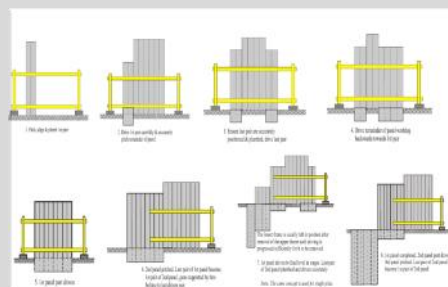
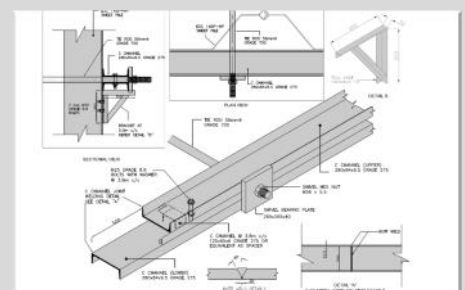
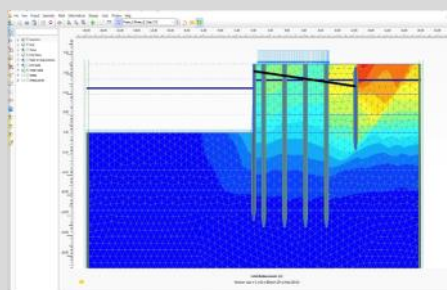
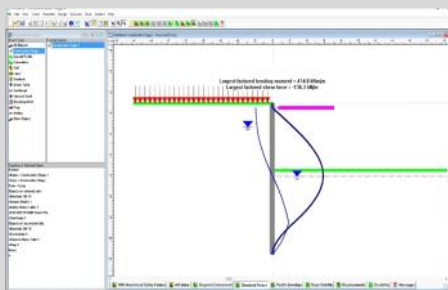
ESC is adept at conforming to various international design standards, covering European, American and other regional codes. On top of this, ESC is able to conform to client and project specific standards.

As part of its ISO certification, ESC ensures that all documentation is of a globally respected standard. ESC invests in Research & Development all the way from inception to the present. With over 20 global patents, ESC prides itself on developing it's internal technology and contributing to the overall civil engineering industry.

### Engineering Capabilities

- ✓ Geotechnical Analysis
- ✓ Structural Analysis
- ✓ Full Retaining Wall Detailed Design - Plaxis, ReWARD, D-Sheet Piling
- ✓ Sheet Pile and Combi Wall Design & Optimisation
- ✓ Fabrication Shop Drawings
- ✓ Project Construction Drawings
- ✓ Front End Engineering Design (FEED) & Concept Studies
- ✓ Project Management
- ✓ 3D Visualisation & Animations
- ✓ Research & Development of new materials, configurations and analysis methods
- ✓ Professional Engineering endorsement
- ✓ Forensic Studies of failed structures
- ✓ Global Patents in Sheet Piling Technology

## CAPABILITIES





# ESC SHEET PILING SERIES

## PRODUCT RANGE

ESC's offers a diverse range of steel sheet piling options utilising hot rolled and cold formed manufacturing processes. Combined Wall Systems are generally utilised when a standard series of sheet piles do not have the strength to resist the required design loads.

Product Range Includes;

Hot Rolled Sheet Piles—Z, U, Flat Web &  $\Omega$  profiles in up to 5200cm<sup>3</sup>/m

Cold Formed Sheet Piles—Z, U,  $\Omega$  profiles in up to 8,000cm<sup>3</sup>/m

H/Sheet Pile Combined Wall System—Beams up to 1.2m Height

Pipe/Sheet Pile Combined Wall System—Pipes over 3.0m diameter

### HOT ROLLED SHEET PILES



HRZ SERIES



HOT ROLLED U SERIES



NS-SP SERIES



FL SERIES

### COLD FORMED SHEET PILES



CRZ SERIES



CRU SERIES



CRM SERIES



CRW SERIES



EU SERIES



BP SERIES



CFW SERIES



T SERIES



LSB SERIES

### H-SHEET PILE COMBINED WALL SYSTEM



H-HRZ SERIES

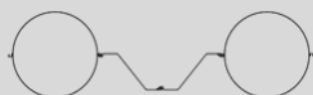


H-CRZ SERIES



H-S SERIES

### PIPE-SHEET PILE COMBINED WALL SYSTEM



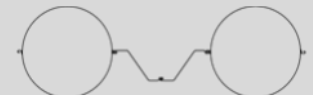
PIPE-HRZ SERIES



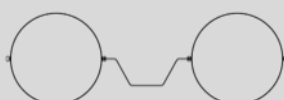
PIPE-U (DOUBLE) SERIES



PIPE-U (TRIPLE) SERIES



PIPE-CRZ SERIES



PIPE-S SERIES



PIPE-PIPE SERIES



PIPE-PIPE INTERLOCKS



## COMBINED WALL SYSTEM PROJECT REFERENCES



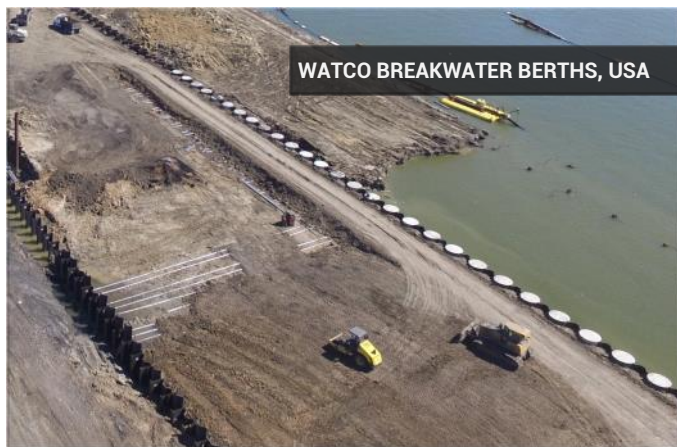
VICTORIA HARBOUR EXTENSION, AUSTRALIA



AL JAZEERAH PORT, UAE



OHAU CHANNEL DIVERSION, NEW ZEALAND



WATCO BREAKWATER BERTHS, USA



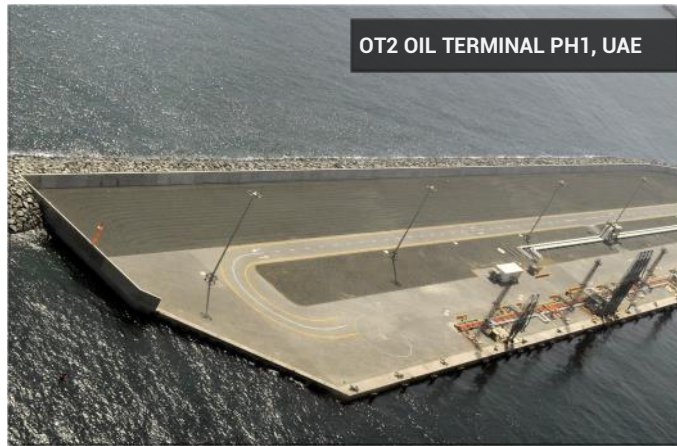
OT2 OIL TERMINAL PH2, UAE



KAOSHIUNG PORT, TAIWAN



BARROW ISLAND, AUSTRALIA



OT2 OIL TERMINAL PH1, UAE





# ESC STEEL PIPE PILES

LSAW, SSAW & ERW PIPES

Pipe Piles can be utilised in a multitude of applications: such as building foundations, roads and railways, port construction and more. Utilising 3 different welding and forming processes, ESC can offer a wide range of Pipe Piles at various steel grades, thicknesses and sizes. With our expertise in logistics we have delivered Pipe Piles at over 100mT a piece and 100m length to halfway around the world directly to project sites.



325-4267mm Diameter  
6.35-100mm Thickness  
Up to 100m Length

LSAW PIPE



219-3,048mm Diameter  
5.16-25.4mm Thickness  
Up to 100m Length

SSAW PIPE



21.3-610mm Diameter  
2.1-22mm Thickness  
Up to 18m Length

ERW PIPE

PRODUCTION STANDARDS	Standard	Description
	API 5L	Specification of Line Pipe
	ASTM 252	Standard Specification for Welded and Seampess Steel Pipe Piles
	BS EN 10219	Cold Formed Welded Structural Hollow Sections of non-allow and fine grain steels.
	ISO 3183	Steel Pipe for Pipeline Transportation Systems
	GB/T 9711	Steel Pipe for Pipeline Transportation Systems

STEEL GRADES	Standard	Description
	EN10219-1	S235JRH , S275JOH, S355JOH, S420MH, S460MH
	API5L	X42, X46, X52, X56, X60, X65, X70
	Others	Available on Request, contact ESC for further information

## Quality Assurance

Coupon Tensile Testing	Chemical Analysis	Ultrasonic Testing	Coupon Impact Testing	Pressure Testing

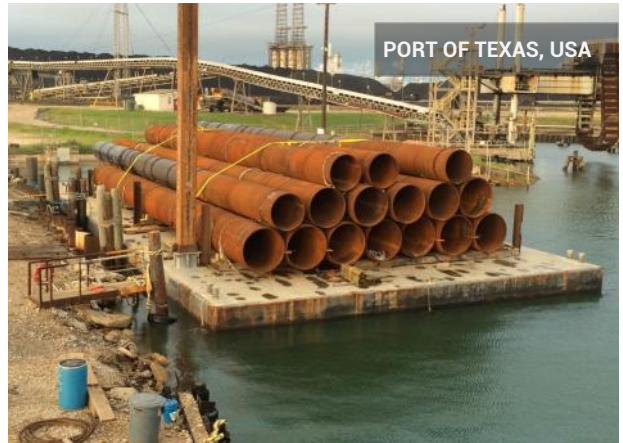


## PIPE PILE PROJECT REFERENCES

CARNIVAL CRUISE LINE TERMINAL, DOMINICAN REPUBLIC



PORT OF TEXAS, USA



COLLINS WHARF, AUSTRALIA



CRUISE SHIP DOCK, DOMINICAN REPUBLIC



LOUISIANA GRAIN EXPORT TERMINAL, UNITED STATES



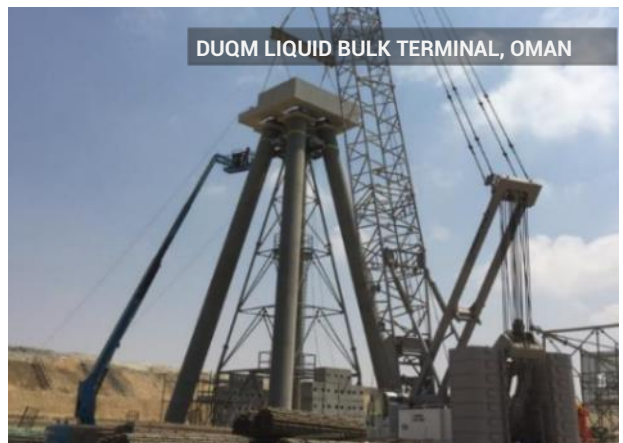
CARGILL RESERVE, LOUISIANA, USA



DUQM LIQUID BULK TERMINAL, OMAN



DUQM LIQUID BULK TERMINAL, OMAN





# MARINE TIE ROD SYSTEMS

## ANCHORAGE SYSTEM

ESC is proud to offer a full suite of options for designing, fabricating and supplying full Tie Rod System Assemblies at competitive delivery schedules. On top of this is the flexibility to provide a wide range of steel grades. Project specific requirements can also be catered to such as corrosion protection combinations, high forces, extreme lengths and large expected settlements.

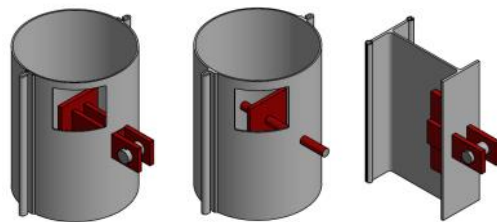
### Tie Rod System Options

- ✓ Steel Grades 450 to 700 MPa Yield Stress
- ✓ Cut, Rolled and Upset Thread Forms
- ✓ Diameters up to 150mm
- ✓ Large Range of Connection and tensioning options
- ✓ Corrosion Protection—Hot Dip Galvanizing, Coating & Taping

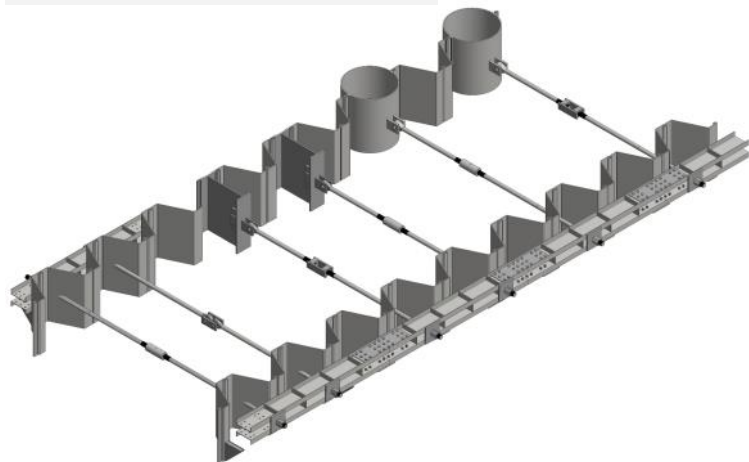
### CORROSION PROTECTION OPTIONS



### COMBINED WALL SYSTEM CONNECTIONS



### SYSTEM LAYOUT OPTIONS



### PROJECT REFERENCES



SBB, FUJAIRAH, UAE



OT2, PHASE 1, UAE



OT2, FUJAIRAH, UAE



DAMMAM, SAUDI ARABIA



STEVIN ROCK, RAK, UAE



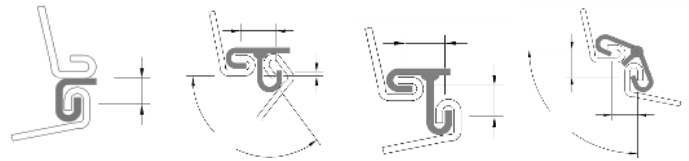
WATCO, HOUSTON, USA



# ESC WELDED ACCESSORIES

## OPTIONS

ESC provides full capability of supplying a wide range of welded accessories and markings for Combined Wall Systems. Shear Keys can be welded internally and externally to provide more rigid embedment. All components are welded as per AWS D1.1 and other standards upon request by client. Featured below are some of the typical components that are fabricated or applied to ESC Pipe Piles. Compliance to specific international standards or project requirements can be applied.



## WELDED ACCESSORIES





# MARINE FENDER SYSTEMS

## MOORING SYSTEM COMPONENTS

### Fender Components & Types available

- ✓ Cone & Cell Fenders up to 20t unit weight
- ✓ Arch Fenders (option for frontal PE pads) up to 4 metres length
- ✓ Element Fenders
- ✓ Other extruded/moulded fenders—cylinder, roller
- ✓ Pneumatic & Foam Fenders
- ✓ Full Frontal Panels Fabrication—low friction UHMW PE Pads, Closed Steel Frames
- ✓ Anchoring Bolts & Brackets
- ✓ Shear, Weight & Tension Chains
- ✓ Cathodic Protection Anodes

### ESC offers complete Marine Rubber Fender Systems

- ✓ Full range of fender types, sizes and rubber grades
- ✓ Manufacturers certified to PIANC 2002, ISO 9001, ISO 14001
- ✓ Experienced design engineers for berthing energy calculations & fender selection and detailed design of fender and frontal panels to PIANC 2002, BS 6349:4 & EAU 2004
- ✓ Highly skilled and experienced front panel fabricators
- ✓ High quality mixture of natural, synthetic rubbers from reputable and prequalified suppliers with strict quality control
- ✓ Global supply network in Asia and Europe
- ✓ Full suite of inhouse testing equipment all the way up to 2,000 metric tons compression

# MOORING BOLLARDS

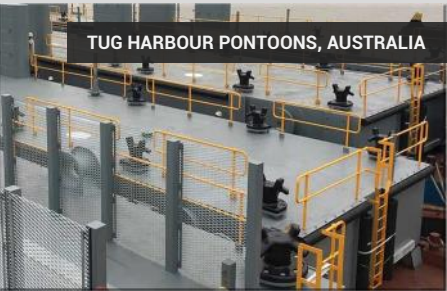
## MOORING SYSTEM COMPONENTS

### ESC offers a full range of Mooring Bollards

- ✓ Cast Iron and Steel Bollards in a range of configurations
- ✓ Up to 200 ton capacity
- ✓ Complete with anchoring sets and epoxy grouting and end-plates
- ✓ Corrosion Protection Coating options —primer, epoxy coating, galvanized, duplex (galvanized & painted)
- ✓ Fully customizable as bollards vary significantly between ports and countries

Section	Rating (metric tons)														
	10	15	20	25	30	35	50	75	80	100	150	200	250	300	
T Head	✓	✓		✓	✓		✓		✓	✓	✓	✓	✓	✓	
T-Horn		✓			✓		✓		✓	✓	✓	✓	✓		
Kidney		✓			✓		✓		✓	✓	✓	✓			
Cleat		✓	✓	✓	✓	✓									
Double Bitt			✓		✓		✓	✓		✓	✓	✓			
Single Bitt		✓			✓		✓	✓		✓	✓	✓			
Pillar	✓	✓			✓		✓	✓		✓	✓	✓			

### PROJECT REFERENCES





# COATINGS

## CORROSION PROTECTION SYSTEMS

ESC is committed to providing high quality Corrosion Protection Systems that prevent corrosion and extend the life of steel structures: whether it be sheet piles, combined walls, tie rod systems or steel structure fabrications. ESC can provide decades of experience to coating systems such as (but not limited to):

- ✓ Coal Tar Epoxy Systems
- ✓ Glass Flake Epoxy Systems
- ✓ Hot Dip Galvanizing

WATCH THE ESC PIPE PILE COATING  
SPRAY APPLICATION PROCESS



OIL TANK PROTECTION BARRIER WITH FIREPROOF COATING, NETHERLANDS

### The ESC Advantage

- ✓ Certified ESC Protective Coating Inspectors
- ✓ State-of-the-Art Coating Application & Inspection
- ✓ Protective Packing included in pricing



## PROJECT REFERENCES



# CATHODIC PROTECTION

## CORROSION PROTECTION METHODS

Cathodic Protection involves electrically connecting a sacrificial element that preferentially corrodes over the structural steel sheet pile or structure. This is typically constituted an alloy of aluminium, magnesium and zinc depending of the water conditions. It may be used as a supplementary form of corrosion protection on top of the corrosion coating system. ESC can offer it's experience in the design, specification and integration of a Cathodic Protection System for submerged Sheet Piles.

### ESC offers an end-to-end design solution for your marine structure

- ✓ Preliminary/concept design and pricing for cathodic protection systems for project budgeting or tendering
- ✓ Calculations to DNV RP-B401, BS EN 13149, NACE and NORSOK standards and design practices
- ✓ ESC Engineering Design Software & Qualified Engineers
- ✓ Installation, commissioning and maintenance capabilities and experience (Middle East)

# PORT HEDLAND TUG HARBOUR

## CASE STUDY

An EPC contract worth nearly US\$100 million for a new tug harbour at Hunt point, Port Hedland in Australia was awarded to Lendlease in July 2015 by BHP Billiton. Another scope of work related was for the upgrade to the existing tug harbour at Nelson point. The project was to be undertaken by BHP Billiton. A fleet of escort-capable tug boats were to be accommodated which would operate within the inner harbour and Port Hedland Channel. This fleet would be intended to greatly reduce the risks of channel blockage and vessel grounding. The contractor for the project was Lendlease Australia.

The size of each pontoon was between 33 and 52 metres in length and it was fabricated in 2 halves initially inside. Only at the last stage were the 2 halves joined.

ESC also fabricated and/or fitted other components such as: removable handrails, cathodic protection anodes and bollards.

The pontoons, gangways and other components successfully arrived in Australia in November 2016.

ESC were also awarded a different section of the project for the supply of pipe piles with connectors.

Client



Owner



### Scope of Work—Pontoons & Gangways

- ✓ 4 Steel Pontoons in Lengths between 31 and 44 metre
- ✓ Cast components— bollards, anodes
- ✓ Gangways complete with anti-slip grating and hand rails
- ✓ Miscellaneous components— access ladders, signage, edge protectors, chains

### Scope of Work—Steel Pipe Piles with Cold Formed Connectors

- ✓ Steel Pipe Piles—Spiral Welded
- ✓ Cold Formed Connectors
- ✓ Corrosion Protection Coating System

## PROJECT PHOTOS





# HINKLEY POINT C AGGREGATE JETTY

## CASE STUDY

A 3,200 MWe nuclear power station with two EPR reactors is being constructed in Somerset, England. The EDF Energy board approved the project in July 2016 and it was 1 of the 8 nuclear power station projects announced by the UK government in 2010. The power station alongside the nearby new Sizewell C Nuclear Power Station is expected to contribute over 13% of the UK's electricity in the decade of 2020.

The scope of work in the construction of the nuclear power station was for a temporary jetty for ships to deliver sand, aggregate and cement for concrete production. Having the ability to use this jetty would reduce the amount of road transport of materials by over 80%, in hopes to minimize disruption to local communities.

ESC's scope of work was to form and fabricate a series of steel pipe piles, some of which were acting as dolphins and some to support the berthing island decking. The pipe diameters ranged from 914mm and 1778mm all at 25mm thickness. Lengths also varied between 4.0m up to 19.398m. Steel grades utilised included S355J2+N (including Z35 through thickness), S420M and S460M.

The design incorporated 4 grouting pipes spanning the from top all the way to a different set of levels, a series of internal and external shear rings and temporary padeyes for safe

Client



Owner



lifting with a project specific spreader beam.

Fabricator qualifications required for this project included: CE certification, EN1011-1 & 2, EN 1090-2 (EXC3), EN 10029: alongside additional client requirements.

The project was successfully completed in October 2016, where the piles arrived in Somerset UK.

### Scope of Work—Temporary Steel Jetty Piles

- ✓ Pipes between 914mm and 1778mm diameter,
- ✓ All 25mm thickness
- ✓ Various lengths from 4.0m to 19.398m
- ✓ Grouting Pipes, Internal and External Shear Rings, Padeyes
- ✓ Steel Grades—S355J2+N (including Z35 through thickness), S420M and S460M

## PROJECT PHOTOS





# GREENSPORT BERTHS 3 & 4

## CASE STUDY

Greens Port Industrial Park is located at the eastside of the Houston heavy industrial zone, along the Houston Ship Channel in Harris Country, 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.

ESC 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
- Soil condition:-
- ✓ The proposed site is located on alluvium which are flood plain deposits.
  - ✓ Top 16m of clay ranging from stiff to very stiff, pre-consolidation.
  - ✓ Underlying by sand layers in vary compactness, from medium dense to very dense (SPT N>50).

Client



Owner

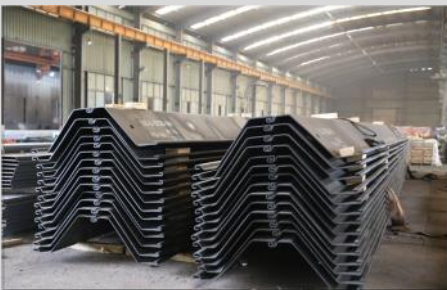


Due to the existence of a very dense sand layer in various thickness along the proposed bulkhead line, there were certain areas with hard driving condition that had been encountered. With the expertise of the contractor onsite and site advice sharing from the ESC team, Russell Marine managed to achieve full pile penetration nicely under the assistance of the use of a driving guide, pre-boring method and then use of diesel and air hammer.

### Scope of Work

- ✓ Pipe Pile with Cold Formed Connectors
- ✓ Cold Rolled Z Sheet Piles
- ✓ HZ Tie Back Wall System
- ✓ Marine Tie Rod System
- ✓ Double Bitt Mooring Bollards

## PROJECT PHOTOS





# BARROW ISLAND LOADOUT JETTY

## CASE STUDY

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 Kellogg 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.

Client



Owner



### Scope of Work—Combined Wall System

- ✓ 654 tons of Ø1,219mm x 32mm LSAW tubular piles in varying lengths from 13m to 20m
- ✓ 217 tons of Ø1,219mm x 25mm LSAW tubular piles in 13m lengths
- ✓ 97 tons of Ø1,540mm x 20mm SSAW tubular piles.
- ✓ Accessories such as clutches, lifting lugs, bolt connections, hose connections, shear connections, tie rod bracket
- ✓ 1,500 microns DFT of Glass Flake Epoxy Coating
- ✓ 140 tons of infill sheet piles in lengths varying from 7 to 13m

## PROJECT PHOTOS



# MARE HARBOUR UPGRADES

## CASE STUDY

The focus of the upgrade works was to improve the existing facility to allow the berthing of Roll-On and Roll-Off resupply ships. Annually the facility would see approximately 10 berths which resupplies the base with food suppliers, hardware, infrastructure and commercial freight.

ESC Steel Structures supplied the mono-piles used as the mooring and breasting dolphins. Each pile was nearly 2.5 metres in diameter and lengths between 19.5m up to 34.8m per piece. The dolphin pile design incorporated a mounting flange for a cone fender system that weighed in excess of 15 metric tons that was each capable of absorbing over 300 ton metres with over 250 tons reaction force. Each dolphin consisted of the steel pile and an upper section bolted on to the top of the steel pile via internal flanges for the bollard and walkway deck mounting.

The service environment as classified under BS EN ISO 12944-2 was Category C5-M – Offshore Environments which is a very high marine atmospheric corrosivity category in regions with high salinity. The selected corrosion protection system for the steel dolphin mono-piles utilized a 380 microns dry film thickness approved coating.

### Client



### Owner



Prior to production, ESC completed a comprehensive Inspection & Test Plan (ITP) with a breakdown of all the processes which included: welder qualification review, raw material inspection, component dimensional inspection, weld inspection and coating inspection. Strategic review, witness and certify hold points were incorporated for each of the stages. A 3rd party inspector was selected for the project as well by ESC and accepted by the client. After several iterations working with both the project client and consultant, the ITP was agreed and approved well before production started.

The production was completed successfully and was loaded to be shipped to the Falkland Islands in May 2017.

### Scope of Work—Dolphin Piles and Pile Heads

- ✓ Dolphin Piles with internal ribs, fender frame structure
- ✓ Pile Heads with bolt on flange for topside platform and mooring bollard

## PROJECT PHOTOS





# DUQM LIQUID BULK TERMINAL

## CASE STUDY

Duqm Port situated in Oman is currently undergoing a large number of infrastructure projects which includes the establishment of a commercial terminal and a commercial quay. Workshops, buildings are also being constructed along with cranes and service roads to eventually provide an integrated berth implemented in the Omani Ports to serve government agencies.

The Special Economic Zone Authority in Duqm (SEZAD) signed an agreement with Boskalis Westminster (Oman) LLC for the construction of the liquid bulk terminal. It is part of a overall goal to allow Duqm Port to export liquid refined products, enhancing its contribution to the Omani economy.

ESC was awarded a contract with a major contractor Besix for the supply of the steel piling pipe for the construction of the 1 kilometre berth. This scope of work totalled over 4800 metric tons of steel.

The project was successfully delivered in February 2018.

### Client



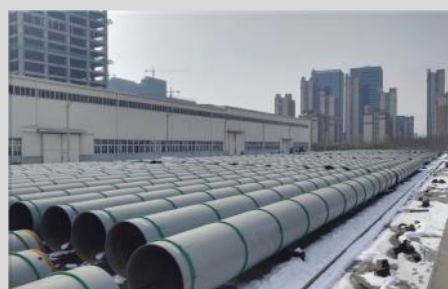
### Owner



### Scope of Work—Steel Pipe Piles

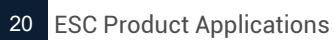
- ✓ 4800 metric tons
- ✓ All 1219mm diameter
- ✓ Various lengths
- ✓ Fully Coated on the External Side

## PROJECT PHOTOS

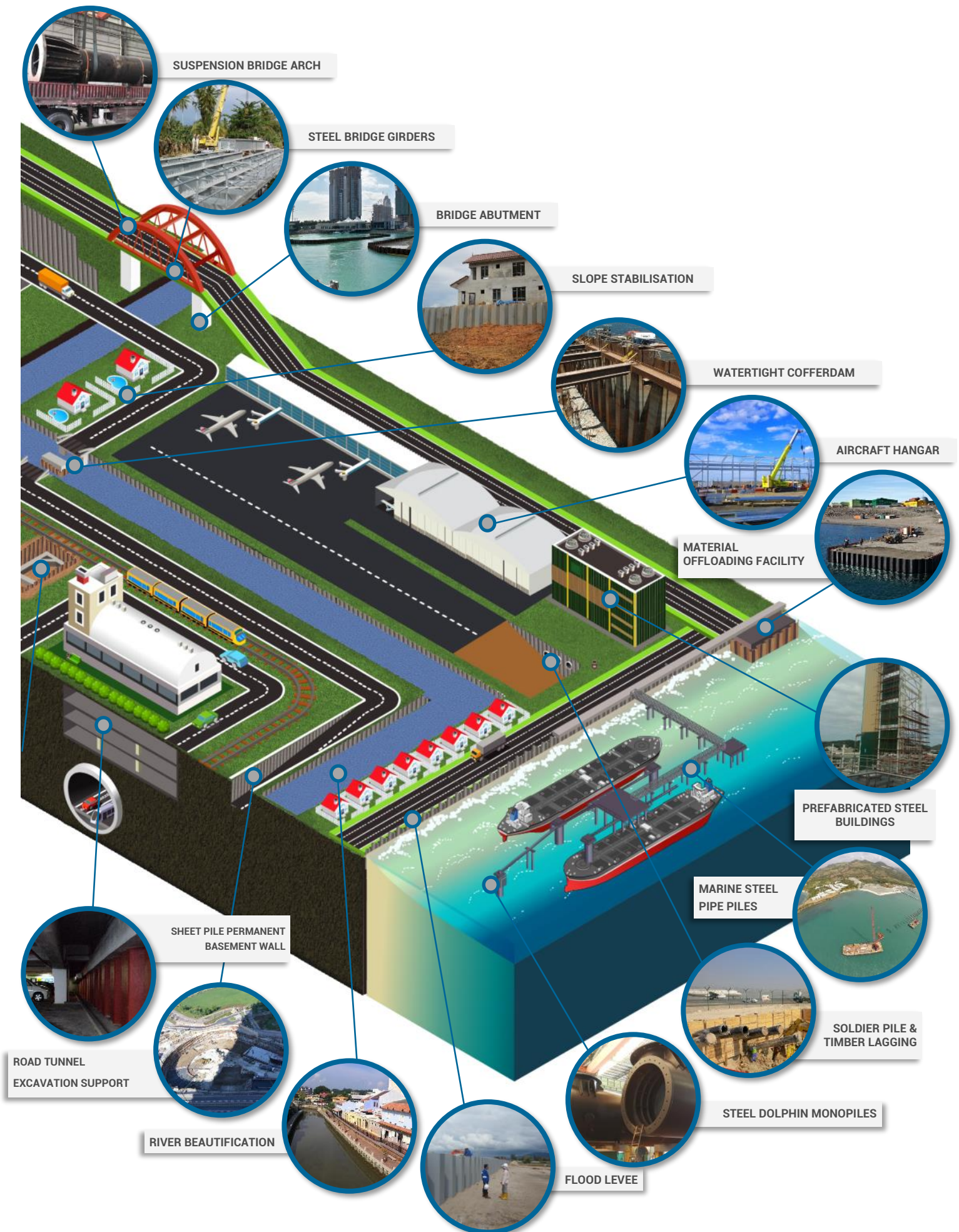




## ISOMETRIC MAP









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