DELIVERING **GLOBAL ENGINEERED SOLUTIONS** SINCE 1986

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ESC GROUP

GENERAL CATALOGUE

2024 Edition

Steel Sheet Piles | Steel Pipe Piles | Combined Wall Systems | Vinyl Sheet Piles | Tie Rod Systems
Marine Fender Systems | Mooring Bollards | Steel Structures | Strutting System | Connector Sealant | Cathodic Protection System | Trench Box | Corrosion Protection Coatings

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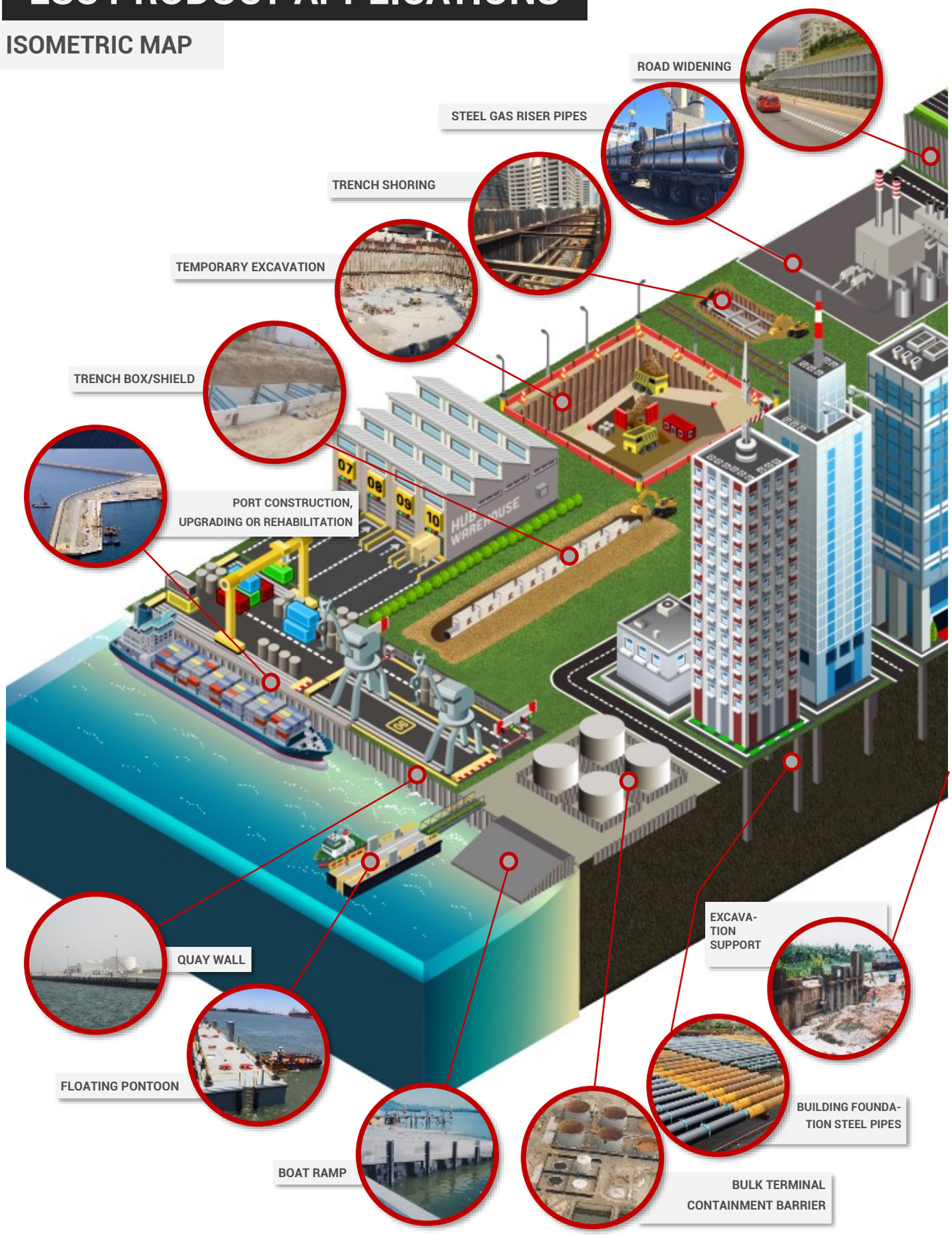
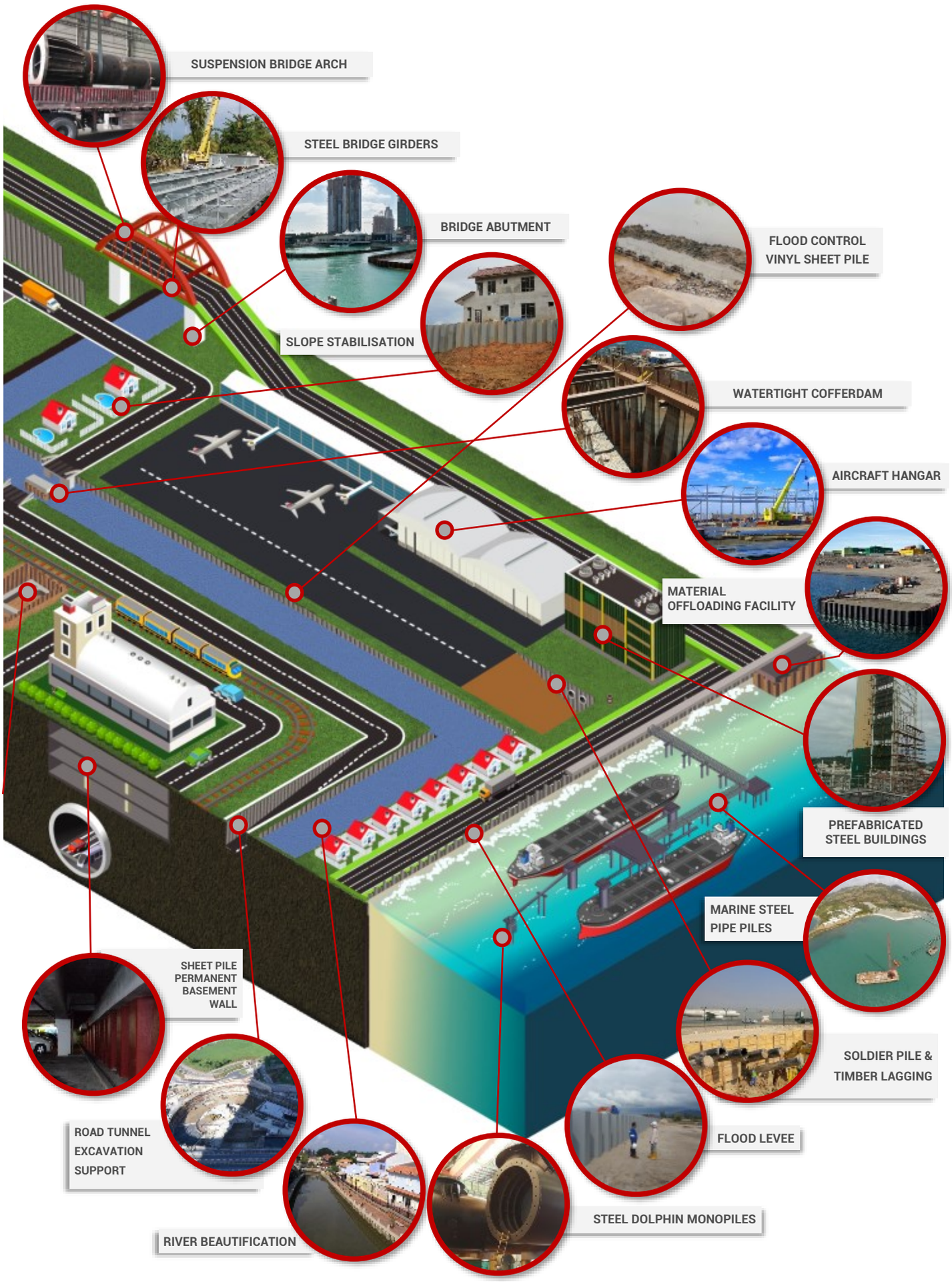
ESC PRODUCT APPLICATIONS

ISOMETRIC MAP




SUSPENSION BRIDGE ARCH
STEEL BRIDGE GIRDERS
BRIDGE ABUTMENT
FLOOD CONTROL VINYL SHEET PILE
SLOPE STABILISATION
WATERTIGHT COFFERDAM
AIRCRAFT HANGAR
MATERIAL OFFLOADING FACILITY
PREFABRICATED STEEL BUILDINGS
MARINE STEEL PIPE PILES
SHEET PILE PERMANENT BASEMENT WALL
SOLDIER PILE & TIMBER LAGGING
ROAD TUNNEL EXCAVATION SUPPORT
FLOOD LEVEE
STEEL DOLPHIN MONOPILES
RIVER BEAUTIFICATION

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COMPANY CERTIFICATION

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

HISTORY OF ESC

ESC Group continues to achieve significant milestones as it goes beyond 34 years since its first sheet pile was driven at Magnetic Island, Australia in 1986.

The inception of ESC 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 foundations and structural solutions 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

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.

Now located in twenty (20) countries and counting, ESC has so far established manufacturing and engineering offices in different regions primarily in Asia, the Middle East and North America. This growth through project awards and market footprint spearheaded its recognition and popularity in the global market helping it become one of the foremost trusted products and service providers with delivery of significant projects all over the world.

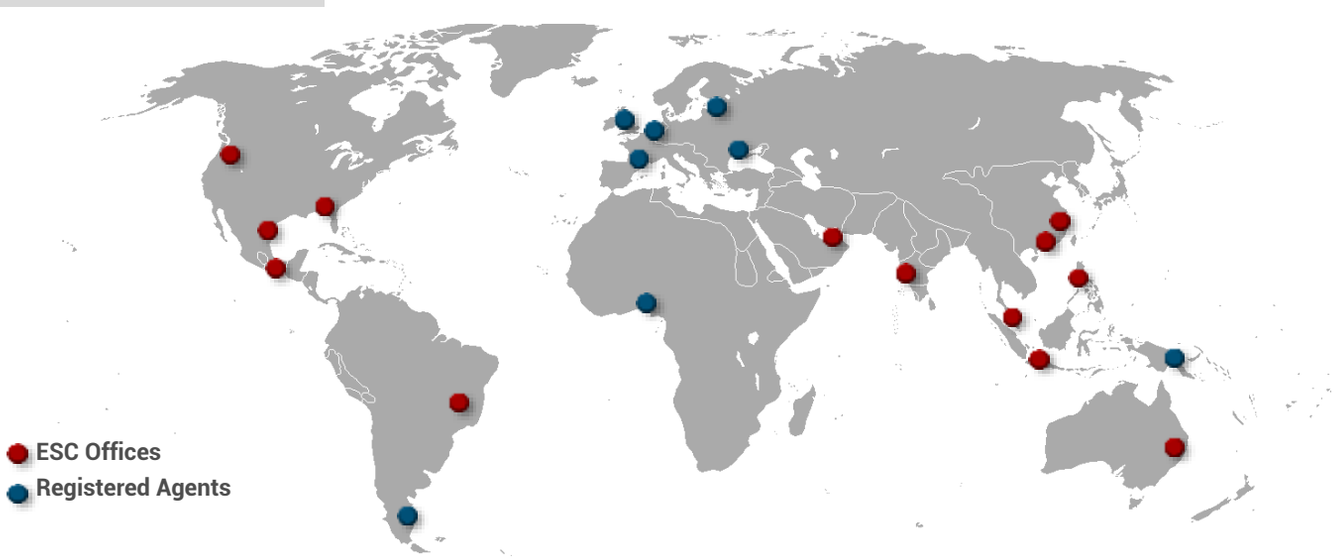
ESC, over the years, has evolved into an internationally certified organization with full capacity in Engineering and Design, Project Management, Research and Development, Manufacturing, Supply and Construction.

ESC 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 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.

ESC GROUP

ESC GLOBAL LOCATIONS



ESC ENGINEERING TEAM

CAPABILITIES

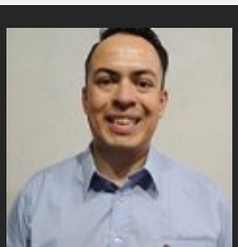
ESC's engineering team provides a responsive service covering various disciplines from geotechnical engineering, civil engineering, manufacturing engineering and materials engineering. Situated in offices at all continents around the world, with a tight-knit communication network, ESC has grown a highly 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

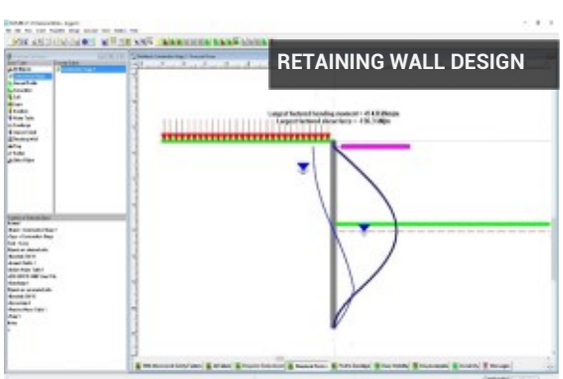
- ✓ Geotechnical Analysis
- ✓ Structural Analysis
- ✓ Full Retaining Wall Detailed Design - Plaxis, ReWARD, D-Sheet Piling
- ✓ Sheet Pile and Combi Wall Design & Optimisation
- ✓ Fabrication Shop Drawings
- ✓ Project Construction Drawings
- ✓ Front End Engineering Design (FEED) & Concept Studies
- ✓ 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
- ✓ Corrosion Protection Design
- ✓ Structural Steel Fabrication Design
- ✓ Marine Systems Components Design
- ✓ Coating System Design



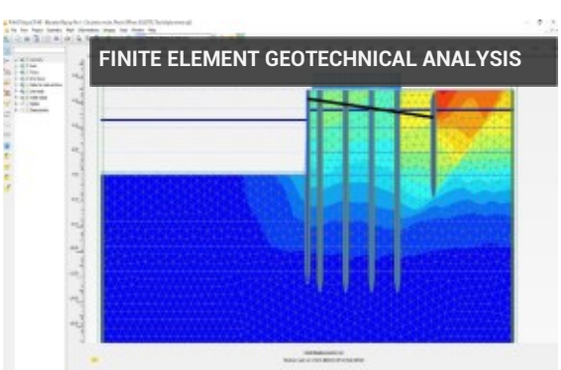
What Our Engineers Say

"ESC Engineers are all degree qualified and are well equipped to provide high quality engineering service free of charge to complement our product line."

CAPABILITIES

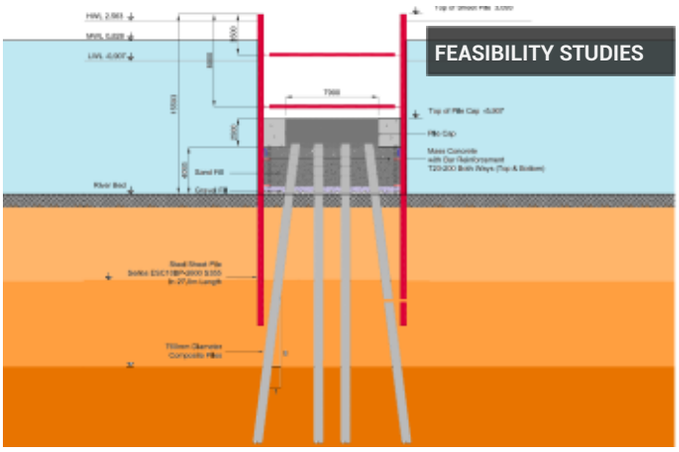


RETAINING WALL DESIGN

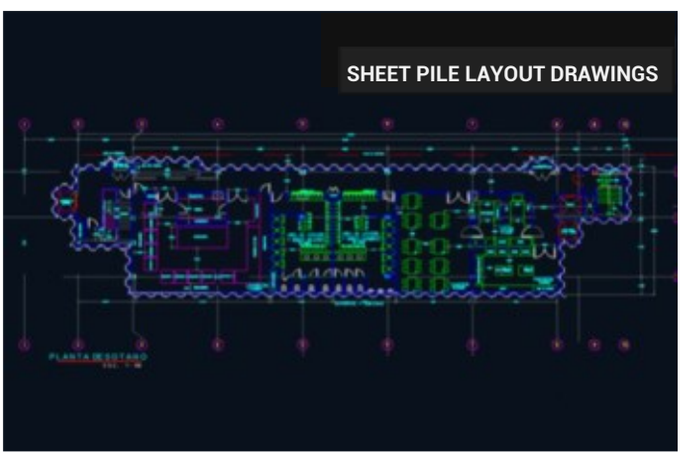


FINITE ELEMENT GEOTECHNICAL ANALYSIS

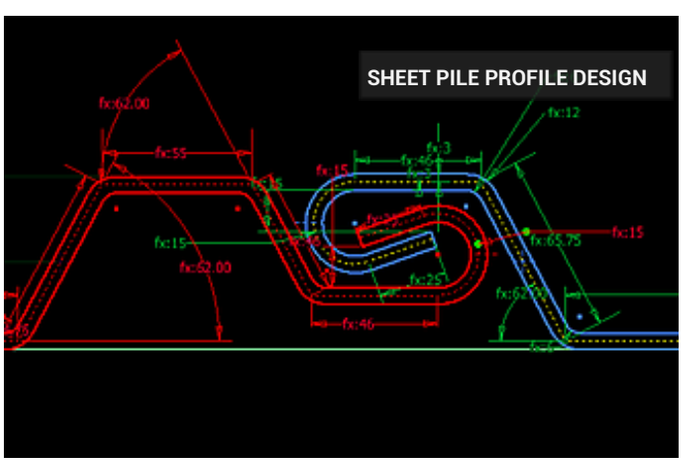
CAPABILITIES


FEASIBILITY STUDIES

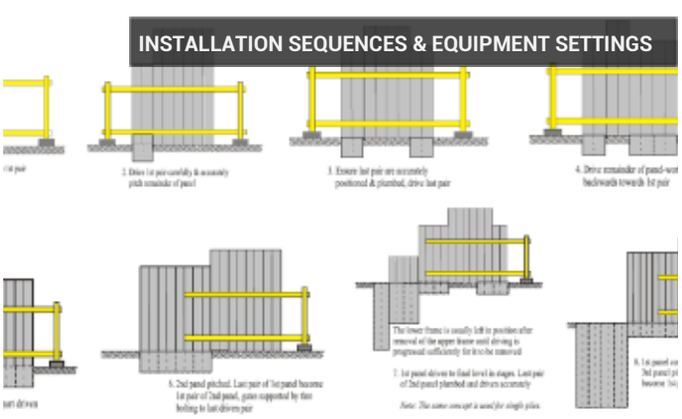
ACADEMIC PRESENTATIONS

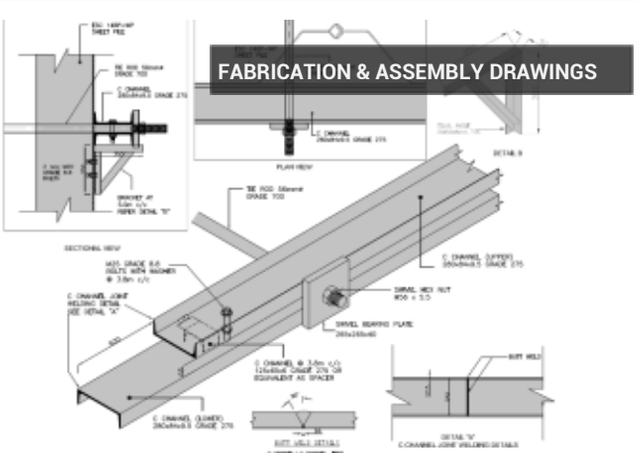

SHEET PILE LAYOUT DRAWINGS

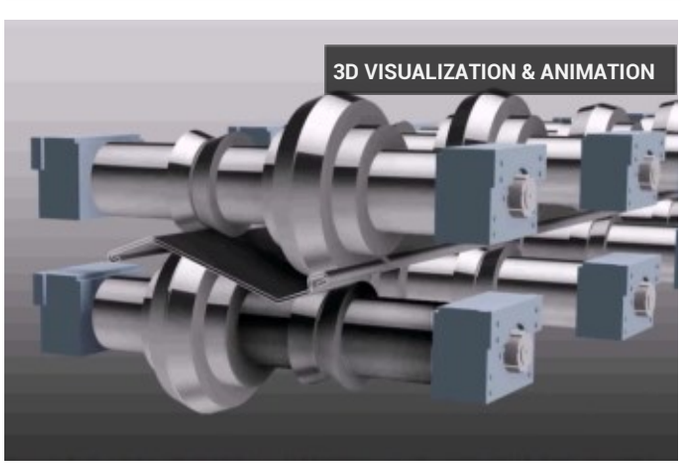
DESIGN QUALIFICATION TESTING



SHEET PILE PROFILE DESIGN


INSTALLATION SEQUENCES & EQUIPMENT SETTINGS


FABRICATION & ASSEMBLY DRAWINGS


3D VISUALIZATION & ANIMATION

ABU DHABI AIRPORT SHORING, UAE

INSTALLATION

CAPABILITIES

ESC UAE as part of the ESC Global Group was established in 2007 as a manufacturing, design and construction piling company. It has established itself as the central information hub for ESC Group for piling installation works with it's wealth of knowledge and experience in the field.

ESC UAE have been involved in various infrastructure works and offer a comprehensive range of piling solutions from design, supply and execution of temporary as well as permanent retention works.

The construction team together with the design engineers are well experienced to handle variable ground conditions to adopt suitable installation techniques and methods. These projects include road tunnels, pipelines, NDRC pits, manholes, jetties and others. ESC also have the experience in working both on-shore and off-shore environments.

To meet all kinds of piling requirements, ESC have the fleet of necessary equipment and manpower resources plus the large stock of sheet piles and shoring materials for carrying out the construction works in line with ESC's commitment and compliance to the International Standard for Quality Management System (ISO 9001:2015), Environmental Management System (ISO 14001:2015) and the Occupational Health and Safety Management System (OSHAS 18001:2007), to ensure continuous client satisfaction.

ESC as a result can quickly mobilise supervisors or entire teams & equipment to sites globally if the project scope warrants it.

What Our Engineers Say

"ESC UAE is now recognized as the preferred supplier by many of the region's top contractors and consultants. We are forging ahead to be increasingly responsive to the unique sheet piling requirements of the Middle East and Africa."

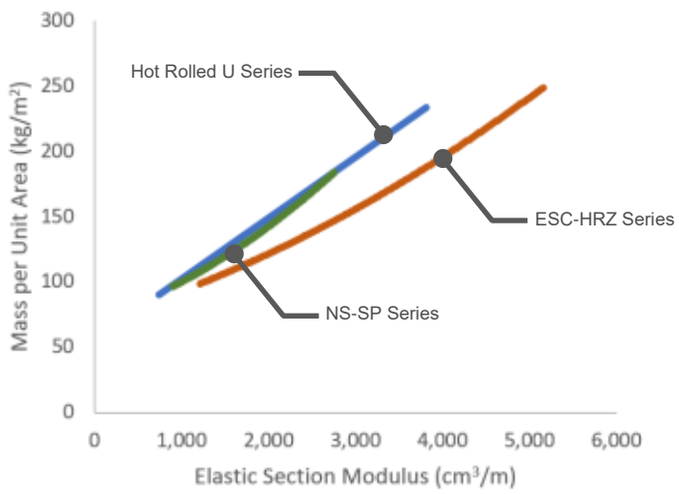
ESC HOT ROLLED SHEET PILES

INTRODUCTION

BAYNUNAH ROAD UNDERPASS, UAE

The first Hot Rolled sheet pile was manufactured over 100 years ago. To manufacture Hot Rolled Sheet Pile Sections, the raw steel material is heated to over 1200°C upon which is formed to its respective sheet pile profile. Plastic deformation to the finished shape is easier due to the higher temperature during forming. Various interlocks configurations and thicknesses in different sections of the profile are possible.

Various construction configurations can be used for different applications. The interlocked sheet pile walls can be installed to create a rigid barrier for both earth and water. Bending forces and lateral pressures are also resisted by the combined profile. ESC can offer 4 different types of sheet pile which covers virtually all applications for both temporary and permanent usage.



Note the lines shown above are trend-lines. The individual profiles may lie at points away from this line. Please see the relevant catalogue page for exact specifications.

The ESC Advantage

- ✓ Global Supply Network
- ✓ Unparalleled Technical Support
- ✓ Competitive Pricing
- ✓ Free of Charge Design
- ✓ Supplied project volumes between 8—20,000MT
- ✓ Full Suite of Sheet Pile Accessories

What Our Engineers Say

"ESC can offer Hot Rolled Sheet Piles from around the world, to enable a responsive service and swift delivery to your project site."

Sheet Pile Profiles

ESC-HRZ SERIES

HOT ROLLED U SERIES

NS-SP SERIES

FL SERIES

ESC-HRZ SERIES

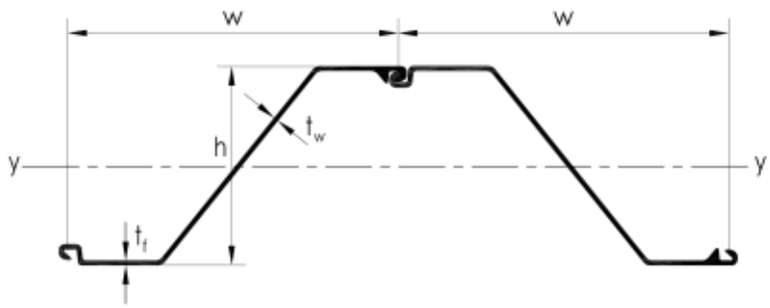
Z PROFILE SHEET PILES

HIGHLY EFFICIENT HOT ROLLED Z SHEET PILES WITH A LARSSEN INTERLOCK

ESC is proud to present the new Hot Rolled HRZ Profile Sheet Piles. The design features interlocks that are located symmetrically on both sides of the neutral axis. The web is continuous, thus the section modulus and shear load transfer are optimised. The ESC-HRZ sheet pile features a durable interlock that provides effective water tightness capabilities. The profile design has a very competitive strength to weight ratio. Due to a deep profile, the design features a higher Inertia resulting in reduced deflection. This higher inertia together with the option of higher steel grades (430 Mpa) provides the most economic solution that meets the performance requirements. The piles are usually shipped in pairs to accommodate faster installation and better alignment. Stock is readily available from the Middle East & Asia Pacific.

ORDER OPTIONS

Steel Grades	✓ S355GP, S390GP, S430GP ✓ ASTM A572 Gr50 & Gr60
Length	6.0m to 31.0m Can be spliced to greater lengths Can be produced to project specific lengths
Delivery Options	✓ Single or Pairs ✓ Pairs either loose, welded or crimped ✓ Lifting Hole ✓ By container (11.8m or less) or Break Bulk ✓ Corrosion Protection Coatings



INTERLOCKING CLUTCH

Section	Width (w) mm	Height (h) mm	Thickness Flange (t_f) mm	Thickness Web (t_w) mm	Cross Sectional Area cm²/m	Weight Per Pile kg/m	Weight Per Wall kg/m²	Elastic Section Modulus cm³/m	Moment of Inertia cm⁴/m	Coating Area* (both sides per pile) m²/m
ESC-HRZ12-770	770	344	8.5	8.5	93.0	72.8	94.5	1,250	21,500	1.96
ESC-HRZ13-770	770	344	9.0	9.0	97.4	76.2	99	1,300	22,430	1.96
ESC-HRZ14-770	770	345	9.5	9.5	101.8	79.6	103.4	1,360	23,370	1.96
ESC-HRZ17-700	700	420	8.5	8.5	93.0	73.3	104.7	1,740	36,430	1.97
ESC-HRZ18-700	700	421	9.0	9.0	97.4	76.7	109.6	1,810	38,000	1.97
ESC-HRZ19-700	700	421	9.5	9.5	101.8	80.2	114.6	1,880	39,580	1.97
ESC-HRZ20-700	700	422	10.0	10.0	106.2	83.7	119.5	1,950	41,160	1.97
ESC-HRZ24-700	700	459	11.2	11.2	122.1	95.8	136.9	2,440	55,950	2.05
ESC-HRZ26-700	700	460	12.2	12.2	131.2	103.0	147.1	2,600	59,840	2.05
ESC-HRZ27-700	700	461	12.7	12.7	135.5	106.4	152	2,680	61,640	2.05
ESC-HRZ28-700	700	461	13.2	13.2	140.3	110.1	157.3	2,760	63,740	2.05
ESC-HRZ36-700	700	499	15.0	11.2	151.3	118.7	169.6	3,600	89,750	2.18
ESC-HRZ38-700	700	500	16.0	12.2	161.2	126.5	180.7	3,800	94,980	2.18
ESC-HRZ40-700	700	501	17.0	13.2	171.1	134.3	191.8	4,000	100,220	2.18
ESC-HRZ42-700	700	499	18.0	14.0	182.1	143.0	204.2	4,230	105,540	2.17
ESC-HRZ44-700	700	500	19.0	15.0	192.0	150.7	215.3	4,440	110,940	2.17
ESC-HRZ46-700	700	501	20.0	16.0	201.9	158.5	226.5	4,640	116,160	2.17
ESC-HRZ48-700	700	503	22.0	15.0	203.0	159.3	227.6	4,790	120,470	2.17
ESC-HRZ50-700	700	504	23.0	16.0	212.4	166.7	238.2	4,970	125,360	2.17
ESC-HRZ52-700	700	505	24.0	17.0	222.1	174.3	249	5,160	130,400	2.17

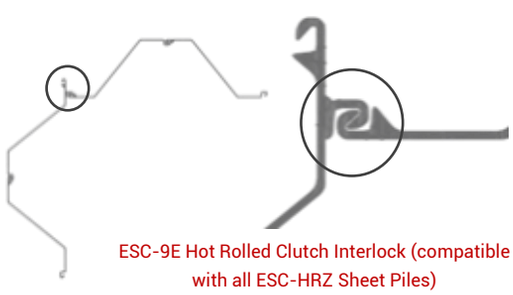
*excludes internal section of interlock

OTHER CONFIGURATIONS

Box King Piles (fabricated out of 4 Z Piles)

Jagged Wall

Box King Piles (fabricated out of 2 ESC-HRZ Piles & 1 Cold Formed U Pile)



ESC-9E Hot Rolled Clutch Interlock (compatible with all ESC-HRZ Sheet Piles)

HOT ROLLED U SERIES

U PROFILE SHEET PILES

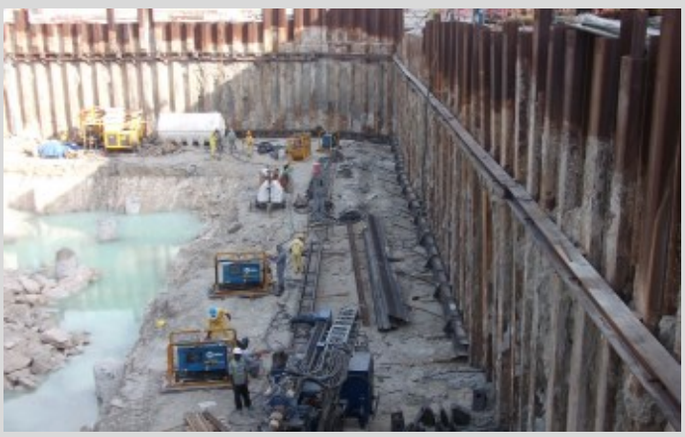
WATCH ESC INSTALL IT'S CORNER HOT ROLLED U SHEET PILE

THE MOST COMMMONLY USED U SHEET PILES IN THE WORLD

The Hot Rolled U Sheet Pile was produced over 90 years ago and millions of tons of it have been used globally. The thicker rolled flange and interlock design enable multiple reusage making Hot Rolled U Sheet Piles a common choice for temporary works. Utilising various profile and interlock designs, ESC is able to offer stock and made-to-order Hot Rolled U Sheet Piles available from various countries in the world. With stock available in ESC facilities in China and UAE ESC is able to respond to urgent customer requests in a timely fashion at competitive prices.

ORDER OPTIONS

Steel Grades	✓ SY295, SY390 & S355GP for Type II to Type VI_L ✓ S240GP, S275GP, S355GP & S390 for VL506A to VL606K
Length	27.0m maximum Standard Stock Lengths of 6m, 9m, 12m, 15m
Delivery Options	✓ Single or Pairs ✓ Pairs either loose, welded or crimped ✓ Lifting Hole ✓ By container (11.8m or less) or Break Bulk ✓ Corrosion Protection Coatings



Type II to Type VL

Type IIw to HRU30-600

HRU25-750

Section	Width (w)	Height (h)	Thickness Flange (t_f)	Thickness Web (t_w)	Cross Sectional Area	Weight Per Pile	Weight Per Wall	Elastic Section Modulus	Moment of Inertia	Coating Area (both sides per pile)
	mm	mm	mm	mm	cm²/m	kg/m	kg/m²	cm³/m	cm⁴/m	m²/m
Type II	400	200	10.5	-	152.9	48.0	120.0	**874**	8,740	1.33
Type III	400	250	13.0	-	191.1	60.0	150.0	**1,340**	16,800	1.44
Type IIIA	400	300	13.1	-	186.0	58.4	146.0	**1,520**	22,800	1.44
Type IV	400	340	15.5	-	242.0	76.1	190.0	**2,270**	38,600	1.61
Type VL	500	400	24.3	-	267.5	105.0	210.0	**3,150**	63,000	1.75
Type II_w	600	260	10.3	-	131.2	61.8	103.0	**1,000**	13,000	1.77
Type III_w	600	360	13.4	-	173.2	81.6	136.0	**1,800**	32,400	1.90
Type IV_w	600	420	18.0	-	225.5	106.0	177.0	**2,700**	56,700	1.99
Type VI_L	500	450	27.6	-	305.7	120.0	240.0	**3,820**	86,000	1.82

Section	Width (w)	Height (h)	Thickness Flange (t_f)	Thickness Web (t_w)	Cross Sectional Area	Weight Per Pile	Weight Per Wall	Elastic Section Modulus	Moment of Inertia	Coating Area (both sides per pile excluding inside of the clutch)
	mm	mm	mm	mm	cm²/m	kg/m	kg/m²	cm³/m	cm⁴/m	m²/m
HRU601-600	600	310	7.5	6.4	98.3	46.3	77.2	**744**	11,530	1.60
HRU602-600	600	310	8.2	8.0	113.3	53.4	89.0	**830**	12,870	1.60
HRU603-600	600	310	9.7	8.2	138.3	64.8	108.0	**1200**	18,600	1.69
HRU607-600	600	452	19.0	10.6	241.7	114.0	190.0	**3200**	72,320	1.91
HRU16-600	600	430	10.2	8.4	154.2	72.6	121.0	**1670**	35,950	1.74
HRU18-600	600	430	11.2	9.0	163.3	76.9	128.2	**1800**	38,650	1.74
HRU19-600	600	430	12.2	9.5	172.3	81.1	135.2	**1920**	41,320	1.74
HRU20-600	600	450	11.1	9.0	173.9	81.9	136.5	**2060**	46,380	1.80
HRU22-600	600	450	12.1	9.5	182.9	86.1	143.6	**2200**	49,460	1.80
HRU23-600	600	450	13.1	10.0	192.0	90.4	150.7	**2335**	52,510	1.80
HRU26-600	600	452	14.2	9.7	206.8	97.4	162.3	**2680**	60,580	1.86
HRU28-600	600	454	15.2	10.1	216.1	101.8	169.6	**2840**	64,460	1.86
HRU30-600	600	456	16.2	10.5	225.6	106.2	177.1	**3000**	68,380	1.86
HRU25-750	750	450	14.5	10.2	188.0	110.4	147.2	**2500**	56,240	2.06

Box Piles can be fabricated out of individual U sections to boost the Moment Capacity of the wall without changing the pile profile. Corners and junctions can be implemented using either a welded interlock or slicing a profile and welding it to the end profile.

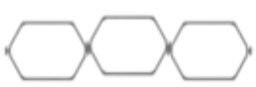
OTHER CONFIGURATIONS

Double U Box Pile

Triple U Box Pile

Quadruple U Box Pile

1/1

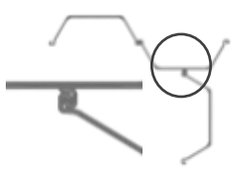


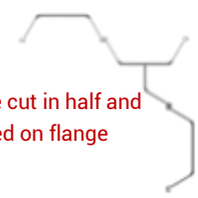
1/3

1/2

1/4

ESC-9J Welded Interlock



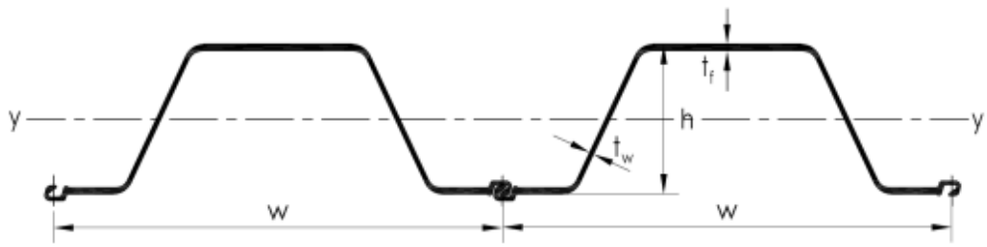


U Pile cut in half and welded on flange

NS-SP SERIES

The NS-SP series is a hot rolled sheet pile profile. It offers interlocked clutches on one side and features a wide profile of 900mm width. Interlocking clutches are located at the outer fibre. This results in an optimized section profile for high strength and low material weight. The profile features a high moment of inertia reducing deflection meeting serviceability requirements. The wider profile width for a hot rolled sheet pile reduces handling and installation time with normal driving equipment. The wider profile also reduces the number of interlocks required for a set wall run length, improving water-tightness capabilities.

INTERLOCKING CLUTCH



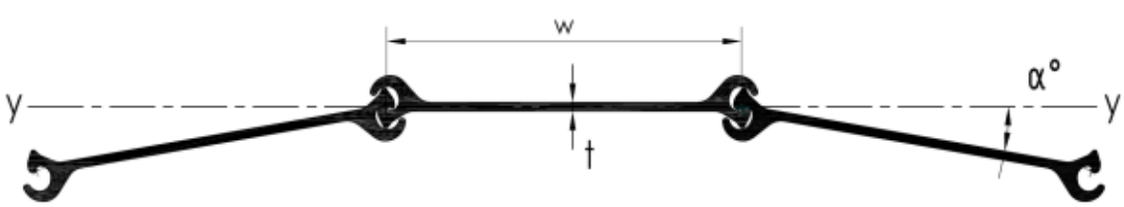
Section	Width (w)	Height (h)	Thickness Flange (t_f)	Thickness Web (t_w)	Cross Sectional Area	Weight Per Pile	Weight Per Wall	Elastic Section Modulus	Moment of Inertia
	mm	mm	mm	mm	cm²/m	kg/m	kg/m²	cm³/m	cm⁴/m
NS-SP-10H	900	230	10.8	-	122.2	86.4	96.0	902	10,500
NS-SP-25H	900	300	13.2	-	160.4	113.0	126.0	1,610	24,400
NS-SP-45H	900	368	15.0	-	207.8	147.0	163.0	2,450	45,000
NS-SP-50H	900	370	17.0	-	236.3	167.0	186.0	2,760	51,100

ORDER OPTIONS

Steel Grades	✓ SYW295, SYW390, SYW430(on request)
Length	30.0m maximum
Delivery Options	✓ Lifting Hole ✓ By container (11.8m or less) or Break Bulk ✓ Corrosion Protection Coatings

FL SERIES

The FL series is a hot rolled straight web sheet pile profile. It features high interlocking clutch strength. It is ideal for circular structures and coffering. The FL Series Sheet Piles can be preassembled as one large cellular unit and dropped in a submerged location, where they can be driven in sequence.



Section	Width (w)	Height (h)	Thickness (t)	Cross Sectional Area	Weight Per Pile	Weight Per Wall	Elastic Section Modulus	Moment of Inertia	Coating Area (both sides per pile)
	mm	mm	mm	cm²/m	kg/m	kg/m²	cm³/m	cm⁴/m	m²/m
FL1	500	45	9.5	157.2	61.7	123.4	89	396	1.39
FL2	500	47	12.7	196.7	77.2	154.4	121	570	1.41

ORDER OPTIONS

Steel Grades	✓ SYW295, SYW390, SYW430 ✓ SY295, SY390 ✓ S355GP, S430GP ✓ A572Gr50
Length	38.0m maximum
Delivery Options	✓ By container (11.8m or less) or Break Bulk

STEEL GRADES & MANUFACTURING TOLERANCES

HOT ROLLED SHEET PILES

STEEL GRADES

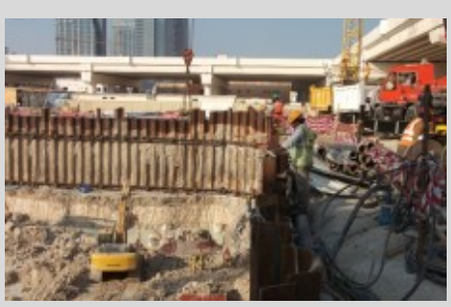
CLASSIFICATION			Minimum Yield Strength	Ultimate Tensile Strength	Minimum Elongation
Region	Code	Grade	MPa	MPa	%
USA	**ASTM A252**	Grade 1	205	345	18
	ASTM A252	Grade 2	240	415	14
	ASTM A252	Grade 3	310	455	-
	ASTM A572	Grade 42	290	415	20
	ASTM A572	Grade 50	345	450	18
	ASTM A572	Grade 55	380	485	17
	ASTM A572	Grade 60	415	520	16
	ASTM A572	Grade 65	450	550	15
Canada	**CSA 40.21**	260W	260	590	20
	CSA 40.21	300W	300	620	20
	CSA 40.21	350W	350	650	19
	CSA 40.21	400W	400	690	16

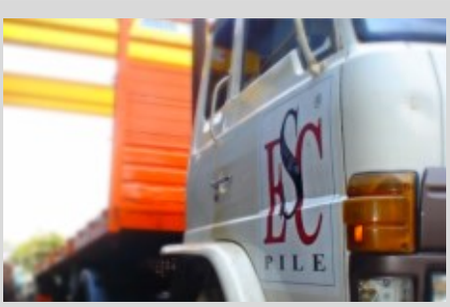
Other Steel Grades are available on request. The Yield Point provided is applicable to thicknesses less than or equal to 16mm.

CLASSIFICATION			Minimum Yield Strength	Ultimate Tensile Strength	Minimum Elongation
Region	Code	Grade	MPa	MPa	%
Europe	**EN 10248**	S240GP	240	340	26
	EN 10248	S270GP	270	410	24
	EN 10248	S320GP	320	440	23
	EN 10248	S355GP	355	480	22
	EN 10248	S430GP	430	490	20
China	**GB/T 700**	Q235B	235	500	26
	GB/T 1591	Q345B	345	630	20
	GB/T 1591	Q345C	345	630	21
	GB/T 1591	Q390B	390	650	20
	GB/T 1591	Q420B	420	680	19
Japan	**JIS A5528**	SY295	295	490	17
	JIS A5528	SY390	390	540	15

MANUFACTURING TOLERANCES TO BS EN 10248

Component	ESC-HRZ Series	Hot Rolled U Series	NS-SP Series	FL Series
Mass	± 5%	± 5%	± 5%	± 5%
Length	± 200mm	± 200mm	± 200mm	± 200mm
Height (≤ 200mm)	± 5.0mm	± 4.0mm	± 4.0mm	N/A
Height (> 200mm & ≤ 300mm)	± 6.0mm	± 5.0mm	± 4.0mm	N/A
Height (> 300mm)	± 7.0mm	± 5.0mm	± 4.0mm	N/A
Thickness (≤ 8.5 mm)	± 0.5 mm	± 0.5 mm	± 0.5 mm	± 0.5 mm
Thickness (> 8.5 mm)	± 6% of thickness	± 6% of thickness	± 6% of thickness	N/A
Width of Single	± 2% of width	± 2% of width	± 2% of width	± 2% of width
Width of Pair	± 3% of width	± 3% of width	N/A	N/A
Straightness	±0.2% of the length	±0.2% of the length	±0.2% of the length	±0.2% of the length
Squareness of Ends	± 2% of the width	± 2% of the width	± 2% of the width	± 2% of the width





WATCH OUR COLD ROLLED SHEET PILE PRODUCTION ANIMATION BY SCANNING THE QR CODE

ESC COLD ROLLED SHEET PILES

INTRODUCTION

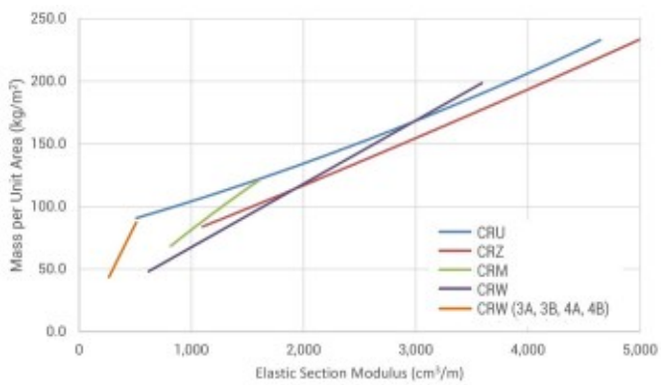
The cold rolling process involves rolling the sheet pile profile continuously at room temperature. The profile thickness is constant along the width of the profile. Cold Rolling occurs in a continuous section which can be cut at any length. A wide range of widths and depths are achievable. Production schedules are much more flexible than Hot Rolling of Sheet Piles, which can lead to cost-savings due to lower stock requirements and greater project-specific profiles and lengths. ESC can offer one of the thickest sheet piles (16mm) in the world that can be produced using the cold rolling process without any compromise in structural properties. ESC can offer 4 different types of cold rolled sheet pile profile which covers virtually all applications – for both temporary and permanent usage.

Frequently, ESC Cold Rolled Sheet Piles are used as an effective and equivalent alternative to a Hot Rolled Sheet Pile Profiles, with possible cost savings of over 20% with no compromise in design, quality or strength. ESC Cold Rolled Sheet Piles have successfully been used in most regions globally.

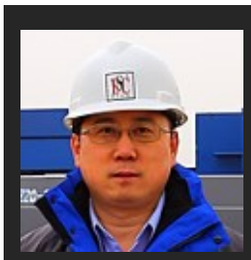
The ESC Advantage

- ✓ Global Supply Network
- ✓ Unparalleled Technical Support
- ✓ Competitive Pricing
- ✓ Free of Charge Design
- ✓ Supplied project volumes between 8—20,000mT
- ✓ Full Suite of Sheet Pile Accessories

SECTION MODULUS RANGE vs MASS



Note the lines shown above are trend-lines. The individual profiles may lie at points away from this line. Please see the relevant catalogue page for exact specifications.

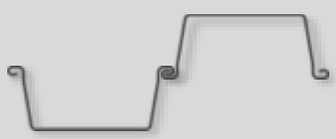


What Our Engineers Say

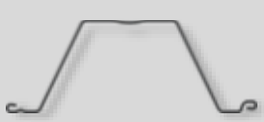
"We at ESC offer an extremely wide range of Cold Rolled Sheet Pile profiles that are high quality and economical from a design and a price per unit weight perspective."

Sheet Pile Profiles

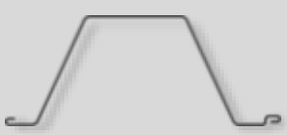
CRZ SERIES



CRU SERIES



CRM SERIES



CRW SERIES

PROJECT REFERENCES

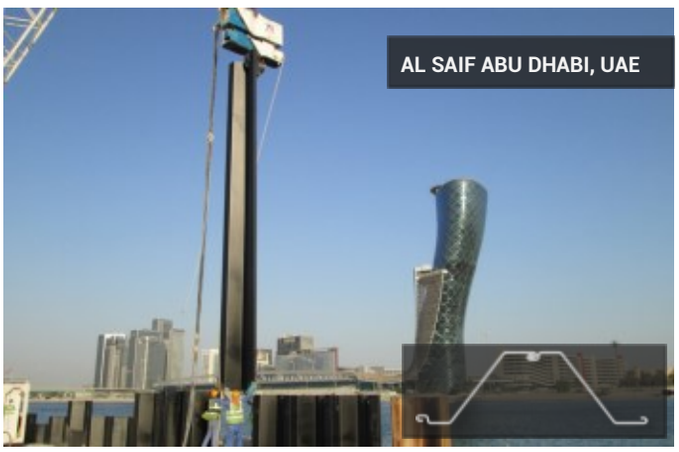
STEVIN ROCK JETTY, UAE

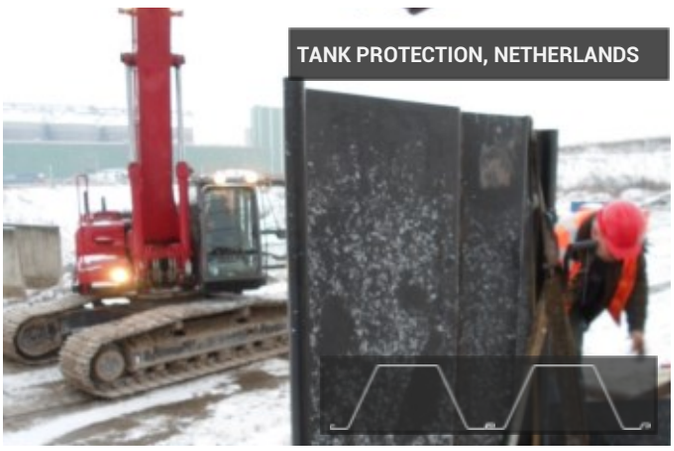
BROOKLYN TEMPORARY WORKS, USA

TIJUANA BASEMENT PARKING, MEXICO

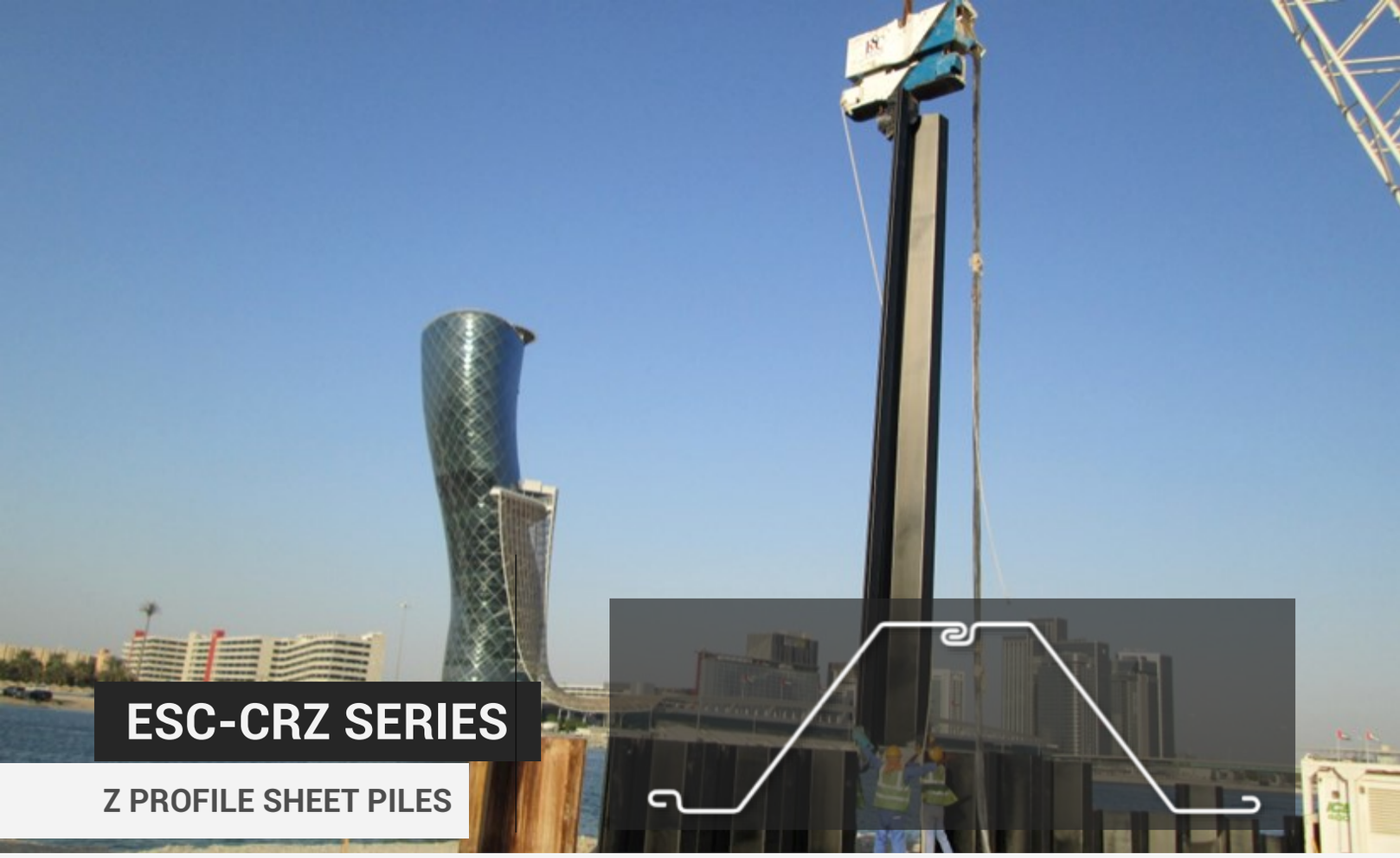
UNDERGROUND PARKING LOT, MEXICO

AL SOWAH PUMP STATION, UAE


AL SAIF ABU DHABI, UAE


TANK PROTECTION, NETHERLANDS

CONTAINMENT BARRIER, NETHERLANDS



ESC-CRZ SERIES

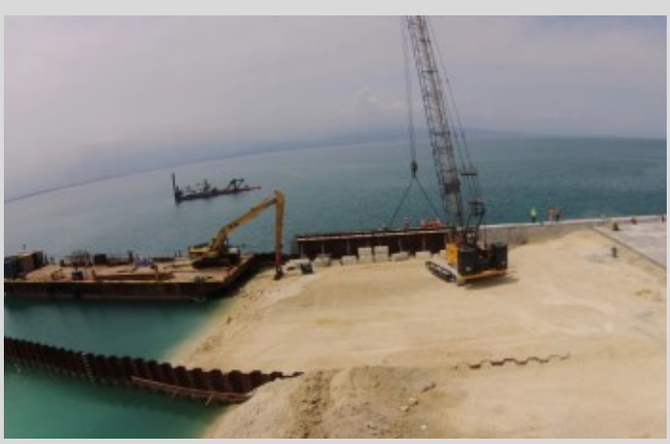
Z PROFILE SHEET PILES

HIGH STRENGTH COLD ROLLED Z SHEET PILES IN A WIDE RANGE OF WIDTHS AND THICKNESSES MANUFACTURED IN EUROPE & ASIA

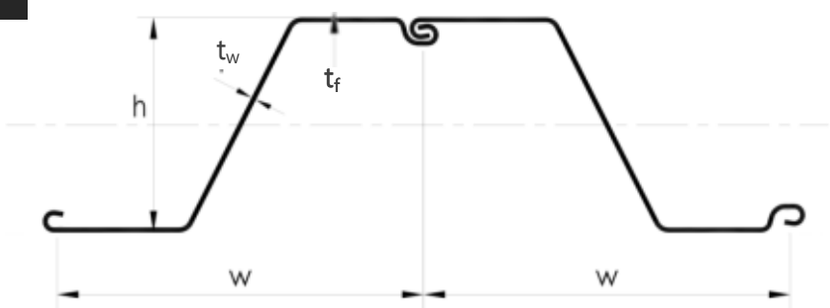
ESC is proud to present its Cold Rolled ESC-CRZ Profile Sheet Piles. The design features interlocks that are located symmetrically on both sides of the neutral axis. The web is continuous, thus the section modulus and shear load transfer are optimised. The profile design has a very competitive strength to weight ratio. Due to a deep profile, the design features a higher Inertia resulting in reduced deflection. This higher inertia together with the option of higher steel grades (430 Mpa) provides the most economic solution that meets the performance requirements. The piles are usually shipped in pairs to accommodate faster installation and better alignment. A wide range of steel grades are available.

ORDER OPTIONS

Steel Grades	✓ Q235B, Q345B, Q345C, Q390B, Q420B ✓ S235JR, S275JR, S355JR, S355JO ✓ ASTM A572 Gr42, Gr50, Gr60 ✓ Others available on request
Length	35.0m maximum Any project specific length can be produced
Delivery Options	✓ Single or Pairs ✓ Pairs either loose, welded or crimped ✓ Lifting Hole ✓ Grip Plate ✓ By container (11.8m or less) or Break Bulk ✓ Corrosion Protection Coatings



CHINA ORIGIN

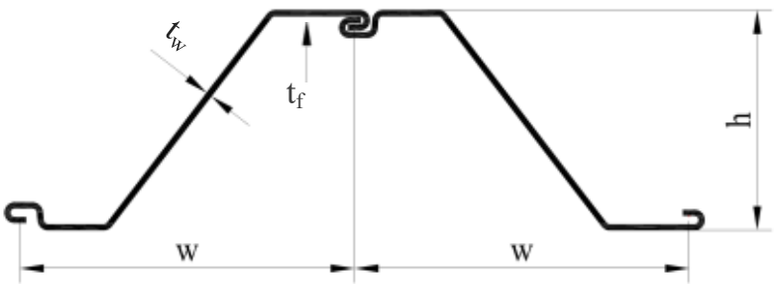


INTERLOCKING CLUTCH

Section	Width (w)	Height (h)	Thickness Flange (t_f)	Thickness Web (t_w)	Cross Sectional Area	Weight Per Pile	Weight Per Wall	Elastic Section Modulus	Moment of Inertia	Coating Area (both sides per pile)
	mm	mm	mm	mm	cm²/m	kg/m	kg/m²	cm³/m	cm⁴/m	m²/m
ESC-CRZ12-700	700	440	6.0	6.0	89.9	49.52	**70.6**	**1,187**	26,124	2.11
ESC-CRZ13-670	670	303	9.5	9.5	139.0	73.10	**109.1**	**1,305**	19,776	1.98
ESC-CRZ13-770	770	344	8.5	8.5	120.4	72.75	**94.5**	**1,311**	22,747	2.20
ESC-CRZ14-670	670	304	10.5	10.5	154.9	81.49	**121.6**	**1,391**	21,148	2.00
ESC-CRZ14-650	650	320	8.0	8.0	125.7	64.11	**98.6**	**1,402**	22,431	2.06
ESC-CRZ14-770	770	345	10.0	10.0	138.5	83.74	**108.8**	**1,417**	24,443	2.15
ESC-CRZ15-750	750	469.5	7.75	7.75	112.5	66.25	**88.34**	**1,523**	35,753	2.19
ESC-CRZ16-700	700	470	7.0	7.0	110.4	60.68	**86.7**	**1,604**	37,684	2.22
ESC-CRZ17-700	700	420	8.5	8.5	132.1	72.57	**103.7**	**1,729**	36,439	2.19
ESC-CRZ18-630	630	380	9.5	9.5	152.1	75.24	**119.4**	**1,797**	34,135	2.04
ESC-CRZ18-700	700	420	9.0	9.0	139.3	76.55	**109.4**	**1,822**	38,480	2.19
ESC-CRZ18-630N	630	450	8.0	8.0	132.7	65.63	**104.2**	**1,839**	41,388	2.11
ESC-CRZ18-800	800	500	8.5	8.5	127.2	79.90	**99.8**	**1,858**	46,474	2.39
ESC-CRZ19-700	700	421	9.5	9.5	146.3	80.37	**114.8**	**1,870**	39,419	2.18
ESC-CRZ20-700	700	421	10.0	10.0	153.6	84.41	**120.6**	**1,946**	40,954	2.17
ESC-CRZ20-800	800	490	9.5	9.5	141.2	88.70	**110.8**	**2,000**	49,026	2.38
ESC-CRZ22-800	800	480	10.0	10.0	149.6	94.00	**117.5**	**2,167**	52,000	2.42
ESC-CRZ22-700	700	449	9.0	9.0	149.8	82.33	**117.6**	**2,250**	50,509	2.35
ESC-CRZ23-800	800	530	9.5	9.5	147.1	92.40	**115.5**	**2,332**	61,811	2.48
ESC-CRZ24-700	700	459	11.2	11.2	177.9	97.75	**139.6**	**2,442**	56,036	2.25
ESC-CRZ25-630	630	480	10.5	10.5	180.5	89.29	**141.7**	**2,515**	60,360	2.19
ESC-CRZ25-800	800	520	10.5	10.5	163.3	102.69	**128.37**	**2,502**	65,060	2.50
ESC-CRZ26-700	700	460	12.2	12.2	194.2	106.70	**152.4**	**2,602**	59,838	2.25
ESC-CRZ27-700	700	520	10.5	10.5	176.2	96.84	**138.4**	**2,695**	70,166	2.37
ESC-CRZ27-800	800	520	11.5	11.5	176.1	110.60	**138.2**	**2,670**	69,419	2.45
ESC-CRZ28-700	700	461	13.2	13.2	212.3	116.66	**166.7**	**2,765**	63,741	2.28
ESC-CRZ28-700-12mm	700	499	12.0	12.0	195.4	107.36	**153.4**	**2,801**	69,896	2.31
ESC-CRZ28-750	750	560	10.0	10.0	165.4	97.40	**129.8**	**2,813**	78,780	2.48
ESC-CRZ29-700	700	540	10.5	10.5	181.5	99.76	**142.5**	**2,959**	79,892	2.44
ESC-CRZ30-750	750	550	11.5	11.5	187.8	110.60	**147.4**	**3,006**	82,673	2.45
ESC-CRZ32-675	675	476	11.0	11.0	204.4	108.30	**160.4**	**3,279**	78,044	2.53
ESC-CRZ32-750	750	560	12.0	12.0	197.2	116.10	**154.8**	**3,202**	89,690	2.47
ESC-CRZ33-675	675	485	12.0	12.0	211.7	112.15	**166.2**	**3,292**	79,837	2.41
ESC-CRZ35-700	700	540	12.2	12.2	213.9	117.53	**167.9**	**3,567**	96,309	2.48
ESC-CRZ36-700	700	540	12.2	12.2	215.0	118.13	**168.8**	**3,609**	97,444	2.49
ESC-CRZ37-700	700	499	13.5	13.5	238.2	130.91	**187.0**	**3,728**	93,020	2.50
ESC-CRZ38-700	700	560	13.0	13.0	231.3	127.14	**181.6**	**3,868**	108,291	2.68
ESC-CRZ40-700	700	580	13.0	13.0	234.9	129.09	**184.4**	**4,015**	112,427	2.58
ESC-CRZ44-700	700	580	14.0	14.0	258.3	141.95	**202.8**	**4,443**	128,841	2.61
ESC-CRZ46-700N	700	580	14.5	14.5	268.2	147.35	**210.5**	**4,623**	134,076	2.62
ESC-CRZ48-700	700	590	15.0	15.0	284.4	156.27	**223.2**	**4,832**	142,846	2.68
ESC-CRZ48-585-14.5mm	580	540	14.5	14.5	305.5	139.10	**239.8**	**4,838**	130,760	2.47
ESC-CRZ50-580-14.0mm	580	580	14.0	14.0	294.6	134.13	**231.3**	**5,037**	140,004	2.47
ESC-CRZ50-580	580	580	16.0	16.0	322.3	146.74	**253.0**	**5,023**	145,657	2.37
ESC-CRZ50-700	700	560	16.0	16.0	298.5	164.0	**234.3**	**5,020**	140,578	2.61
ESC-CRZ52-700	700	550	16.0	16.0	305.2	167.7	**239.6**	**5,226**	143,742	2.70

*excludes internal section of interlock

EUROPE ORIGIN

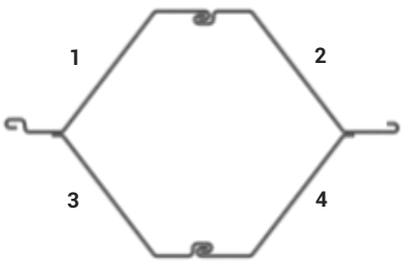


INTERLOCKING CLUTCH

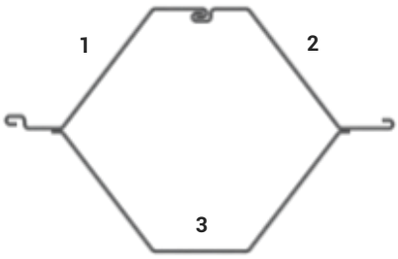
Section	Width (w)	Height (h)	Thickness Flange (t_f)	Thickness Web (t_w)	Cross Sectional Area	Weight Per Pile	Weight Per Wall	Elastic Section Modulus	Moment of Inertia	Coating Area (both sides per pile)
	mm	mm	mm	mm	cm²/m	kg/m	kg/m²	cm³/m	cm⁴/m	m²/m
ESC-M-CRZ12-700	700	314	8.5	8.5	123.5	67.69	96.7	1,180	18,530	1.86
ESC-ML-CRZ12-743	743	407	6.0	6.0	86.0	50.5	68.0	1,150	23,440	1.98
ESC-M-CRZ14A-700	700	316	9.0	9.0	134.5	72.1	103.0	1,410	22,320	1.87
ESC-M-CRZ14B-700	700	354	9.0	9.0	132.8	72.8	104.0	1,410	24,990	1.89
ESC-M-CRZ14C-700	700	315	9.5	9.5	139.0	74.9	107.0	1,360	21,390	1.84
ESC-M-CRZ18-630	630	380	9.5	9.5	153.5	75.93	120.5	1,800	35,970	1.87
ESC-M-CRZ18-700	700	410	9.0	9.0	141.0	77.5	110.7	1,820	37,390	2.02
ESC-ML-CRZ18-720	720	580	6.0	6.0	100.0	56.50	**78.47**	**1,800**	52,190	2.23
ESC-M-CRZ19-630	630	380	10.0	10.0	160.0	78.75	125.0	1,880	35,790	1.84
ESC-ML-CRZ19-650	650	576	6.0	6.0	111.5	57.10	**87.8**	**1,960**	56,850	2.25
ESC-M-CRZ20-700	700	411	10.0	10.0	150.0	85.96	122.8	2,020	41,410	2.02
ESC-M-CRZ20-743	743	411	10.0	10.0	153.0	89.53	120.5	2,010	41,340	2.11
ESC-M-CRZ22-800	800	475	11.0	11.0	162.5	102.48	**128.1**	**2,180**	51,740	2.20
ESC-M-CRZ24-700	700	460	11.0	11.0	177.0	96.6	138.0	2,460	56,560	2.07
ESC-M-CRZ25-630	630	456	10	10.0	176.2	87.13	138.3	2,540	57,910	2.05
ESC-M-CRZ25-750	750	475	11.0	11.0	173.0	102.0	**136.0**	**2,520**	59,700	2.19
ESC-M-CRZ27-700	700	456	11.0	11.0	182.0	100.8	144.0	**2,710**	61,740	2.16
ESC-M-CRZ28-700	700	475	11.0	11.0	185.0	102.2	**146.0**	**2,830**	67,110	2.20
ESC-M-CRZ30-700	700	476	12.0	12.0	202.3	111.3	**159.0**	**3,080**	73,210	2.20

*excludes internal section of interlock

OTHER CONFIGURATIONS



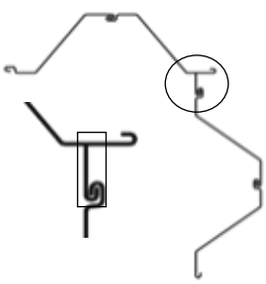
Box King Piles (fabricated out of 2 CRZ Piles & 1 Cold Formed U Pile)



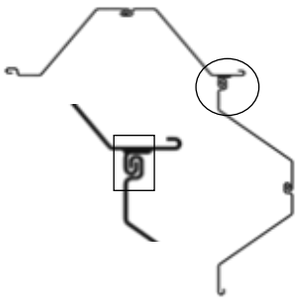
Box King Piles (fabricated out of 2 CRZ Piles & 1 Cold Formed U Pile)

CORNER PILES

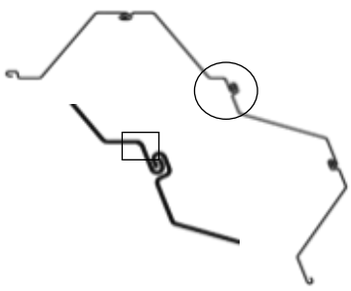
ESC is able to offer 3 options for Corner Pile configurations in the ESC-CRZ Series. Option 1 is frequently used when the installation contractor prefers to create their own corner piles on site depending on the as-driven layout. However this produces wastage on the offcut pile. Option 2 allows welding at the mill or on site and provides the installation contractor with more flexibility on corner pile location. Option 3 provides an option where no welding is required. Option 3 provides increased accuracy at corners that are deviated from the typical 90˚ corner.



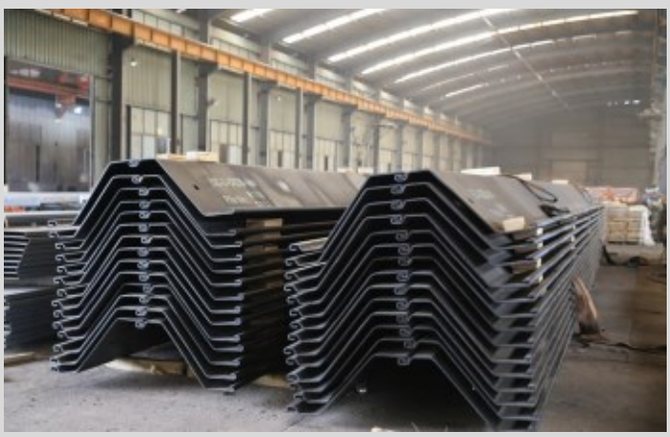
OPTION 1
Cut & weld on section from CRZ Sheet Pile



OPTION 2
ESC CR Interlock welded



OPTION 3
Cold Form bending of flange



ESC-CRU SERIES

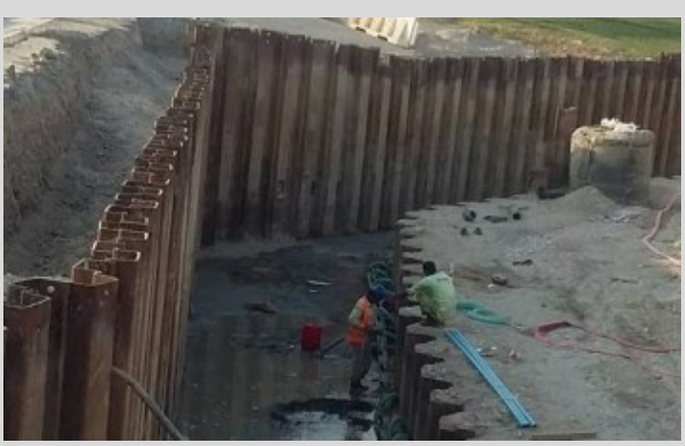
U PROFILE SHEET PILES

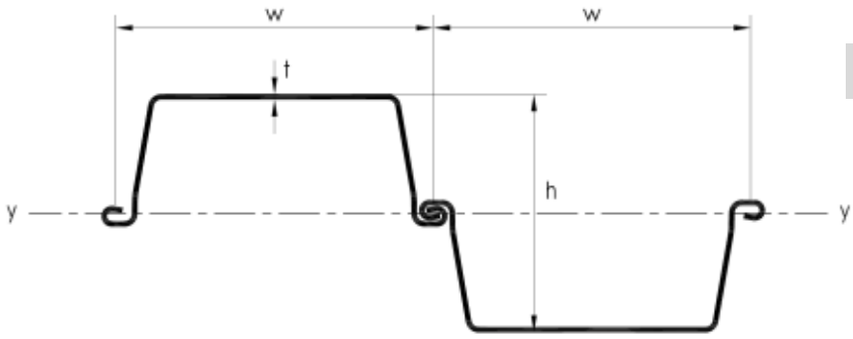
A REUSABLE AND ECONOMIC ALTERNATIVE TO HOT ROLLED U SHEET PILES

The ESC-CRU series is a cold rolled sheet pile profile. U-shaped steel sheet piles have long been familiar to designers and constructors because of the long-standing traditions and technologies, and are widely used for permanent structures, temporarily installed soil-retaining construction and temporary cofferdams. ESC-CRU profiles provide an economic alternative to Hot Rolled U Sheet Piles as they are of similar size and possess similar structural properties, with a section modulus ranging from 500cm^3/m all the way up to 4,650cm^3/m. With over 50 choices in profile, the CRU series sheet piles allow greater fine tuning in the design for the most economical solution.

ORDER OPTIONS

Steel Grades	✓ Q235B, Q345B, Q345C, Q390B, Q420B ✓ S235JR, S275JR, S355JR, S355JO ✓ ASTM A572 Gr42, Gr50, Gr60 ✓ Others available on request
Length	35.0m maximum Any project specific length can be produced
Delivery Options	✓ Single or Pairs ✓ Pairs either loose, welded or crimped ✓ Lifting Hole ✓ Grip Plate ✓ By container (11.8m or less) or Break Bulk ✓ Corrosion Protection Coatings

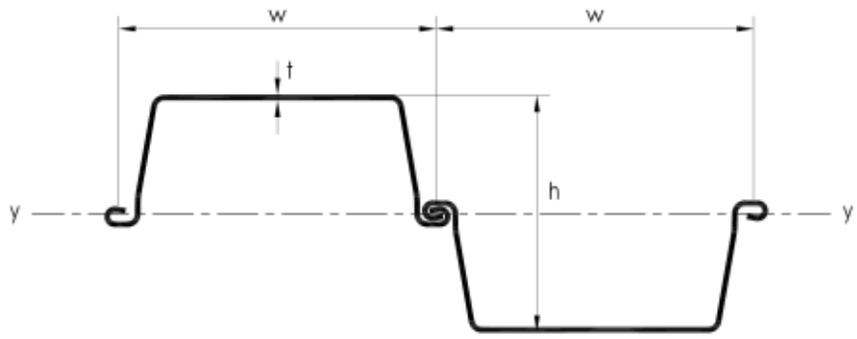




INTERLOCKING CLUTCH

Section	Width (w)	Height (h)	Thickness (t)	Cross Sectional Area	Weight Per Pile	Weight Per Wall	Elastic Section Modulus	Moment of Inertia	Coating Area (both sides per pile)
	mm	mm	mm	cm²/m	kg/m	kg/m²	cm³/m	cm⁴/m	m²/m
ESC-CRU5-600	600	150	9.5	119.0	56.40	**94.0**	**510**	3,825	1.52
ESC-CRU7-600	600	340	6.0	98.1	46.20	**77.0**	**745**	12,665	1.96
ESC-CRU8-600	600	325	7.0	110.0	51.80	**86.3**	**825**	13,406	1.89
ESC-CRU11-600	600	360	8.0	131.6	62.00	**103.3**	**1,110**	19,980	1.98
ESC-CRU12-600	600	310	9.0	137.6	64.80	**108.0**	**1,200**	18,600	1.84
ESC-CRU12-700	700	440	7.5	123.0	67.60	**96.6**	**1,210**	26,620	2.30
ESC-CRU12-450	450	360	10.0	184.0	65.00	**144.4**	**1,250**	22,482	1.66
ESC-CRU12-600	600	400	7.5	77.8	61.07	**101.8**	**1,257**	25,143	2.08
ESC-CRU13-600	600	400	8.0	83.0	65.14	**108.6**	**1,337**	26,745	2.08
ESC-CRU15-600	600	400	9.0	93.4	73.28	**122.1**	**1,496**	29,921	2.08
ESC-CRU15-675	675	420	8.5	142.0	75.90	**112.0**	**1,520**	31,920	2.26
ESC-CRU16-400	400	290	11.5	203.8	64.00	**160.0**	**1,565**	22,693	1.42
ESC-CRU16-600	600	400	10.0	103.7	81.42	**135.7**	**1,653**	33,061	2.08
ESC-CRU17-500	500	420	12.0	224.0	88.00	**176.0**	**1,660**	34,860	1.87
ESC-CRU17-750	750	430	9.5	151.0	89.10	**119.0**	**1,670**	35,905	2.39
ESC-CRU18-750	750	460	9.0	150.3	88.50	**118.0**	**1,780**	40,940	2.51
ESC-CRU18-600	600	430	9.5	165.4	77.90	**129.8**	**1,800**	38,700	2.09
ESC-CRU20-750	750	460	10.0	164.4	96.80	**129.0**	**2,005**	46,115	2.47
ESC-CRU20-650	650	500	10.0	121.0	94.99	**146.1**	**2,029**	50,732	2.43
ESC-CRU20-650	650	540	8.0	150.1	76.60	**117.8**	**2,075**	56,025	2.44
ESC-CRU21-750	750	500	10.0	169.3	99.70	**133.0**	**2,080**	49,920	2.47
ESC-CRU22-600	600	500	10.0	186.6	87.90	**146.5**	**2,200**	55,000	2.24
ESC-CRU22-650	650	500	11.0	133.1	104.50	**160.8**	**2,222**	55,553	2.43
ESC-CRU23-750	750	480	10.5	173.4	102.10	**136.1**	**2,275**	54,600	2.48
ESC-CRU23-650	650	540	9.0	109.5	86.00	**132.3**	**2,295**	61,954	2.44
ESC-CRU23-700	700	540	9.0	114.0	89.52	**127.9**	**2,299**	62,060	2.54
ESC-CRU23-750	750	540	9.0	118.5	93.05	**124.1**	**2,302**	62,153	2.64
ESC-CRU24-650	650	500	12.0	145.2	114.00	**175.4**	**2,413**	60,331	2.43
ESC-CRU25-750	750	470	11.5	188.2	110.80	**147.7**	**2,500**	58,750	2.46

*excludes internal section of interlock

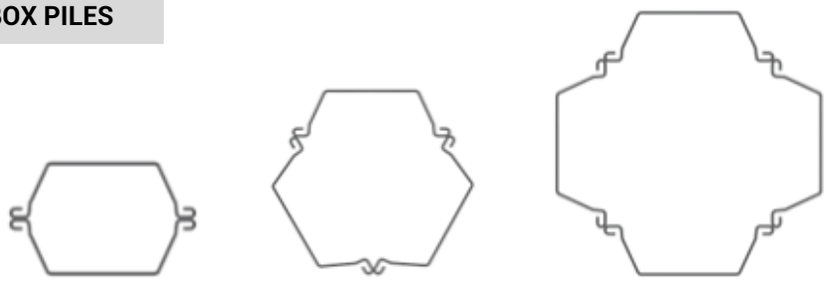


INTERLOCKING CLUTCH

Section	Width (w)	Height (h)	Thickness (t)	Cross Sectional Area	Weight Per Pile	Weight Per Wall	Elastic Section Modulus	Moment of Inertia	Coating Area (both sides per pile)
	mm	mm	mm	cm²/m	kg/m	kg/m²	cm³/m	cm⁴/m	m²/m
ESC-CRU25-650	650	540	10.0	121.7	95.54	**147.0**	**2,539**	68,549	2.44
ESC-CRU25-700	700	540	10.0	126.7	99.47	**142.1**	**2,543**	68,669	2.54
ESC-CRU25-750	750	540	10.0	131.7	103.39	**137.9**	**2,547**	68,773	2.64
ESC-CRU26-650	650	540	10.0	186.2	95.00	**146.1**	**2,560**	69,120	2.42
ESC-CRU26-750	750	451	12.0	192.0	113.20	**151.0**	**2,580**	58,179	2.41
ESC-CRU26-650	650	540	10.5	127.8	100.32	**154.3**	**2,667**	72,017	2.44
ESC-CRU27-750	750	560	10.0	141.8	111.34	**148.5**	**2,699**	75,567	2.84
ESC-CRU26-700	700	560	10.0	136.8	107.42	**153.5**	**2,699**	75,562	2.74
ESC-CRU26-650A	650	560	10.0	131.8	103.49	**159.2**	**2,699**	75,557	2.64
ESC-CRU27-650	650	540	11.0	133.9	105.10	**161.6**	**2,760**	74,767	2.11
ESC-CRU27-700	700	540	11.0	139.4	109.41	**156.3**	**2,774**	74,903	2.54
ESC-CRU28-750	750	540	11.0	144.9	113.73	**151.6**	**2,790**	75,338	2.64
ESC-CRU28-600	600	480	12.0	216.0	101.90	**169.8**	**2,840**	68,160	2.17
ESC-CRU29-650	650	560	11.0	145.0	113.85	**175.2**	**2,956**	82,778	2.64
ESC-CRU29-750	750	560	11.0	156.0	122.48	**163.3**	**2,957**	82,794	2.84
ESC-CRU29-700	700	560	11.0	150.5	118.17	**168.8**	**2,957**	82,787	2.74
ESC-CRU30-650	650	540	12.0	146.1	114.65	**176.4**	**3,021**	81,570	2.44
ESC-CRU30-700	700	540	12.0	152.1	119.36	**170.5**	**3,027**	81,718	2.54
ESC-CRU30-750	750	540	12.0	158.1	124.07	**165.4**	**3,031**	81,847	2.64
ESC-CRU32-750	750	605	11.0	204.0	120.00	**160.0**	**3,170**	95,893	2.78
ESC-CRU32-600	600	520	13.0	242.0	114.00	**190.0**	**3,200**	83,200	2.24
ESC-CRU32-650	650	560	12.0	158.2	124.20	**191.1**	**3,212**	89,941	2.64
ESC-CRU32-750	750	560	12.0	170.2	133.62	**178.2**	**3,213**	89,963	2.84
ESC-CRU32-700	700	560	12.0	164.2	128.91	**184.2**	**3,213**	89,953	2.74
ESC-CRU35-750	750	608	12.0	226.0	133.00	**177.0**	**3,465**	105,336	2.83
ESC-CRU37-750	750	610	13.0	243.0	143.00	**191.0**	**3,750**	114,344	2.81
ESC-CRU40-750	750	610	14.0	263.0	155.00	**207.0**	**4,045**	123,373	2.83
ESC-CRU43-750	750	610	15.0	283.0	167.00	**223.0**	**4,340**	132,309	2.84
ESC-CRU46-750	750	615	16.0	302.0	178.00	**237.0**	**4,645**	142,834	2.84

*excludes internal section of interlock

BOX PILES

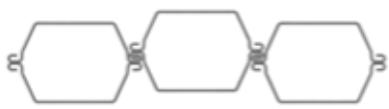


Double CRU Box Pile | Triple CRU Box Pile | Quadruple CRU Box Pile

ESC-CRU Series Sheet Piles can be combined to create special arrangements. These combined sections presented can greatly amplify the bending strength of a single section by over 5 times. Box Piles with intermediate standard U Piles can be designed. The welded box section can also be incorporated along a certain section of the length where the bending moments are the highest. Please contact our engineering department at engineering@escpile.com if you would like to receive more information about the presented combined pile systems.

COMBINED WALL CONFIGURATIONS

1/1

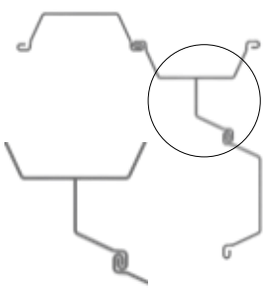


1/3

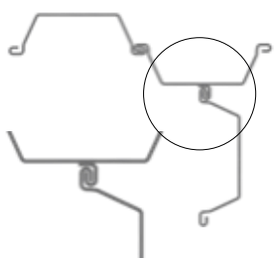
1/2

1/4

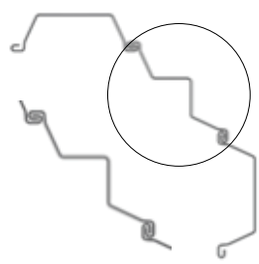
CORNER PILES



OPTION 1
Cut & weld on section from CRU Sheet Pile



OPTION 2
ESC Welded Interlocks



OPTION 3
Cold Form bending of CRU flange at any angle between 20˚ to 120˚

ESC is able to offer 3 options for Corner Pile configurations in the ESC-CRU Series. Option 1 is frequently used when the installation contractor prefers to create their own corner piles on site depending on the as-driven layout. However this produces wastage on the offcut pile. Option 2 allows welding at the mill or on site and provides the installation contractor with more flexibility on corner pile location. Option 3 provides an option with no welding required and provides increased accuracy at corners that are deviated from the typical 90˚ corner.

ESC-CRM SERIES

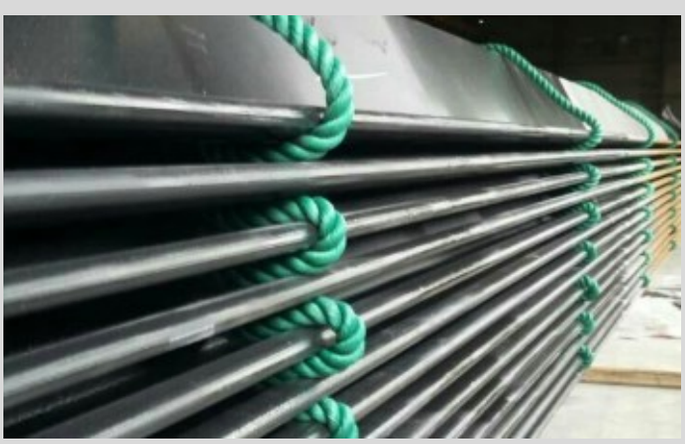
WIDE U PROFILE SHEET PILES

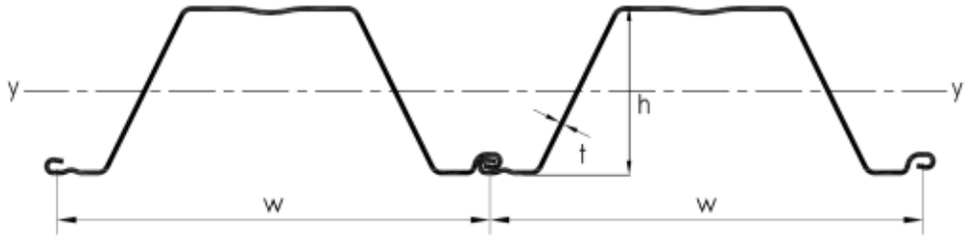
WIDE PROFILE 900MM WIDTH COLD ROLLED SHEET PILE

Within ESC's cold rolled sheet pile portfolio is the ESC-CRM Series. The design features a 900mm Wide U Sheet Pile. The flange and track have a rolled dimple which improves the stiffness of the profile, improving driveability. A wide range of steel grades are available to cater to various international standards and project codes. Featuring more than 30% fewer interlocks versus standard U sheet pile walls improves overall seepage characteristics of the installed sheet pile wall.

ORDER OPTIONS

Steel Grades	✓ Q235B, Q345B, Q345C, Q390B, Q420B ✓ S235, S275JR, S355JR ✓ ASTM A572 Gr42, Gr50, Gr60 ✓ Others available on request
Length	24.0m maximum Any project specific length can be produced
Delivery Options	✓ Lifting Hole ✓ Grip Plate ✓ By container (11.8m or less) or Break Bulk ✓ Corrosion Protection Coatings



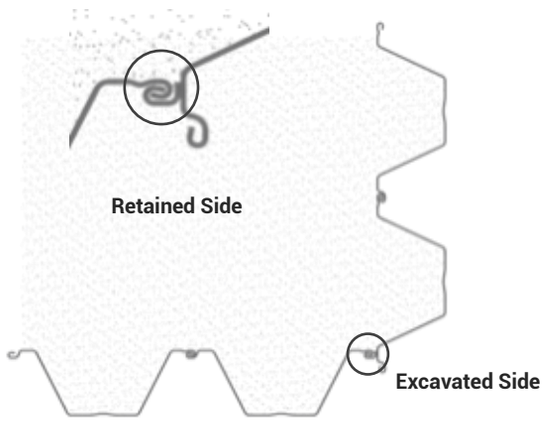


INTERLOCKING CLUTCH

Section	Width (w)	Height (h)	Thickness (t)	Cross Sectional Area	Weight Per Pile	Weight Per Wall	Elastic Section Modulus	Moment of Inertia	Coating Area (both sides per pile)
	mm	mm	mm	cm²/m	kg/m	kg/m²	cm³/m	cm⁴/m	m²/m
ESC-CRM9-900	900	307.5	5.5	77.2	60.6	**67.4**	**815**	12,534	2.81
ESC-CRM9-900A	900	308	6.0	84.3	66.1	**73.5**	**888**	13,674	2.81
ESC-CRM9-900B	900	308.5	6.5	91.3	71.7	**79.6**	**961**	14,815	2.81
ESC-CRM10-900	900	309	7.0	98.3	77.2	**85.7**	**1,033**	15,955	2.81
ESC-CRM11-900	900	309.5	7.5	105.3	82.7	**91.9**	**1,105**	17,095	2.81
ESC-CRM11-900A	900	310	8.0	112.3	88.2	**98.0**	**1,177**	18,236	2.81
ESC-CRM11-900B	900	347.5	6.5	96.0	76.3	**83.7**	**1,107**	19,227	2.96
ESC-CRM11-900C	900	348	7.0	103.4	81.1	**90.2**	**1,190**	20,707	2.96
ESC-CRM12-900	900	310.5	8.5	119.4	93.7	**104.1**	**1,248**	19,377	2.81
ESC-CRM12-900A	900	348.5	7.5	110.8	86.9	**96.6**	**1,273**	22,187	2.96
ESC-CRM13-900	900	349	8.0	118.1	92.7	**103.0**	**1,356**	23,667	2.96
ESC-CRM14-900	900	349.5	8.5	125.5	98.5	**109.5**	**1,439**	25,148	2.96
ESC-CRM15-900	900	350	9.0	132.9	104.3	**115.9**	**1,522**	26,628	2.96
ESC-CRM16-900	900	350.5	9.5	140.3	110.1	**122.4**	**1,604**	28,110	2.96

*excludes internal section of interlock

CORNER PILES



ESC-CRW SERIES

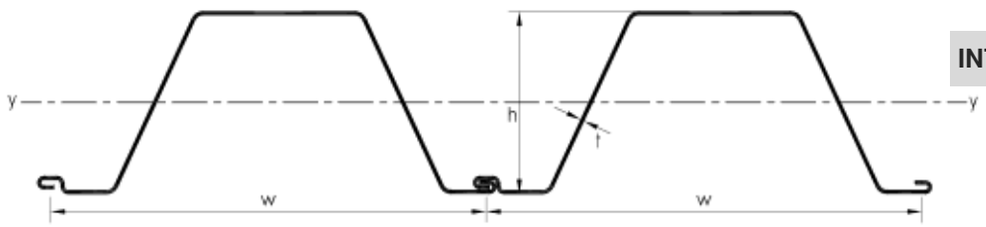
WIDE U PROFILE SHEET PILES

ECONOMICAL WIDE PROFILE SHEET PILE WITH HALF THE INTERLOCKS OF Z SHEET PILE WALLS

The ESC CRW Series is a wide profile U Sheet Pile which is the widest rolled single sheet pile in the industry. It features the same interlocks as the ESC-CRZ Series, but is equivalent to a paired Z sheet pile. It has a high strength to weight ratio and excellent seepage characteristics as it has the fewest interlocks per unit width. There is a large spectrum in the strength and sizing, allowing the designer to optimise their design to the application. The lower strength range is optimal for cutoff wall applications.

ORDER OPTIONS

Steel Grades	✓ Q235B, Q345B, Q345C, Q390B, Q420B ✓ S235, S275JR, S355JR, S355JO ✓ ASTM A572 Gr42, Gr50, Gr60 ✓ Others available on request
Length	24.0m maximum for ESC-CRW6 to ESC-CRW14 35.0m maximum for ESC-CRW14 to ESC-CRW34 Any project specific length can be produced
Delivery Options	✓ Lifting Hole ✓ Grip Plate ✓ By container (11.8m or less) or Break Bulk ✓ Corrosion Protection Coatings



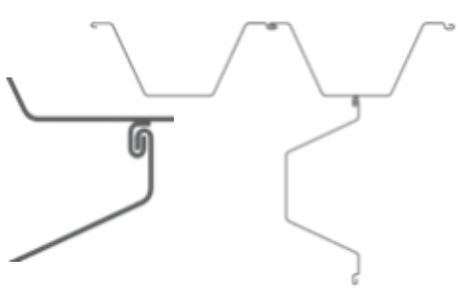
INTERLOCKING CLUTCH

Section	Width (w) mm	Height (h) mm	Thickness (t) mm	Cross Sectional Area cm²/m	Weight Per Pile kg/m	Weight Per Wall kg/m²	Elastic Section Modulus cm³/m	Moment of Inertia cm⁴/m	Coating Area (both sides per pile) m²/m
ESC-CRW3A	700	146	4.0	56.0	30.80	**44.0**	**265**	1,945	1.97
ESC-CRW3B	700	147	5.0	70.3	38.60	**55.2**	**328**	2,417	1.98
ESC-CRW4A	700	148	6.0	84.1	46.20	**66.0**	**392**	2,910	1.97
ESC-CRW4B	700	149	7.0	96.8	53.20	**76.0**	**447**	3,385	1.95
ESC-CRW5A	700	150	8.0	112.0	61.60	**88.0**	**508**	3,872	1.98
ESC-CRW6	600	251.2	5.2	90.4	42.58	**70.97**	**679**	8,718	3.49
ESC-CRW7	1,560	340	6.0	76.9	94.20	**60.4**	**740**	13,400	4.06
ESC-CRW9	1,420	407	6.0	84.5	94.20	**66.3**	**980**	21,540	4.05
ESC-CRW10	1,350	450	5.0	74.0	78.50	**58.1**	**970**	22,960	4.05
ESC-CRW11	1,330	450	6.0	90.2	94.20	**70.8**	**1,060**	27,140	4.04
ESC-CRW12A	1,270	450	6.0	94.5	94.20	**74.2**	**1,250**	30,000	4.05
ESC-CRW12B	1,430	391	8.5	118.9	133.50	**93.3**	**1,260**	27,400	4.05
ESC-CRW13	1,185	500	6.5	109.7	102.10	**86.1**	**1,390**	29,910	4.05
ESC-CRW14A	1,195	481	7.0	117.2	109.90	**92.0**	**1,460**	40,410	4.05
ESC-CRW14B	1,400	377	9.5	135.7	149.20	**106.5**	**1,420**	30,110	4.05
ESC-CRW15	1,280	450	8.0	125.0	125.60	**98.1**	**1,500**	37,960	4.04
ESC-CRW16A	1,130	500	7.0	123.9	109.90	**97.2**	**1,580**	45,910	4.05
ESC-CRW17	1,320	450	9.0	136.3	141.30	**107.0**	**1,720**	41,610	4.05
ESC-CRW18	1,245	491	8.0	125.5	122.62	**98.5**	**1,760**	54,674	3.92
ESC-CRW19	1,245	491	8.5	133.8	130.76	**105.0**	**1,880**	58,325	3.94
ESC-CRW20	1,245	492	9.0	142.2	138.95	**111.6**	**2,000**	61,996	3.95
ESC-CRW21	1,245	492	9.5	150.6	147.19	**118.2**	**2,120**	65,687	3.97
ESC-CRW22	1,245	493	10.0	159.1	155.49	**124.9**	**2,250**	69,397	3.98
ESC-CRW24	1,250	493	10.5	167.0	163.84	**131.1**	**2,360**	73,125	4.00
ESC-CRW25	1,250	494	11.0	175.5	172.25	**137.8**	**2,490**	76,871	4.01
ESC-CRW26	1,250	494	11.5	184.2	180.72	**144.6**	**2,610**	80,632	4.03
ESC-CRW27	1,250	495	12.0	192.9	189.24	**151.4**	**2,720**	84,409	4.04
ESC-CRW28	1,255	495	12.5	200.8	197.81	**157.6**	**2,820**	88,200	4.06
ESC-CRW29	1,255	496	13.0	209.5	206.44	**164.5**	**2,940**	92,005	4.07
ESC-CRW30	1,255	496	13.5	218.4	215.13	**171.4**	**3,050**	95,822	4.09
ESC-CRW31	1,255	497	14.0	227.2	223.87	**178.4**	**3,160**	99,652	4.10
ESC-CRW32	1,260	497	14.5	235.2	232.66	**184.7**	**3,260**	103,494	4.12
ESC-CRW34	1,260	498	15.0	244.2	241.51	**191.7**	**3,370**	107,346	4.13
ESC-CRW35	1,260	498	15.5	253.2	250.42	**198.7**	**3,480**	111,208	4.15
ESC-CRW36	1,260	499	16.0	262.2	259.38	**205.9**	**3,590**	115,079	4.16

*excludes internal section of interlock

CORNER PILES

A welded interlock can be positioned on the ESC-CRW flange to allow corner configurations. Note the flange should be orientated towards the excavated side and the interlock orientated towards the retained side.



WATCH OUR COLD FORMED SHEET PILE PRODUCTION ANIMATION BY SCANNING THE QR CODE

ESC COLD FORMED SHEET PILES

INTRODUCTION

Cold forming processes are when the steel sheet pile is profiled at room temperature. The profile thickness is constant along the width of the profile. Cold Forming of Sheet Piles is completed in discrete lengths instead of a continuous rolling process. A wide range of widths and depths are achievable. This production process provides the following benefits:

✓ Much greater flexibility in forming dimensions. Cold Forming involves pressing the cut steel plate at various locations, which can be customised by varying the pressing penetration depth. This means that numerous profiles and sizes can be produced without any change of manufacturing equipment. Profile widths can also be much wider, with single sheet piles being over 1.5m width, much wider than any sheet pile produced by rolling processes.

✓ Various interlock configurations - ESC is experienced in the design & manufacture of various interlock systems, such as the EU and BP which uses Pipe & Box sections respectively. These can offer advantages to rolled interlocks from a grouting aspect and also ease of installation.

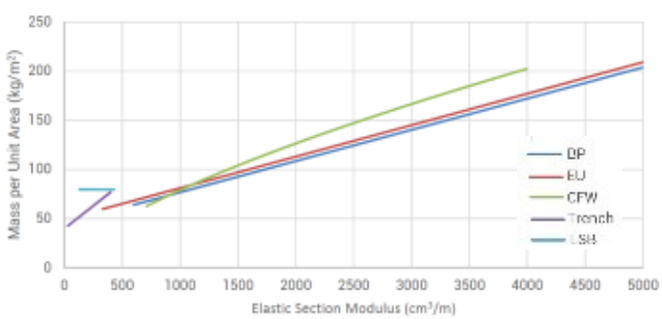
✓ Lower machinery costs – due to the simplicity of a cold forming production line, these translate to lower production costs especially when it comes to low volume, special profile jobs

✓ Unlimited number of configurations – numerous variables, such as angle, web width, flange width, interlock size allow a virtually limitless number of configurations to be designed and produced

✓ Corner Pile Production without extra welding or forming

✓ Special Piles can be produced – tapered sheet piles, sheet piles with varying thickness along the length and more can be produced.

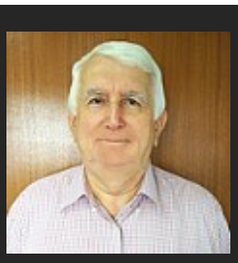
SECTION MODULUS RANGE vs MASS



Note the lines shown above are trendlines. The individual profiles may lie at points away from this line. Please see the relevant catalogue page for exact specifications.

The ESC Advantage

✓ Global Supply Network
✓ Wide Sheet Pile Product Range
✓ Competitive Pricing
✓ Free of Charge Design
✓ Small orders possible
✓ Easy to supply special piles, corner piles, tapered piles and more



What Our Engineers Say

"ESC is a global pioneer of Cold Formed Sheet Piles, with global patents dating back over 30 years ago for wide profile sheet piles, trench piles and various interlock designs.

Sheet Pile Profiles

EU SERIES | BP SERIES | CFW SERIES | T SERIES | LSB SERIES

PROJECT REFERENCES

DAVIS BASE MATERIAL OFFLOADING FACILITY, ANTARCTICA

JB BASEMENT CAR PARK, MALAYSIA

RUBIS OIL TANK PROTECTION, NETHERLANDS

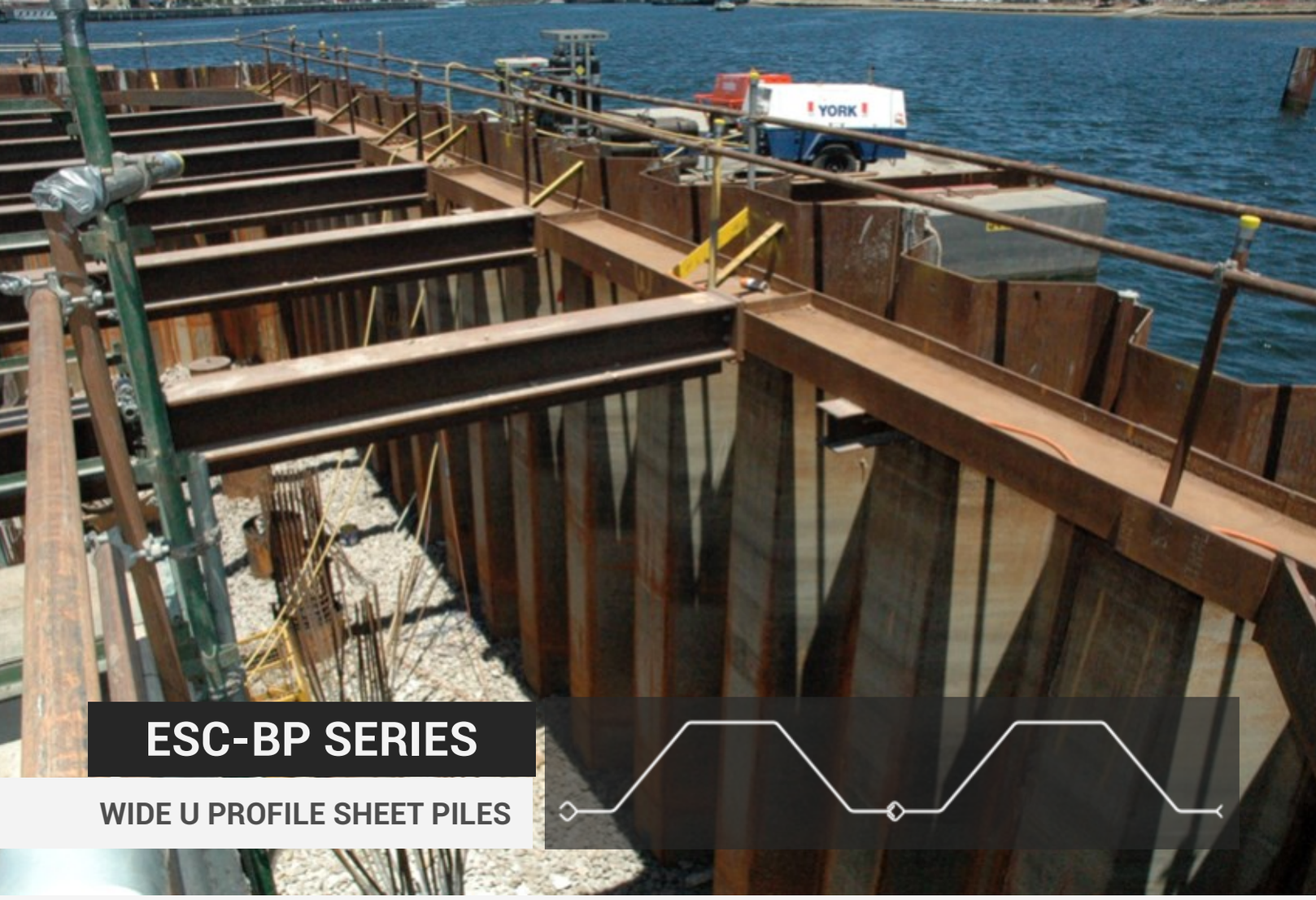
MALACCA RIVER BEAUTIFICATION, MALAYSIA

KIMANIS POWER PLANT, MALAYSIA

ALTAMIRA, MEXICO

DRAINAGE SYSTEM TRENCH, CAMBODIA

AD TRENCH, UAE



ESC-BP SERIES

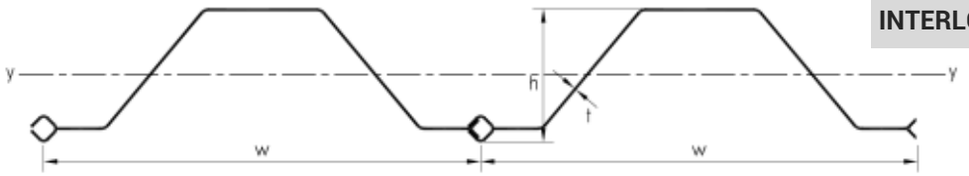
WIDE U PROFILE SHEET PILES

A WIDE PROFILE SHEET PILE WITH BOX CLUTCH FOR EASY GROUTING

Designed with an open clutch suitable for post installation grout sealing, the ESC-BP Series sheet pile is ideal for de-watering works, groundwater cutoff walls and pollution control situations. This pile with its light weight wide profile resulting in fewer clutches per unit length of wall provides an attractive commercial proposition for retaining walls and other applications.

ORDER OPTIONS

Steel Grades	✓ Q235B, Q345B, Q345C, Q390B, Q420B ✓ S235, S275JR, S355JR ✓ ASTM A572 Gr42, Gr50, Gr60 ✓ Others available on request
Length	14.0m maximum Longer lengths can be spliced (>30m possible) Any project specific length can be produced
Delivery Options	✓ Lifting Hole ✓ Grip Plate ✓ By container (11.8m or less) or Break Bulk ✓ Corrosion Protection Coatings



INTERLOCKING CLUTCH

Section	Width (w) mm	Height (h) mm	Thickness (t) mm	Cross Sectional Area cm²/m	Weight Per Pile kg/m	Weight Per Wall kg/m²	Elastic Section Modulus cm³/m	Moment of Inertia cm⁴/m	Coating Area*(both sides) m²/m
ESC-6BP-S	1,063	291	5.75	91.8	76.60	72.1	**600**	9,150	2.85
ESC-7BP-S	1,036	321	5.75	94.2	76.60	73.9	**700**	11,340	2.85
ESC-8BP-S	1,002	352	5.75	97.4	76.60	76.4	**800**	13,900	2.85
ESC-9BP-S	951	372	5.75	102.6	76.60	80.6	**900**	16,610	2.85
ESC-10BP-S	903	389	5.75	108.1	76.60	84.9	**1,000**	19,250	2.85
ESC-11BP-S	852	404	5.75	114.5	76.60	89.9	**1,100**	22,130	2.85
ESC-12BP-S	806	415	5.75	121.0	76.60	95.0	**1,200**	24,860	2.85
ESC-13BP	1,234	443	7.75	117.4	107.69	87.3	**1,330**	28,220	3.47
ESC-13BP-S	759	425	5.75	128.5	76.60	100.9	**1,310**	27,820	2.85
ESC-14BP	1,205	456	7.75	120.2	107.69	89.4	**1,400**	30,690	3.47
ESC-14BP-S	718	433	5.75	135.9	76.60	106.6	**1,410**	30,550	2.85
ESC-15BP	1,168	470	7.75	124.0	107.69	97.3	**1,500**	33,950	3.47
ESC-16BP-S	1,448	539	7.75	116.0	126.30	87.2	**1,610**	41,080	4.07
ESC-16BP	1,130	484	7.75	128.2	107.69	95.3	**1,600**	37,410	3.47
ESC-17BP	1,090	498	7.75	132.8	107.69	98.8	**1,710**	41,090	3.47
ESC-18BP-S	1,376	569	7.75	122.1	126.30	91.8	**1,790**	48,590	4.07
ESC-18BP	1,058	508	7.75	136.9	107.69	101.8	**1,800**	44,190	3.47
ESC-19BP	1,025	517	7.75	141.3	107.69	105.1	**1,890**	47,450	3.47
ESC-20BP-S	1,300	597	7.75	129.2	126.30	97.2	**2,000**	56,920	4.07
ESC-20BP	1,470	523	9.75	138.9	160.20	109.0	**1,990**	49,180	4.11
ESC-21BP	1,436	538	9.75	142.1	160.20	111.6	**2,100**	53,420	4.11
ESC-21BP	957	534	7.75	151.3	107.69	118.8	**2,100**	54,480	3.47
ESC-22BP-S	1,231	619	7.75	136.5	126.30	102.6	**2,190**	64,940	4.07
ESC-22BP	1,401	552	9.75	145.7	160.20	114.4	**2,210**	57,870	4.11
ESC-23BP	1,374	562	9.75	148.5	160.20	116.6	**2,300**	61,350	4.11
ESC-23BP	896	547	7.75	161.7	107.69	112.5	**2,300**	61,260	3.47
ESC-24BP-S	1,159	639	7.75	145.0	126.30	109.0	**2,410**	73,760	4.07
ESC-24BP	1,347	571	9.75	151.5	160.20	118.9	**2,390**	64,940	4.11
ESC-25BP	1,310	584	9.75	155.8	160.20	122.3	**2,520**	69,940	4.11
ESC-26BP	1,281	593	9.75	159.3	160.20	125.0	**2,610**	73,840	4.11
ESC-27BP	1,252	601	9.75	163.0	160.20	127.9	**2,720**	77,880	4.11
ESC-28BP	1,223	609	9.75	166.9	160.20	131.0	**2,820**	82,070	4.11
ESC-29BP	1,203	614	9.75	169.6	160.20	133.2	**2,900**	84,940	4.11
ESC-30BP	1,173	622	9.75	174.0	160.20	136.6	**3,010**	89,390	4.11
ESC-31BP	1,303	559	11.75	188.1	192.33	147.6	**3,090**	80,750	4.11
ESC-32BP	1,276	566	11.75	192.1	192.33	150.8	**3,200**	84,800	4.11
ESC-34BP	1,230	578	11.75	199.2	192.33	156.4	**3,390**	91,810	4.11
ESC-36BP	1,183	588	11.75	207.0	192.33	162.5	**3,590**	99,150	4.11
ESC-38BP	1,136	597	11.75	215.7	192.33	169.3	**3,810**	106,850	4.11
ESC-40BP	1,097	604	11.75	223.3	192.33	175.3	**3,990**	113,290	4.11
ESC-42BP	1,381	664	14.0	229.2	248.36	179.9	**4,220**	132,530	4.54
ESC-44BP	1,348	672	14.0	234.7	248.36	184.2	**4,380**	139,490	4.54
ESC-46BP	1,304	683	14.0	242.6	248.36	190.4	**4,610**	149,170	4.54
ESC-48BP	1,271	691	14.0	248.9	248.36	195.4	**4,780**	156,730	4.54
ESC-50BP	1,226	700	14.0	258.1	248.36	202.6	**5,030**	167,250	4.54

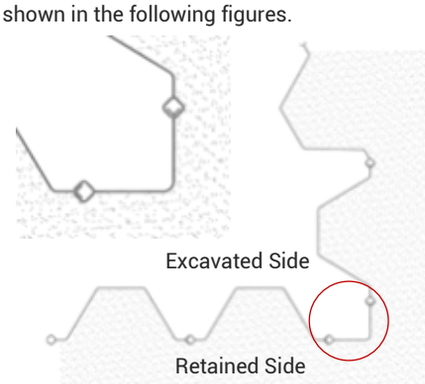
*excludes internal section of interlock

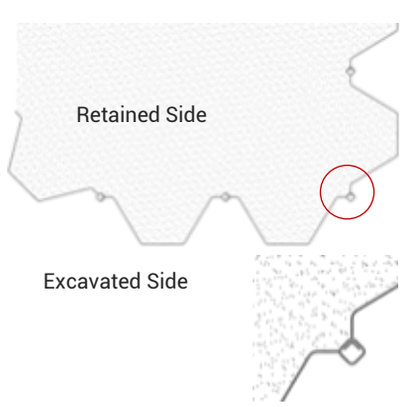
CLASSIFICATION

All sheet piles, excluding the -S Series are class 2 or 3 for grade S355 and below. BP-S Series sheet piles are class 3 for S275 and below in accordance to EN 1993-5:2007. Contact engineering@escpile.com if further detail is required

CORNER PILES

Due to the flexibility of the forming process, the ESC-BP Series Sheet Piles can be formed to almost any corner configuration, without requiring any wastage or welding. Note that the interlocks should be orientated toward the retained side as shown in the following figures.





ESC-EU SERIES

WIDE U PROFILE SHEET PILES

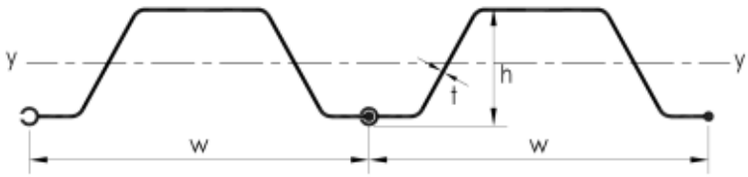
A WIDE PROFILE SHEET PILE WITH A PIPE CLUTCH OFFERING EFFECTIVE ANNULAR SEALING FOR OUTSTANDING FLUID CUTOFF

A wide profile pile utilising a robust ball joint clutch, the ESC-EU Series is efficient in terms of weight and installation costs. It is suitable for temporary and permanent works. The profile is especially effective in marine conditions where strength and installation efficiency are premium considerations.

ESC also offers EU sheet piles made in the USA in standard widths for the North American market.

ORDER OPTIONS

Steel Grades	✓ Q235B, Q345B, Q345C, Q390B, Q420B ✓ S235, S275JR, S355JR ✓ ASTM A572 Gr42, Gr50, Gr60 ✓ Others available on request
Length	14.0m maximum Longer lengths can be spliced (>30m possible) Any project specific length can be produced
Delivery Options	✓ Lifting Hole ✓ Grip Plate ✓ By container (11.8m or less) or Break Bulk ✓ Corrosion Protection Coatings



Section	Width (w)	Height (h)	Thickness (t)	Cross Sectional Area	Weight Per Pile	Weight Per Wall	Elastic Section Modulus	Moment of Inertia	Coating Area* (both sides per pile)
	mm	mm	mm	cm²/m	kg/m	kg/m²	cm³/m	cm⁴/m	m²/m
ESC-EU3	800	171	5.75	73.0	45.90	**57.3**	**330**	3,040	1.98
ESC-EU4	770	188	5.75	75.8	45.90	**59.5**	**400**	3,900	1.98
ESC-EU5	740	209	5.75	79.0	45.90	**62.0**	**500**	5,060	1.98
ESC-EU6	690	237	5.75	84.6	45.90	**66.4**	**600**	6,880	1.98
ESC-EU7	730	210	7.75	107.5	61.60	**84.4**	**690**	6,870	2.01
ESC-EU8	700	236	7.75	112.2	61.60	**88.1**	**810**	8,850	2.02
ESC-EU9	770	261	7.75	114.9	69.50	**90.2**	**910**	11,220	2.22
ESC-EU12	1,160	406	7.75	113.5	103.30	**89.1**	**1,250**	26,030	3.26
ESC-EU13	1,140	409	7.75	115.4	103.30	**90.6**	**1,300**	27,160	3.26
ESC-EU14	1,110	429	7.75	118.6	103.30	**93.1**	**1,410**	30,300	3.25
ESC-EU15	1,060	439	7.75	124.2	103.30	**97.5**	**1,520**	33,630	3.25
ESC-EU18	1,410	484	9.50	132.2	146.30	**103.8**	**1,800**	42,210	3.85
ESC-EU19	1,390	495	9.50	134.1	146.30	**105.3**	**1,870**	44,500	3.85
ESC-EU20	1,350	493	9.50	138.0	146.30	**108.3**	**1,950**	46,940	3.85
ESC-EU21	1,320	511	9.50	141.3	146.30	**110.9**	**2,080**	51,060	3.85
ESC-EU22	1,280	516	9.75	149.0	149.80	**117.0**	**2,200**	55,640	3.85
ESC-EU23	1,270	516	9.75	150.3	149.80	**118.0**	**2,270**	56,340	3.85
ESC-EU24	1,210	585	9.75	149.0	149.80	**117.0**	**2,400**	55,640	3.64
ESC-EU25	1,180	569	9.75	140.1	149.80	**110.0**	**2,500**	56,340	3.50
ESC-EU26	1,170	566	9.75	163.2	149.80	**128.1**	**2,600**	71,150	3.85
ESC-EU27	1,160	574	9.75	171.5	156.00	**134.6**	**2,680**	77,250	3.89
ESC-EU28	1,280	530	11.75	184.8	185.80	**145.1**	**2,760**	71,540	3.90
ESC-EU32	1,380	615	11.75	188.5	204.20	**148.0**	**3,200**	96,160	4.29
ESC-EU36	1,290	642	11.75	201.7	204.20	**158.3**	**3,590**	111,940	4.30
ESC-EU38	1,250	661	11.75	188.5	204.20	**163.41**	**3,800**	96,160	3.89
ESC-EU40	1,440	590	15.50	262.3	271.70	**205.9**	**4,600**	137,900	4.74
ESC-EU46	1,320	622	15.50	262.3	271.70	**205.9**	**4,600**	137,900	4.34
ESC-EU48	1,280	641	15.50	270.3	271.70	**212.2**	**4,800**	149,390	4.34
ESC-EU50	1,240	648	15.50	279.1	271.70	**219.1**	**5,000**	158,080	3.50
ESC-EU60	1,060	739	15.50	326.5	271.70	**256.3**	**6,000**	224,180	4.10
ESC-EU65	1,500	739	18.00	312.1	367.50	**245.0**	**6,500**	235,350	3.43
ESC-EU70	1,500	752	20.00	343.9	405.20	**270.0**	**7,080**	263,590	3.42
ESC-EU80	1,500	764	22.00	385.5	444.70	**302.6**	**8,010**	302,130	3.50

NORTH AMERICAN SIZES

Made In the U.S.A.

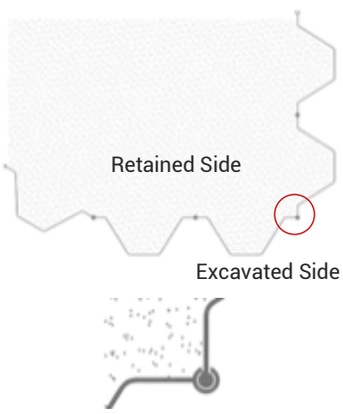
Section	Width (w)	Height (h)	Thickness (t)	Cross Sectional Area	Weight Per Pile	Weight Per Wall	Elastic Section Modulus	Moment of Inertia	Coating Area (both sides per pile)
	mm	mm	mm	cm²/m	kg/m	kg/m²	cm³/m	cm⁴/m	m²/m
ESC-EU14-770	1,540	402	9.525	122.5	148.1	**96.1**	**1,440**	30,640	3.91
ESC-EU19-700	1,400	477	9.525	135.1	148.1	**106.0**	**1,930**	46,480	3.92
ESC-EU26-700	1,400	480	12.7	180.9	198.8	**142.0**	**2,610**	63,010	3.95
ESC-EU38-700	1,400	613	12.7	208.6	229.2	**163.8**	**3,900**	119,700	4.55
ESC-EU48-700	1,400	654	15.875	257.0	282.4	**201.7**	**4,740**	155,080	4.55
ESC-EU50-580	1,160	712	12.7	251.8	229.2	**197.7**	**5,080**	181,880	4.55

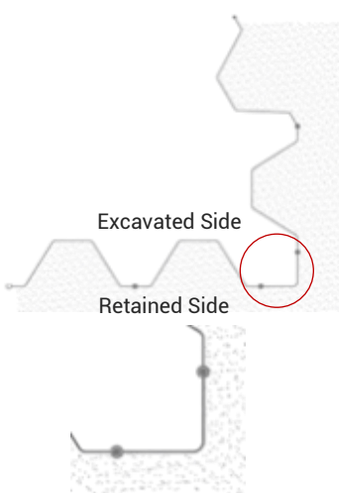
INTERLOCKING CLUTCH

*excludes internal section of interlock

CORNER PILES

The slotted pipe clutch can be orientated at any angle allowing almost any corner configuration, without requiring any wastage or additional welding. For internal corners a special piece can be fabricated with little cost due to the flexibility in the cold forming process. Note that the interlocks should be orientated toward the retained side as shown in the following figures.





ESC-CFW SERIES

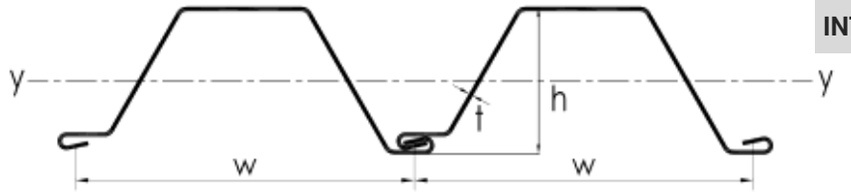
WIDE U PROFILE SHEET PILES

AN ECONOMIC & SIMPLE WIDE PROFILE COLD FORMED SHEET PILE WITHOUT ANY WELDING

The ESC CFW series was developed to enable a wide profile sheet pile to be produced economically without any requirement for interlock clutch welding. ESC-CFW sheet piles have excellent driveability due to the interlock design. A large range of sizes and strengths can be designed. The manufacturing process gives full flexibility in the profile design allowing features such as corner piles, tapered piles.

ORDER OPTIONS

Steel Grades	✓ Q235B, Q345B, Q345C, Q390B, Q420B ✓ S235, S275JR, S355JR ✓ ASTM A572 Gr42, Gr50, Gr60 ✓ Others available on request
Length	14.0m maximum Longer lengths can be spliced Any project specific length can be produced
Delivery Options	✓ Lifting Hole ✓ Grip Plate ✓ By container (11.8m or less) or Break Bulk ✓ Corrosion Protection Coatings



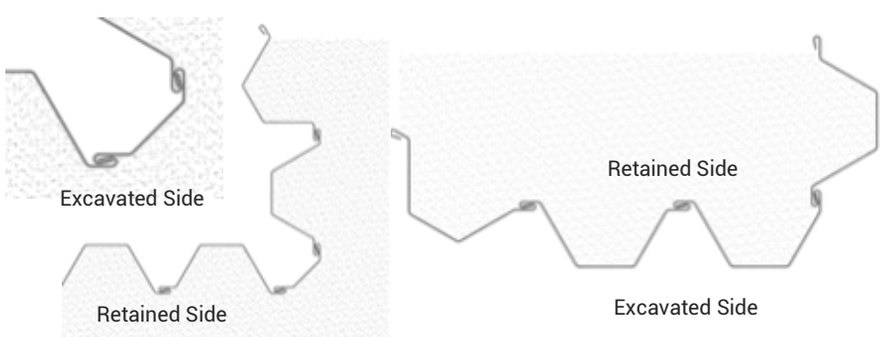
INTERLOCKING CLUTCH

Section	Width (w)	Height (h)	Thickness (t)	Cross Sectional Area	Weight Per Pile	Weight Per Wall	Elastic Section Modulus	Moment of Inertia	Coating Area (both sides per pile)
	mm	mm	mm	cm²/m	kg/m	kg/m²	cm³/m	cm⁴/m	m²/m
ESC-C-CFW7	995	297	5.75	86.6	67.71	68.0	**710**	10,700	2.71
ESC-C-CFW8	960	323	5.75	90.1	67.71	70.7	**800**	13,160	2.81
ESC-C-CFW9	900	343	5.75	95.7	67.71	75.1	**910**	15,910	3.00
ESC-C-CFW10	855	356	5.75	100.6	67.71	79.0	**1,000**	18,100	3.16
ESC-C-CFW11	805	365	5.75	107.1	67.71	84.1	**1,090**	20,280	3.35
ESC-C-CFW12	745	377	5.75	115.8	67.71	90.9	**1,220**	23,350	3.62
ESC-C-CFW13	1,162	401	7.75	120.1	109.51	94.2	**1,308**	26,340	2.80
ESC-C-CFW14	1,127	416	7.75	123.8	109.51	97.2	**1,408**	29,290	2.89
ESC-C-CFW15	1,101	430	7.75	126.7	109.51	99.5	**1,486**	31,940	2.97
ESC-C-CFW16	1,059	444	7.75	131.7	109.51	103.4	**1,600**	35,520	3.10
ESC-C-CFW17	1,020	454	7.75	136.4	109.51	107.0	**1,697**	38,660	3.22
ESC-C-CFW18	985	464	7.75	141.6	109.51	111.2	**1,802**	41,990	3.35
ESC-C-CFW19	947	474	7.75	147.3	109.51	115.6	**1,910**	45,460	3.50
ESC-C-CFW20	916	480	7.75	152.3	109.51	119.5	**2,016**	48,450	3.63
ESC-C-CFW21	884	487	7.75	157.8	109.51	123.9	**2,114**	51,510	3.77
ESC-C-CFW22	860	488	7.75	162.4	109.51	127.5	**2,187**	53,380	3.89
ESC-C-CFW23	946	450	9.75	185.5	137.77	145.6	**2,295**	52,100	3.51
ESC-C-CFW24	920	464	9.75	190.8	137.77	149.7	**2,405**	56,260	3.61
ESC-C-CFW25	894	467	9.75	196.3	137.77	154.1	**2,493**	58,970	3.73
ESC-C-CFW26	864	473	9.75	203.1	137.77	159.5	**2,611**	62,620	3.87
ESC-C-CFW27	855	471	9.75	205.3	137.77	161.1	**2,686**	63,370	3.91
ESC-C-CFW28	830	481	9.75	211.4	137.77	166.0	**2,785**	67,470	4.04
ESC-C-CFW29	1,120	519	11.75	209.8	184.48	164.7	**2,911**	75,570	3.27
ESC-C-CFW30	1,100	528	11.75	213.6	184.48	167.7	**2,995**	79,400	3.34
ESC-C-CFW32	1,058	535	11.75	222.1	184.48	174.4	**3,192**	85,490	3.48
ESC-C-CFW34	1,016	546	11.75	231.3	184.48	181.6	**3,393**	92,800	3.64
ESC-C-CFW36	974	556	11.75	241.3	184.48	189.4	**3,604**	100,440	3.81
ESC-C-CFW38	935	563	11.75	250.8	184.48	196.9	**3,794**	107,180	3.97
ESC-C-CFW40	900	569	11.75	261.1	184.48	205.0	**3,995**	114,220	4.14

*excludes internal section of interlock

CORNER PILES

Due to the flexibility of the forming process, the ESC-C-CFW Series Sheet Piles can be formed to almost any corner configuration, without requiring any wastage or welding. Note that the interlocks should be orientated toward the retained side as shown in the following figures.



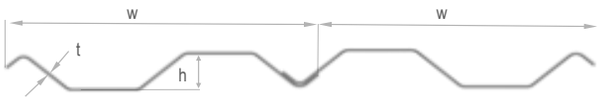
ESC TRENCH & ESC-LSB SERIES

TRENCH SHEETS

ESC T-SERIES

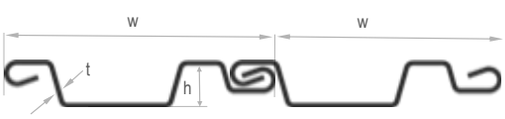
ESC-T35, T40, T60

ESC-T80



Section	Width (w) mm	Height (h) mm	Thickness (t) mm	Weight Per Pile kg/m	Weight Per Wall kg/m²	Section Modulus Section cm³	Section Modulus Wall cm³/m
ESC-T35-3.5	330	35	3.5	10.99	**33.30**	14.95	**45.29**
ESC-T35-3.7	330	35	3.7	11.62	**35.21**	15.70	**47.59**
ESC-T35-4.0	330	35	4.0	12.56	**38.06**	16.85	**51.07**
ESC-T35-5.0	330	36	5.0	15.70	**47.58**	20.63	**62.50**
ESC-T35-6.0	330	37	6.0	18.84	**57.09**	23.73	**71.91**
ESC-T40-3.5	400	43	3.5	13.74	**34.34**	21.98	**54.94**
ESC-T40-3.7	400	43	3.7	14.52	**36.31**	23.14	**57.86**
ESC-T40-4.0	400	43	4.0	15.70	**39.25**	24.85	**62.14**
ESC-T40-5.0	400	44	5.0	19.63	**49.06**	30.41	**76.03**
ESC-T40-6.0	400	45	6.0	23.55	**58.88**	35.77	**89.42**
ESC-T60-6.0	600	66	6.0	35.33	**58.88**	84.24	**140.40**
ESC-T60-8.0	600	68	8.0	47.10	**78.50**	108.59	**180.99**
ESC-T80-4.0	800	120	4.0	31.40	**39.25**	123.57	**154.47**
ESC-T80-6.0	800	122	6.0	47.10	**58.88**	179.30	**224.13**
ESC-T80-8.0	800	124	8.0	62.80	**78.50**	236.72	**295.90**

ESC LSB-SERIES



Section	Width (w) mm	Height (h) mm	Thickness (t) mm	Cross Sectional Area cm²/m	Weight Per Pile kg/m	Weight Per Wall kg/m²	Elastic Section Modulus cm³/m	Moment of Inertia cm⁴/m
ESC-LSB-600-6-74	315	66	6	114.4	28.26	**89.8**	**170**	533
ESC-LSB-600-6-62	340	64	6	106.1	28.26	**83.3**	**150**	508
ESC-LSB-600-6-50	366	59	6	98.6	28.26	**77.4**	**130**	458
ESC-LSB-750-6-74	407	104	6	110.4	35.33	**86.7**	**310**	1,252
ESC-LSB-750-6-62	448	98	6	100.3	35.33	**78.7**	**250**	1,139
ESC-LSB-750-6-50	488	89	6	92.1	35.33	**72.3**	**200**	978
ESC-LSB-900-6-74	506	138	6	106.6	42.39	**83.7**	**430**	2,189
ESC-LSB-900-6-62	560	130	6	96.4	42.39	**75.7**	**360**	1,991
ESC-LSB-900-6-50	617	112	6	87.5	42.39	**68.7**	**270**	1,667

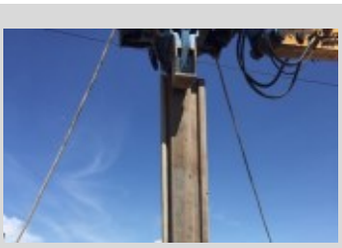
ESC Trench & ESC-LSB sheet products offer a highly efficient retention system for shallow excavations. ESC trench sheet can be used to support earth banks for the safety of construction workers, and are ideal for reinforcement of waterway banks and services trenches. The strength, speed and flexibility of light trench sheets makes it ideal for all forms of temporary and permanent works. The trench piles also offer good durability and ease of installation and extraction allows sustainable construction.

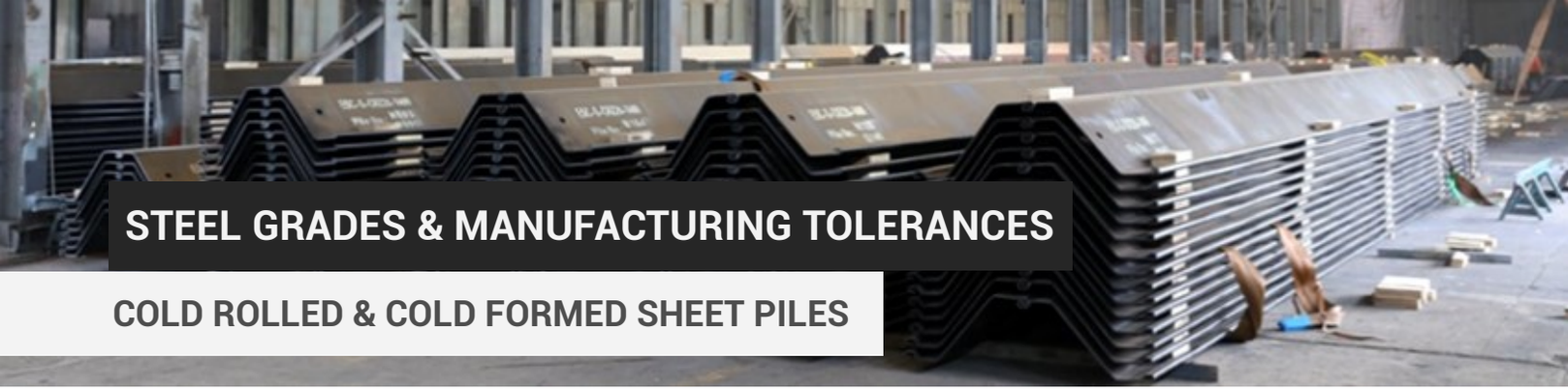
ORDER OPTIONS

Steel Grades	✓ Q235B, Q345B ✓ S235, S275JR, S355JR ✓ ASTM A572 Gr42, Gr50 ✓ Others available on request
Length	12.0m maximum Any project specific length can be produced
Delivery Options	✓ Lifting Hole ✓ By container or Break Bulk

ESC TRENCH PILE INSTALLATION VIDEO

Scan the QR Code below:





STEEL GRADES & MANUFACTURING TOLERANCES

COLD ROLLED & COLD FORMED SHEET PILES

STEEL GRADES

Classification		Mechanical Properties: Minimum Yield Point MPa t≤16	Minimum Yield Point MPa 16<t≤40	Ultimate Tensile Strength MPa	Elongation % (min) 3≤t≤40	Impact Strength (Charpy)	Chemical Composition % (max): C	Si	Mn	P	S
BS EN 10025-2: 2004	**S275JR**	**275**	**265**	410-560	23	27J at 20˚C	0.21	-	1.50	0.035	0.035
	S275J2	**275**	**265**	410-560	21	27J at -20˚C	0.18	-	1.50	0.025	0.025
	S355JR	**355**	**345**	470-630	22	27J at 20˚C	0.24	0.55	1.60	0.035	0.035
BS EN 102481: 1998	**S390GP**	**390**	**390**	≥ 490	20	-	0.24	0.55	1.60	0.04	0.040
	S430GP	**430**	**430**	≥510	19	-	0.24	0.55	1.60	0.04	0.040
GB/T 700:2006	**Q235B**	**235**	**225**	375-500	26	27J at 20˚C	0.20	0.35	1.40	0.045	0.045
	Q275B	**275**	**265**	410-540	22	27J at 20˚C	0.21	0.35	1.50	0.045	0.045
GB/T1591:2008	**Q345B**	**345**	**335**	470-630	20	34J at 20˚C	0.20	0.50	1.70	0.035	0.035
	Q390B	**390**	**370**	490-650	20	34J at 20˚C	0.20	0.50	1.70	0.030	0.030
	Q420B	**420**	**400**	540-680	19	34J at 20˚C	0.20	0.50	1.70	0.030	0.030
	MDB350	**350**	**350**	470-630	21	40J at 20˚C	0.20	0.50	1.50	0.025	0.020
ASTMA36-14	**A36**	**250**	**250**	400-550	23	-	0.26	0.40	-	0.040	0.050
ASTM A572-2013a	**A572 Gr.42**	**290**	**290**	≥415	20	-	0.21	0.40	1.35	0.040	0.050
	A572 Gr.50	**345**	**345**	≥450	18	-	0.23	0.40	1.30	0.040	0.050
	A572 Gr.60	**413**	**413**	≥517	16	-	0.26	0.40	1.35	0.040	0.050
ASTM A690-2013a	**A690**	**345**	**345**	>485	21	-	0.22	0.40	0.60-0.90	0.08-.015	0.040
JIS G3101-2010	**SS400**	**245**	**235**	400-510	17 (5<t<16), 21 (t<5 or t>16)	-	-	-	-	0.050	0.050
	SS490	**285**	**275**	490-610	15 (5<t<16), 19 (t<5 or t>16)	-	-	-	-	0.050	0.050
	SS540	**400**	**330**	≥540	13 (5<t<16), 16 (t<5 or t>16)	-	0.30	-	1.60	0.040	0.040
JIS A5523-2012	**SYW295**	**295**	**295**	≥490	17	43J at 0˚C	0.18	0.55	1.50	0.040	0.040
	SYW390	**390**	**390**	≥ 540	15	43J at 0˚C	0.18	0.55	1.50	0.040	0.040
MS 2025-1:2006	**S235JR**	**235**	**225**	360-510	26	-	0.17	-	1.40	0.035	0.035
	S275JR	**275**	**265**	410-560	23	-	0.21	-	1.50	0.035	0.035
	S355JO	**355**	**345**	470-630	22	-	0.20	0.55	1.60	0.030	0.030

MANUFACTURING TOLERANCES TO BS EN 10249

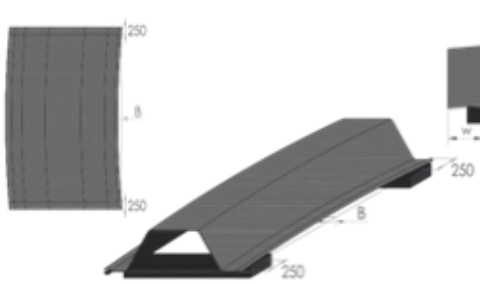
Component	Tolerance
Mass	± 5%
Length	± 50mm
Height (≤ 200mm)	± 4.0mm
Height (> 200mm & ≤ 300mm)	± 6.0mm
Height (> 300mm & ≤ 400mm)	± 8.0mm
Height (> 400mm)	± 10.0mm
Width of Single Pile	± 2% of width
Width of Double Z or Wide U	± 3% of width
Squareness of Ends	2% of width

Nominal Thickness	Tolerance
5mm	± 0.29mm
6mm	± 0.31mm
8mm	± 0.35mm
9mm	± 0.40mm
10mm	± 0.40mm
12mm	± 0.43mm
13mm	± 0.46mm
15mm	± 0.46mm

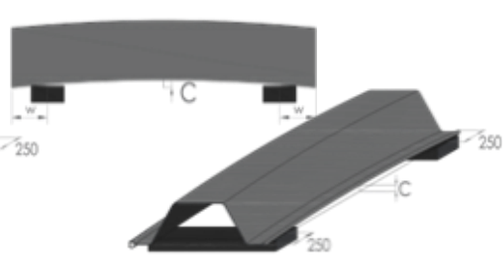
SHEET PILE MARKING

ESC is able to apply adhesive stickers to its products to provide useful information such as destination, order number, project identifier, client name and others. To enable good traceability, material heat number & pile specification is included as standard.

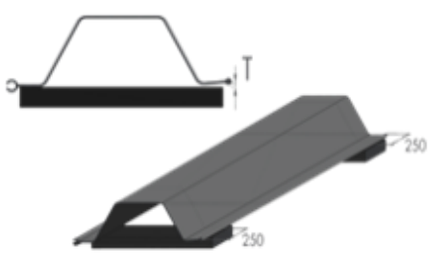
Bending B
±0.2% of the length



Curving C
±0.2% of the length



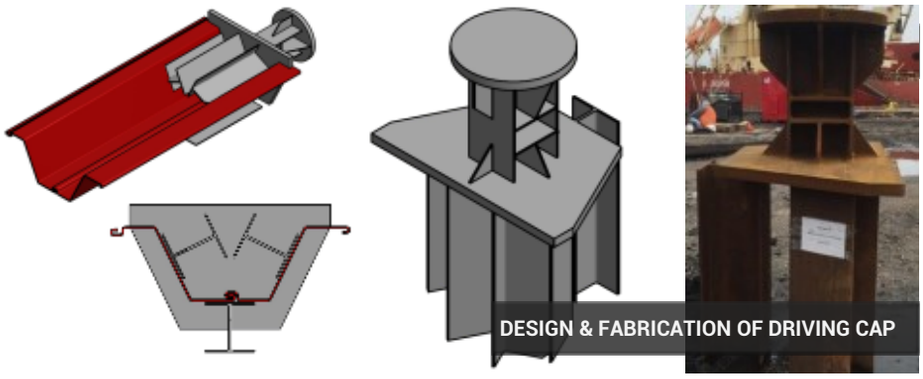
Twisting T
±0.2% of the length but no more than 100mm

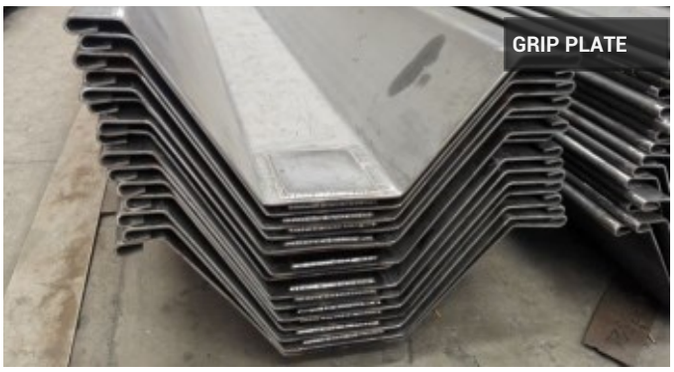


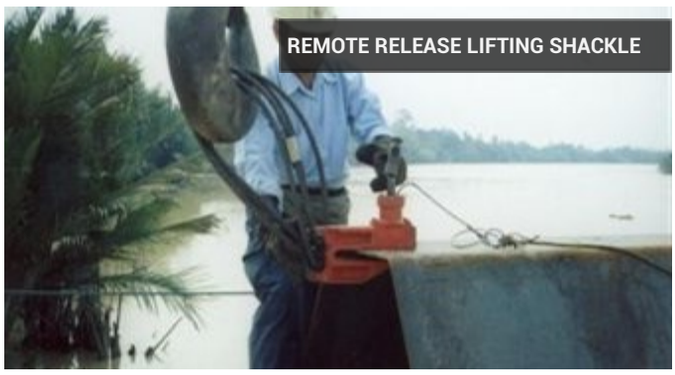
ESC SHEET PILING ACCESSORIES

OPTIONS

ESC is capable of supplying a wide range of accessories for Sheet Piles. All components that are welded are fabricated as per AWS D1.1 and other standards upon request by client. Featured are some of the typical components that can supplement ESC's sheet piling range.







ESC VINYL SHEET PILES

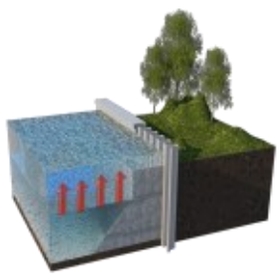
INTRODUCTION

ESC Vinyl Sheet Piles also known as PVC Sheet Piles are a modern alternative for your project. They offer a lower cost than steel, wood or concrete alternatives. The ESC Vinyl Sheet Pile is a strong, light-weight, UV and impact resistant product. The product is inert does not rust, corrode or crack. The ESC Vinyl Sheet Pile retains its structural integrity for decades.

APPLICATIONS

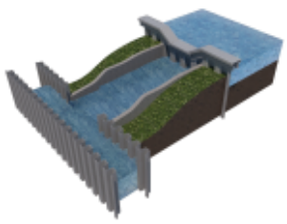
FLOOD CONTROL

ESC Vinyl PVC Sheet Piles can be utilized for flood protection structures such as Flood Walls or Levees, Stabilization of Dams, Protection of Piping.



WATER CONTROL

ESC Vinyl PVC Sheet Piles can be utilized for water control structures that function by altering the flow of water in a pond, drainage channel or stream.

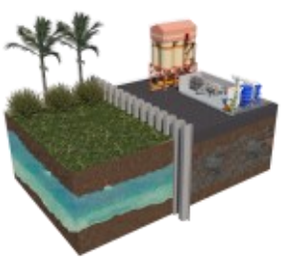


MARINE STRUCTURES

ESC Vinyl PVC Sheet Piles provide an excellent option for a long lasting seawall due to their superior corrosion resistance, aesthetic finish and lightweight profile for easy handling and installation.

CONTAINMENT & CUTOFF SYSTEMS

ESC Vinyl Sheet Piles are frequently the optimal solution for fluid containment projects as they are made of an inert material that can exhibit superior chemical resistance and water corrosion resistance. The interlocks of the sheet pile can be coextruded with a sealing membrane that further improves cut-off performance. Alternatively, a hydrophilic sealant can be applied for swelling in contact with water.



ADVANTAGES

- ✓ **50+ year design life** - Due to its superior corrosion resistance, ESC Vinyl Sheet Piles can be installed with confidence in their structural integrity and appearance even after 50 years
- ✓ **Cost Efficiency** - both from installation and long term cost savings due to superior corrosion resistance and lower price per unit metre material
- ✓ **UV Resistance** - The PVC material is engineered with special compounds for resistance to harmful ultraviolet rays
- ✓ **No toxic coatings** - No coatings are required, which may be detrimental to the environment
- ✓ **Not Affected by Marine Borers** - Small mollusks or crustaceans in the ocean can cause devastating effects over a period of time to traditional timber piling. Vinyl Sheet Piling offers an attractive alternative that is unaffected by these organisms.
- ✓ **Easy Installation** - Compared to steel sheet piles, vinyl sheet piles can be up to 40 times lighter per square meter making it much easier to handle. Driving can also be completed under certain conditions by pressing down with an excavator or a impact vibrohammer.

INSTALLATION PROCEDURES

The use of ESC Vinyl Sheet Piles in any application should be done in compliance with the engineering plans, drawings and documentation. These should be developed and submitted for the particular project by a structural engineer or designer familiar with the materials and local site conditions. The application and installation of the product should precisely follow these design specifications. ESC Vinyl Sheet Pile is designed to be driven into the ground similar to steel sheet piles. Different methods and equipment are used for driving the product, the following are the most common driving methods used.

VIBRO HAMMER

A vibro hammer is used to lift the sheets and vibrate the sheets into the soil. Much lighter weight vibro hammers can be used for vinyl sheet piles than would be used for steel sheet piling.

PLATE COMPACTOR

In areas where the soil is moderately stiff or less, a plate compactor on a backhoe can drive ESC Vinyl Sheet Pile smoothly and effectively.

COMPRESSION DRIVING

Where the soils are very soft, compression driving works well to install the ESC Vinyl Sheet Pile. The bucket of a backhoe is used to exert downward pressure in the sheets, pressing them smoothly into the soil. A steel adapter is sometimes used for protecting the top end of the sheet pile.

ESC VINYL SHEET PILES

SPECIFICATION

TEST STANDARDS

Density	1400-1480kg/m^3
Flexural Strength	66MPa
Shore Durometer	75 Shore D
Modulus of Elasticity	2.62GPa
Tensile Strength	41-44MPa
Izod Impact Strength	9kJ/m^2
Vicat Softening Temperature	>77˚C
Other Options	Co-extrusion for UV protection.
Options	Lifting holes and Z piles delivered in pairs or singles

ACCESSORIES

- ✓ Sheet Pile Cap
- ✓ Ground Anchors
- ✓ Tie Rods
- ✓ Waling Channels/Beams
- ✓ Bumper Fender
- ✓ Installation Mandrel
- ✓ Driving Cap
- ✓ Driving Guide

SECTION PROFILES

ESC-VU25 & ESC-VU40

ESC-VU695-8 , ESC-VU705-7.5 & ESC VU740-6.0

ESC-VZ437-10.5

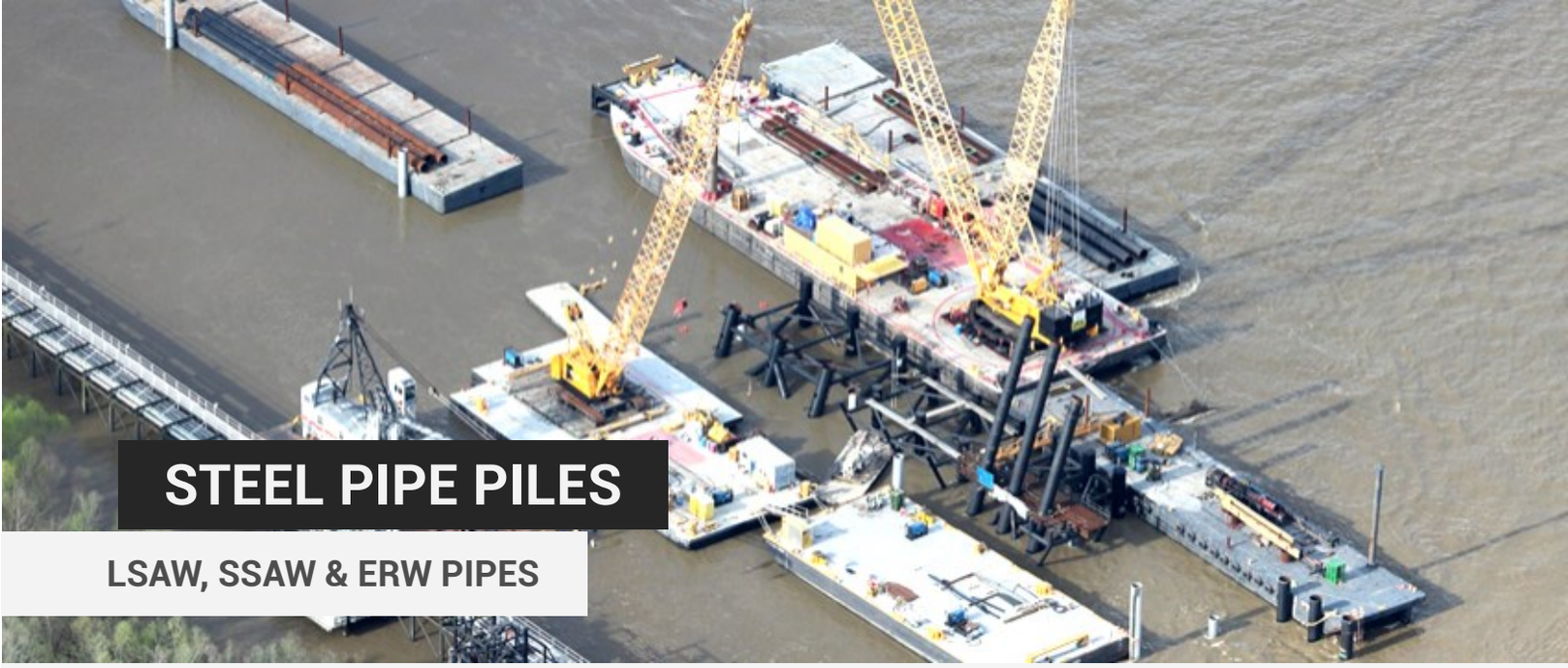
ESC-VZ565

ESC-VZ580

SECTION PROPERTIES

Section	Width (w) mm	Height (h) mm	Thickness (t) mm	Weight Per Pile kg/m	Weight Per Wall kg/m²	Elastic Section Modulus cm³/m	Moment of Inertia cm^4/m	Allowable Bending Moment kNm/m	Maximum Bending Moment kNm/m
ESC-VU25	500	160	6	7.2	14.4	502	4,013	10.3	20.6
ESC-VU40	600	230	7.5	11.1	18.5	920	10,574	18.8	37.6
ESC-VZ437-10.5	437	254	10.5	11.6	26.54	1,480	19,300	32.6	65.1
ESC-VU610-9.0	610	230	9.0	13.2	21.64	1,086	12,478	23.9	47.8
ESC-VU695-8	695	180	8.0	14.57	20.96	717	6,961	14.39	35.8
ESC-VU705-7.5	705	180	7.5	12.40	17.64	682	6,420	13.65	34.1
ESC-VU740-6	740	180	6.0	11.08	14.97	548	5,465	10.95	27.5
ESC-VZ565-9.0	565	245	9.0	15.3	27.08	1,042	12,768	22.9	45.8
ESC-VZ580-7.0	290	240	7.0	6.1	21.03	1,228	15,429	27.0	54.0
ESC-VZ580-9.0	290	240	9.0	6.5	22.41	1,462	18,739	32.2	64.3
ESC-VZ580-11.0	290	240	11.0	7.9	27.24	1,711	21,851	37.6	75.3

PROJECT & PRODUCT PHOTOS



STEEL PIPE PILES

LSAW, SSAW & ERW PIPES

HIGH STRENGTH, ECONOMICAL AND EXCELLENT QUALITY STEEL PIPE PILES DELIVERED TO YOUR EXPECTATIONS

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 directly to project sites halfway around the world.

PRODUCTION STANDARDS

Standard	Description
API 5L	Specification of Line Pipe
ASTM 252	Standard Specification for Welded and Seamless Steel Pipe Piles
BS EN 10219	Cold Formed Welded Structural Hollow Sections of non-alloy 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

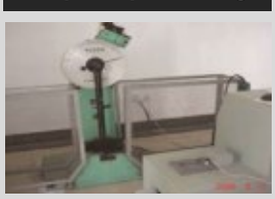
Quality Assurance Guaranteed

Coupon Tensile Testing

Chemical Analysis

Ultrasonic Testing

Coupon Impact Testing



Pressure Testing

PIPE AVAILABLE SIZES & MASS PER UNIT LENGTH (kg/m) ESC LSAW PIPE

LSAW PIPE THICKNESS (mm)

OUTER DIAMETER (mm)	6.35	7.52	9.52	11.13	12.70	14.27	15.87	17.48	19.05	22.22	25.40	31.75	34.9	38.1	44.5	50.80	60	70	80	90	100
406.4			93.2	108.5	123.3	138.0	152.8	167.7	182.0	210.5	238.7	293.4	319.7	346.1	397.2	445.5					
457.2			105.1	122.4	139.2	155.9	172.7	189.6	205.8	238.4	270.5	333.1	363.5	393.8	452.9	509.1					
508.0			117.0	136.4	155.1	173.8	192.6	211.5	229.7	266.2	302.3	372.9	407.2	441.5	508.7	572.8	662.9				
609.6	94.5	111.7	140.9	164.3	186.9	209.5	232.4	255.3	277.4	321.9	365.9	452.5	494.6	537.0	620.2	700.1	813.2	931.5			
762.0	118.3	139.9	176.7	206.1	234.7	263.1	292.0	320.9	349.0	405.4	461.4	571.8	625.8	680.2	787.4	891.0	1,039	1,195			
914.4	142.2	168.2	212.4	247.9	282.4	316.8	351.7	386.6	420.6	488.9	556.9	691.1	757.0	823.4	954.7	1,082	1,264	1,458	1,646		
1066.8	166.1	196.4	248.2	289.8	330.1	370.4	411.3	452.3	492.2	572.4	652.3	810.4	888.1	966.6	1,122	1,273	1,490	1,721	1,947	2,168	2,384
1219.2			284.0	331.6	377.9	424.0	471.0	518.0	563.8	655.9	747.8	929.8	1,019	1,110	1,289	1,464	1,715	1,984	2,248	2,506	2,760
1371.6			319.8	373.4	425.6	477.7	530.6	583.7	635.4	739.4	843.3	1,049	1,150	1,253	1,456	1,655	1,941	2,247	2,548	2,845	3,136
1524.0					473.3	531.3	590.2	649.4	707.0	822.9	938.7	1,168	1,282	1,396	1,624	1,846	2,166	2,510	2,849	3,183	3,512
1676.4					521.1	584.9	649.9	715.1	778.6	906.5	1,034	1,288	1,413	1,539	1,791	2,037	2,392	2,773	3,150	3,521	3,888
1829.0					568.9	638.6	709.6	780.9	850.3	990.1	1,130	1,407	1,544	1,683	1,958	2,228	2,618	3,037	3,451	3,860	4,264
1981.2					616.5	692.2	769.2	846.5	921.8	1,073	1,225	1,526	1,675	1,826	2,125	2,418	2,843	3,299	3,751	4,198	4,639
2134.0					664.4	746.0	829.0	912.4	993.6	1,157	1,321	1,646	1,807	1,969	2,293	2,610	3,069	3,563	4,052	4,537	5,016
2280.0						797.4	886.1	975.3	1,062	1,237	1,412	1,760	1,932	2,106	2,453	2,793	3,285	3,815	4,340	4,861	5,376
2438.4						853.1	948.1	1,044	1,137	1,324	1,512	1,884	2,069	2,255	2,627	2,991	3,519	4,089	4,653	5,212	5,767
2590.8						906.7	1,008	1,109	1,208	1,408	1,607	2,004	2,200	2,399	2,794	3,182	3,745	4,352	4,954	5,551	6,143
2743.2						960.4	1,067	1,175	1,280	1,491	1,702	2,123	2,331	2,542	2,962	3,373	3,970	4,615	5,254	5,889	6,519
2895.6							1,127	1,241	1,351	1,575	1,798	2,242	2,462	2,685	3,129	3,564	4,196	4,878	5,555	6,227	6,894
3048.0							1,187	1,306	1,423	1,658	1,893	2,362	2,593	2,828	3,296	3,755	4,421	5,141	5,856	6,565	7,270
3200.0								1,372	1,494	1,741	1,989	2,481	2,724	2,971	3,463	3,945	4,646	5,403	6,156	6,903	7,645
3353.0								1,438	1,566	1,825	2,084	2,601	2,856	3,115	3,631	4,137	4,873	5,667	6,457	7,242	8,022
3505.0									1,638	1,908	2,180	2,720	2,987	3,258	3,798	4,327	5,098	5,930	6,757	7,580	8,397
3657.6									1,709	1,992	2,275	2,839	3,118	3,401	3,965	4,519	5,323	6,193	7,058	7,918	8,774
3810.0										2,076	2,371	2,958	3,249	3,544	4,132	4,710	5,549	6,456	7,359	8,257	9,149
3962.0										2,159	2,466	3,077	3,380	3,687	4,299	4,900	5,774	6,719	7,659	8,594	9,524
4115.0										2,243	2,562	3,197	3,512	3,831	4,467	5,092	6,000	6,983	7,961	8,934	9,902
4267.0										2,326	2,657	3,316	3,643	3,973	4,634	5,282	6,225	7,245	8,261	9,271	10,276

PIPE AVAILABLE SIZES & MASS PER UNIT LENGTH (kg/m) ESC SSAW PIPE

SSAW PIPE THICKNESS (mm)

OUTER DIAMETER (mm)	5.16	5.56	6.35	7.92	9.53	12.70	15.88	19.05	22.20	25.40
355.6	44.56	48.01	54.69	67.93	81.28	107.38				
406.4		34.99	62.63	77.86	93.21	125.2				
457.2		61.95	70.6	87.78	105.13	139.2	172.76			
508.0		68.91	78.54	97.71	117.07	155.1	192.63			
609.6		82.84	94.45	117.57	140.04	196.92	232.4	277.4		
762.0		103.76	118.32	147.35	176.73	234.64	292.05	348.97	405.42	461.32
914.4		124.66	142.17	177.13	212.51	282.37	351.71	420.57	488.94	556.77
1,066.8		145.56	166.04	206.9	248.3	230.09	411.37	492.14	572.46	652.22
1,219.2			189.9	236.68	284.11	377.81	471.01	563.74	655.98	747.29
1,371.6					319.9	425.54	530.67	635.31	739.5	843.11
1,524.0					355.68	473.26	590.33	706.9	823.02	938.56
1,828.8						568.71	709.63	850.07	990.06	1129.45
2,133.6						664.15	828.94	993.24	1157.11	1320.34
2,438.4							948.24	1136.41	1324.15	1511.24
2,743.2							1067.56	1279.58	1491.19	1702.13
3,048.0							1186.86	1425.73	1658.23	1893.02

PIPE AVAILABLE SIZES & MASS PER UNIT LENGTH (kg/m) ESC ERW PIPE

ERW PIPE THICKNESS (mm)

OUTER DIAMETER (mm)	2.1	2.5	3.2	3.73	3.91	4.19	4.55	4.78	4.85	5.08	5.54	7.14	8.08	8.58	9.53	10.97	12.7	15.1	22
21.3	0.99	1.16	1.43	1.62															
26.7	1.27	1.49	1.85	2.11	2.20														
33.4	1.62	1.91	2.38	2.73	2.84	3.02	3.24												
42.2	2.08	2.45	3.08	3.54	3.69	3.93	4.22	4.41	4.47	4.65									
48.3	2.39	2.82	3.56	4.10	4.28	4.56	4.91	5.13	5.20	5.41									
60.3	3.01	3.56	4.51	5.20	5.44	5.80	6.26	6.54	6.63	6.92	7.48	9.36							
73		4.35	5.51	6.37	6.66	7.11	7.68	8.04	8.15	8.51	9.22	11.60							
89.9		5.39	6.84	7.93	8.29	8.86	9.58	10.03	10.17	10.63	11.53	14.57							
101.6		6.11	7.77	9.00	9.42	10.07	10.89	11.41	11.57	12.09	13.12	16.63	18.64						
114.3		6.89	8.77	10.17	10.64	11.38	12.32	12.91	13.09	13.68	14.86	18.87	21.17	22.37					
141.3		8.56	10.90	12.65	13.25	14.17	15.34	16.09	16.32	17.07	18.55	23.62	26.55	28.08	30.97				
168.3		10.22	13.03	15.14	15.85	16.96	18.37	19.28	19.55	20.45	22.24	28.38	31.93	33.80	37.31	42.56			
219.1			17.04	19.81	20.75	22.21	24.07	25.26	25.63	26.81	29.18	37.32	42.05	44.55	49.25	56.31	64.64		
273							30.12	31.62	32.07	33.57	36.54	46.81	52.79	55.95	61.92	70.89	81.53	96.04	
323.9										39.94	43.50	55.78	62.93	66.72	73.88	84.66	97.47	114.99	
355.6						36.31	39.39	41.36	41.95	43.91	47.83	61.36	69.25	73.43	81.33	93.24	107.40	126.80	181.00
406.4						41.56	45.09	47.34	48.03	50.28	54.77	70.30	79.37	84.18	93.27	106.98	123.31	145.72	208.56
457						46.79	50.77	53.31	54.08	56.62	61.68	79.21	89.45	94.88	105.17	120.67	139.16	164.56	236.01
500								58.38	59.22	62.00	67.56	86.78	98.02	103.98	115.27	132.30	152.62	180.57	259.34
559								65.33	66.28	69.40	75.62	97.17	109.78	116.47	129.14	148.26	171.10	202.54	291.35
610											82.58	106.15	119.94	127.26	141.12	162.06	187.08	221.53	319.02

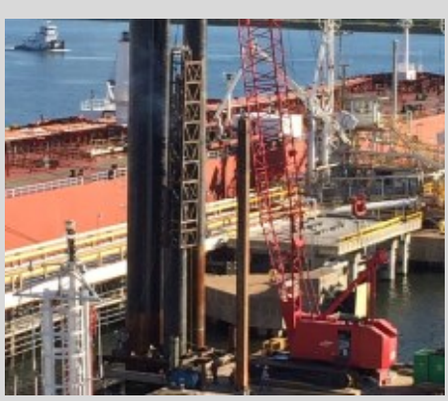
PRODUCT TOLERANCES

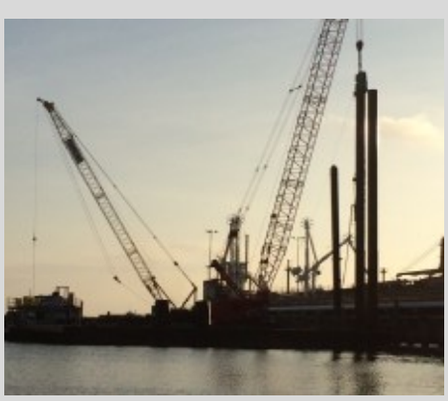
Note that for diameters above 1,422mm, the tolerances are to be agreed between the client and ESC as this size is excluded from the presented standards.

Standard	EN 10219-2	API 5L	ISO 3183	AS 1163	ASTM A139	ASTM A252
Outside Diameter D	±1% or ±10.0	t≤1422, ±0.5% or ≤4.0	For 168.3<D≤610, ± 0.75% For 610<D≤1422, ± 0.5% but ≤4.0	±1%, min ±0.5 max ±10.0	N/A	±1%
Wall Thickness t	±10% or ±2.0	<15.0, ±10% ≥15.0, ±1.5	For 5.0<t≤15.0 ±10% For >15.0 ±1.5	±10%, ±2mm if D>406.4mm	±12.5%	-12.50%
Straightness	0.2%L	0.2%L	0.2%L	0.2%L	N/A	0.2%L
Out-of-roundness	±2%	D/t ≤ 75, D < 1,422 ± 1.5%, ≤ 15.0	For D≤1422 & D/t≤75, ± 1.5%D but ≤15.0	±2% for D/t ≤ 100	±1% within 100mm of ends	±2%
Mass	±6%	+10%/-3.5%	+10%/-3.5% For Pipe Wt > 20t, +1.75%/-1.75%	-4%	+10%, -5%(t≤4.78) or -5.5% (t>4.78)	+15%/-5%
Length L	±200mm	±200mm	±500mm	-0,+5mm(L<6m), -0,+15mm(6.0m≤t≤10.0m), -0,(+5+1m/m)mm for >10m	±12.7mm	±25mm
Maximum Bead Weld Height	t≤14.2, 3.5 t>14.2, 4.8	t≤13.0, 3.5 t>13.0, 4.5	For t≤15.0, 1.5 For 15.0<t≤25.0, 10%t For t>25.0, 2.5	N/A	N/A	N/A

STEEL GRADES

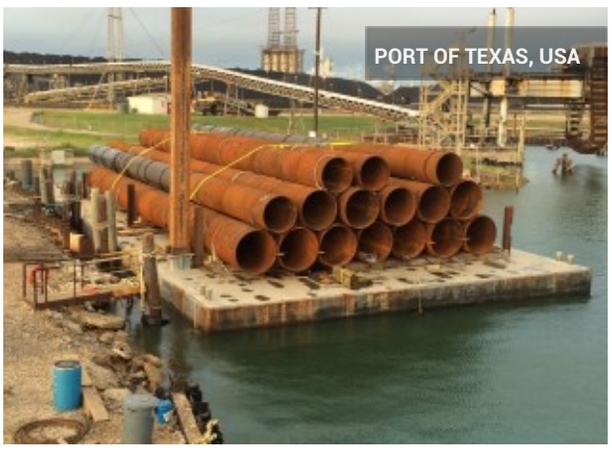
Classification		Mechanical Properties: Minimum Yield Point MPa t≤16	Minimum Yield Point MPa 16<t≤40	Ultimate Tensile Strength MPa	Elongation % (min) 3≤t≤40	Impact Strength (Charpy)	Chemical Composition % (max) C	Si	Mn	P	S
BS EN 10025-2: 2004	**S275JR**	**275**	**265**	410-560	23	27J at 20˚C	0.21	-	1.50	0.035	0.035
	S275J2	**275**	**265**	410-560	21	27J at -20˚C	0.18	-	1.50	0.025	0.025
	S355JR	**355**	**345**	470-630	22	27J at 20˚C	0.24	0.55	1.60	0.035	0.035
BS EN 102481: 1998	**S390GP**	**390**	**390**	≥ 490	20	-	0.24	0.55	1.60	0.04	0.040
	S430GP	**430**	**430**	≥510	19	-	0.24	0.55	1.60	0.04	0.040
GB/T 700:2006	**Q235B**	**235**	**225**	375-500	26	27J at 20˚C	0.20	0.35	1.40	0.045	0.045
	Q275B	**275**	**265**	410-540	22	27J at 20˚C	0.21	0.35	1.50	0.045	0.045
GB/T1591:2008	**Q345B**	**345**	**335**	470-630	20	34J at 20˚C	0.20	0.50	1.70	0.035	0.035
	Q390B	**390**	**370**	490-650	20	34J at 20˚C	0.20	0.50	1.70	0.030	0.030
	Q420B	**420**	**400**	540-680	19	34J at 20˚C	0.20	0.50	1.70	0.030	0.030
	MDB350	**350**	**350**	470-630	21	40J at 20˚C	0.20	0.50	1.50	0.025	0.020
ASTMA36-14	**A36**	**250**	**250**	400-550	23	-	0.26	0.40	-	0.040	0.050
ASTM A572-2013a	**A572Gr.42**	**290**	**290**	≥415	20	-	0.21	0.40	1.35	0.040	0.050
	A572Gr.50	**345**	**345**	≥450	18	-	0.23	0.40	1.30	0.040	0.050
	A572Gr.60	**413**	**413**	≥517	16	-	0.26	0.40	1.35	0.040	0.050
ASTM A690-2013a	**A690**	**345**	**345**	>485	21	-	0.22	0.40	0.60-0.90	0.08-.015	0.040
JIS G3101-2010	**SS400**	**245**	**235**	400-510	17 (5<t<16), 21 (t<5 or t>16)	-	-	-	-	0.050	0.050
	SS490	**285**	**275**	490-610	15 (5<t<16), 19 (t<5 or t>16)	-	-	-	-	0.050	0.050
	SS540	**400**	**330**	≥540	13 (5<t<16), 16 (t<5 or t>16)	-	0.30	-	1.60	0.040	0.040
API 5L / ISO 3183	**L245 / B**	**245**	**245**	415	23	-	0.26	-	1.20	0.030	0.030
	L290 / X42	**290**	**290**	415	23	-	0.26	-	1.30	0.030	0.030
	L320 / X46	**320**	**320**	435	22	-	0.26	-	1.40	0.030	0.030
	L360 / X52	**360**	**360**	460	21	-	0.26	-	1.40	0.030	0.030
	L390 / X56	**390**	**390**	490	19	-	0.26	-	1.40	0.030	0.030
	L 415 / X60	**415**	**415**	520	18	-	0.26	-	1.40	0.030	0.030
	L 450 / X65	**450**	**450**	535	18	-	0.26	-	1.45	0.030	0.030
	L 485 / X70	**485**	**485**	570	17	-	0.26	-	1.65	0.030	0.030





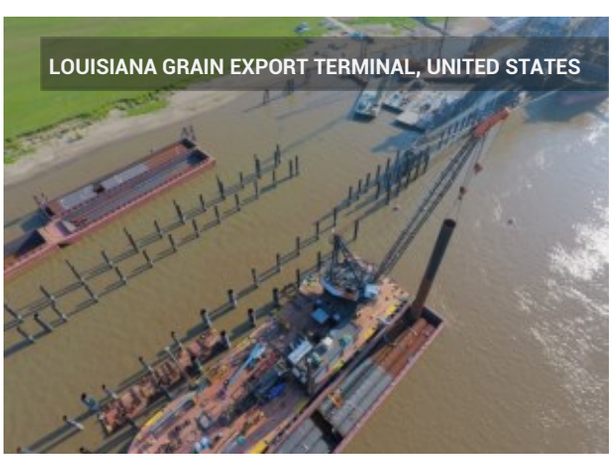
PROJECT REFERENCES

CARNIVAL CRUISE LINE TERMINAL, DOMINICAN REPUBLIC

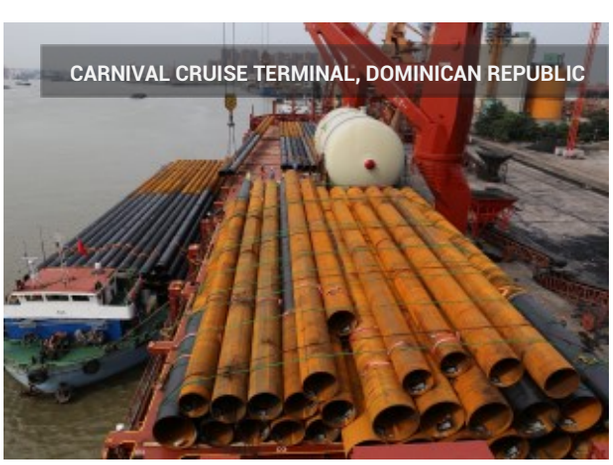

PORT OF TEXAS, USA

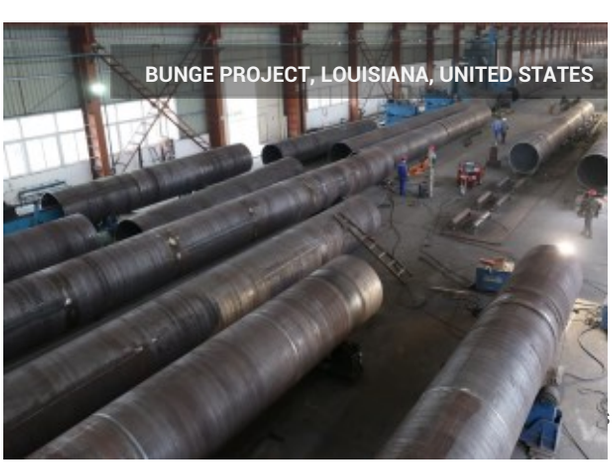
COLLINS WHARF, AUSTRALIA

CRUISE SHIP DOCK, DOMINICAN REPUBLIC


LOUISIANA GRAIN EXPORT TERMINAL, UNITED STATES

PORT OF BROWNSVILLE, UNITED STATES


CARNIVAL CRUISE TERMINAL, DOMINICAN REPUBLIC


BUNGE PROJECT, LOUISIANA, UNITED STATES

WATCH THE PILING INSTALLATION OF THIS PROJECT BY SCANNING THE QR CODE BELOW:

ESC PIPE COMBINATION WALL

PIPE-HRZ, PIPE-CRZ, PIPE-S, PIPE-PIPE SERIES

A Pipe Pile Combination Wall System consists of Steel Pipe Piles that withstand most of the loading and Infill Sheet Piles that transmit pressure loads to the Pipe Piles. Pipe Piles can range in sizing utilising LSAW, SSAW and ERW Pipes.

The Pipe Piles serve two purposes from a structural standpoint, the first being as a retaining member that resists horizontal hydrostatic and earth pressures. The second purpose is to act as a bearing pile, resisting vertical loads. Pipe Pile Combination Walls are generally utilised when a standard series of sheet piles do not have the strength to resist the required design loads. Integration with Tie Back Systems and other anchorages is simple and ESC can offer the full configuration as part of its piling solution package. Frequently infill sheet piles are not required to be the same length as the king Pipe piles – typically between 60 to 100% of the H Pile length.

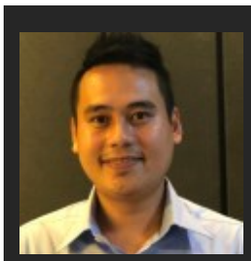
PIPE PILE SPLICING

ESC is proud to present it's ESC-PSP Pipe-Pile Splicing Ring, which allows Pipe Piles to be delivered and installed in shorter lengths and spliced as they are driven on site. This can save logistical costs and handling costs.

Frequently infill sheet piles are not required to be the same length as the king pipe piles – typically between 60 to 100% of the Pipe Pile length.

The ESC Advantage

- ✓ Design flexibility of LSAW, SSAW and ERW Pipes
- ✓ Comprehensive Range of Interlocks & Infill Sheet Piles
- ✓ Competitive Pricing
- ✓ Free of Charge Design
- ✓ Ability to supply small and large quantities
- ✓ Full Suite of Components: Tie Rods, Bollards and more



What Our Engineers Say

"At ESC, we have the in-house expertise, software and experience to design the most economic and robust Tubular Combination Wall System. "

1. The bottom of the upper Pipe Pile being spliced is pre-fitted and welded with the internal splicing ring that is welded on from the inside and outside.

2. The bottom Pipe Pile is also bevelled prior to driving. After driving, the top Pipe Pile is positioned over. The Splicing Ring contains a lead in which helps positioning.

3. The two Pipe Piles are then welded. The full weld preparation is present and the internal splicing ring also acts as a backing strip to enable full penetration single sided welding.

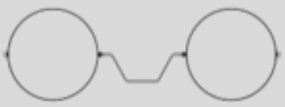
Combined Wall Profiles

PIPE-HRZ SERIES

PIPE-U (DOUBLE) SERIES

PIPE-U (TRIPLE) SERIES

PIPE-CRZ SERIES



PIPE-S SERIES

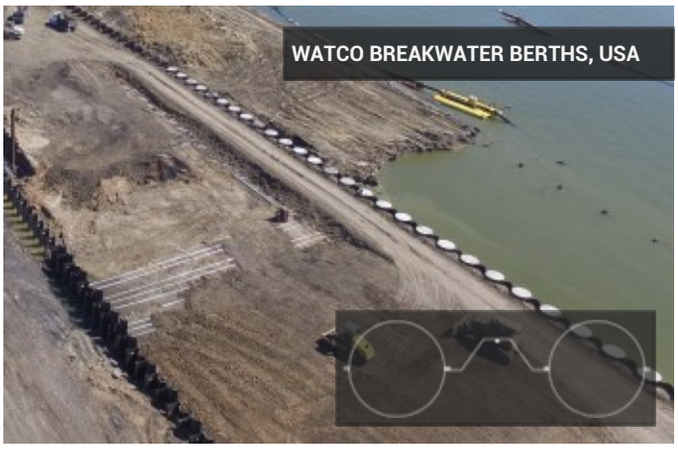
PIPE-PIPE SERIES

PIPE-PIPE INTERLOCKS

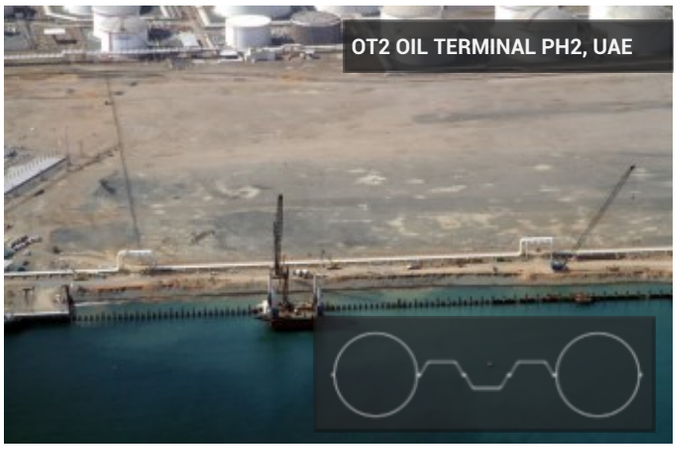
PROJECT REFERENCES

OT2 OIL TERMINAL PH1, UAE

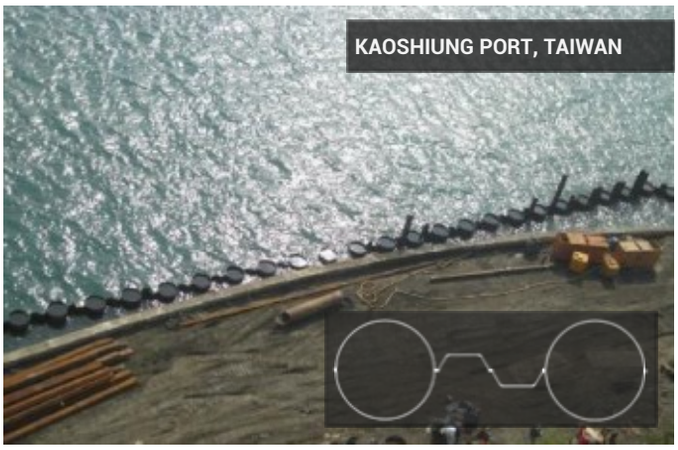
VICTORIA HARBOUR EXTENSION, AUSTRALIA



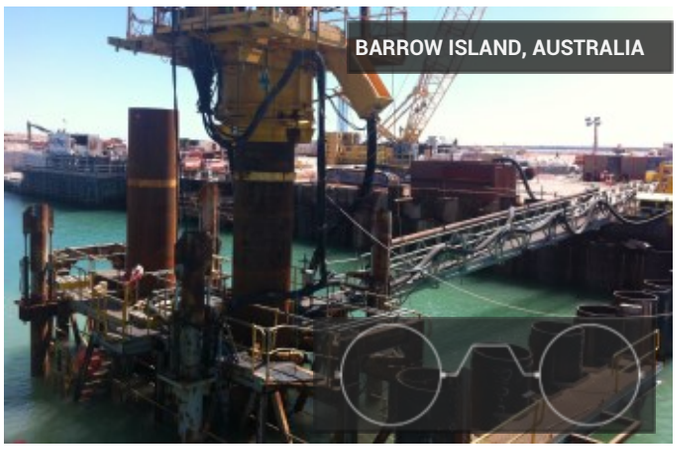
WATCO BREAKWATER BERTHS, USA



OT2 OIL TERMINAL PH2, UAE



KAOSHIUNG PORT, TAIWAN



BARROW ISLAND, AUSTRALIA

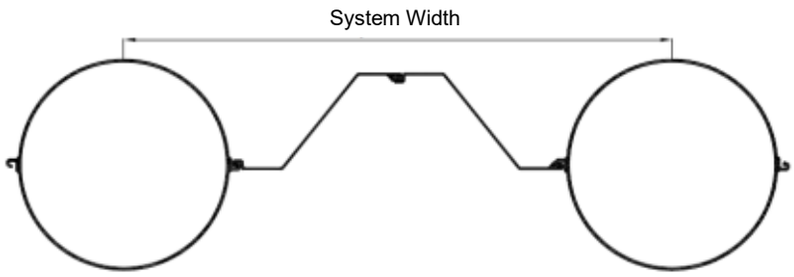
ESC has provided Pipe Pile Combined Wall Solutions to projects globally. Alongside the material fabrication and delivery, ESC has provided full geotechnical design in accordance with the client's' specifications and also conformance to international design standards. **Contained in this catalogue are only a few of the configurations possible with the Pipe Pile and Infill Sheet Pile profiles.** Please contact our engineering department at **engineering@escpile.com** to see if a more optimal design can be provided, free of charge. For the projects listed here, ESC has provided various components alongside the Pipe Pile and Sheet Pile materials. These include Tie Rod Systems, Corrosion Protection Coatings, Steel Bollards Anchorage .Points and Waling Beams.

ESC-HRZ INFILL SHEET PILES

Section	Width (w)	Height (h)	Thickness (t_f)	Thickness (t_w)	Cross Sectional Area	Weight Per Pile	Elastic Section Modulus	Moment of Inertia	Coating Area* (both sides per double pile)
	mm	mm	mm	mm	cm²	kg/m	cm³	cm^4	m²/m
ESC-HRZ14-1540	1540	345	9.5	9.5	101.8	159.2	2094.4	35,990	3.92
ESC-HRZ19-1400	1400	421	9.5	9.5	101.8	160.4	2632	55,412	3.94
ESC-HRZ26-1400	1400	460	12.2	12.2	131.2	206	3640	83,776	4.10
ESC-HRZ38-1400	1400	500	16	12.2	161.2	253	5320	132,972	4.36

*excludes internal section of interlock

COMBINED WALL PROPERTIES ESC PIPE-HRZ COMBI WALL



INTERLOCKING CLUTCH

Combination Section (Pipe Pile/Sheet Pile)	Properties of Pipe Pile: Outer Diameter	Pipe Thickness	Pipe (w/ clutch) Weight	Properties of Combined Wall: System Width	System Inertia	**Section Modulus**	Mass per Unit Area $Mass_{60\%}$*	$Mass_{100\%}$*	Cross Sectional Area	Coating Both Sides**
	mm	mm	kg/m	mm	cm^4/m	**cm^3/m**	kg/m^2	kg/m^2	cm^2/m	m^2/m
ESC-P762/HRZ14-1540	762	7.90	156.9	2,362	71,584	1,879	106.9	133.8	170.5	6.54
ESC-P762/HRZ19-1400	762	9.53	186.8	2,222	96,690	2,538	127.4	156.2	199.0	6.56
ESC-P914.4/HRZ26-1400	914.4	9.53	222.6	2,374	152,031	3,325	145.8	180.5	229.9	7.20
ESC-P914.4/HRZ38-1400	914.4	12.70	292.4	2,374	210,041	4,594	187.1	229.7	292.6	7.46
ESC-P1066.8/HRZ14-1540	1066.8	11.11	299.3	2,667	206,057	3,863	148.1	171.9	219.0	7.50
ESC-P1066.8/HRZ19-1400	1066.8	12.70	340.1	2,527	253,153	4,746	172.7	198.1	252.3	7.52
ESC-P1066.8/HRZ26-1400	1066.8	15.88	421.4	2,527	319,600	5,992	215.7	248.3	316.3	7.68
ESC-P1066.8/HRZ38-1400	1066.8	19.05	502.2	2,527	393,284	7,373	258.8	298.9	380.8	7.94
ESC-P1219.2/HRZ14-1540	1219.2	12.70	387.9	2,819	323,499	5,307	171.5	194.1	247.2	7.98
ESC-P1219.2/HRZ19-1400	1219.2	15.88	481.1	2,679	426,199	6,991	215.5	239.4	305.0	8.00
ESC-P1219.2/HRZ26-1400	1219.2	19.05	573.8	2,679	514,082	8,433	260.3	291.1	370.8	8.16
ESC-P1219.2/HRZ38-1400	1219.2	22.23	666.1	2,679	608,504	9,982	305.3	343.0	437.0	8.42
ESC-P1371.6/HRZ14-1540	1371.6	14.29	488.3	2,972	484,311	7,062	196.4	217.9	277.6	8.46
ESC-P1371.6/HRZ19-1400	1371.6	15.88	540.8	2,832	568,259	8,286	225.0	247.6	315.4	8.48
ESC-P1371.6/HRZ26-1400	1371.6	19.05	645.4	2,832	683,437	9,966	271.6	300.7	383.0	8.64
ESC-P1371.6/HRZ38-1400	1371.6	22.23	749.6	2,832	804,479	11,731	318.3	354.1	451.0	8.90
ESC-P1524/HRZ14-1540	1524	15.88	600.4	3,124	696,111	9,135	222.8	243.2	309.8	8.94
ESC-P1524/HRZ19-1400	1524	19.05	717.0	2,984	873,240	11,460	272.5	294.0	374.6	8.96
ESC-P1524/HRZ26-1400	1524	22.23	833.1	2,984	1,018,949	13,372	320.6	348.2	443.6	9.12
ESC-P1524/HRZ38-1400	1524	25.40	948.7	2,984	1,169,897	15,353	368.8	402.7	513.0	9.38
ESC-P1676.4/HRZ14-1540	1676.4	17.46	724.4	3,276	966,666	11,533	250.3	269.7	343.6	9.41
ESC-P1676.4/HRZ19-1400	1676.4	19.05	788.6	3,136	1,103,664	13,167	282.1	302.6	385.5	9.43
ESC-P1676.4/HRZ26-1400	1676.4	22.23	916.7	3,136	1,286,499	15,348	331.7	357.9	456.0	9.59
ESC-P1676.4/HRZ38-1400	1676.4	25.40	1044.2	3,136	1,473,958	17,585	381.3	413.6	526.9	9.85
ESC-P1828.8/HRZ14-1540	1828.8	19.05	860.2	3,429	1,303,860	14,259	278.7	297.3	378.7	9.89
ESC-P1828.8/HRZ19-1400	1828.8	20.64	930.3	3,289	1,473,824	16,118	312.1	331.6	422.5	9.91
ESC-P1828.8/HRZ26-1400	1828.8	22.23	1000.2	3,289	1,590,426	17,393	341.7	366.8	467.2	10.07
ESC-P1828.8/HRZ38-1400	1828.8	25.40	1139.7	3,289	1,819,618	19,900	392.7	423.5	539.4	10.33
ESC-P1981.2/HRZ26-1400	1981.2	22.23	1083.7	3,441	1,931,285	19,496	350.8	374.8	477.4	10.55
ESC-P1981.2/HRZ38-1400	1981.2	25.40	1235.1	3,441	2,207,507	22,285	403.0	432.4	550.9	10.81
ESC-P2133.6/HRZ26-1400	2133.6	22.23	1167.2	3,594	2,309,534	21,649	359.2	382.1	486.8	11.03
ESC-P2133.6/HRZ38-1400	2133.6	25.40	1330.6	3,594	2,638,145	24,730	412.5	440.7	561.4	11.29

**Mass$_{60\%}$ refers to a combined wall with a sheet pile length at 60% of the King Pipe Pile Length. Mass$_{100\%}$ refers to equal sheet pile and King Pipe Pile Lengths. Please refer to our 'Useful Equations' section for the formula to calculate other length combinations.*

***Coating Area excludes internal area of pipe and interlocks*

HOT ROLLED U INFILL SHEET PILES

TYPE…..-2

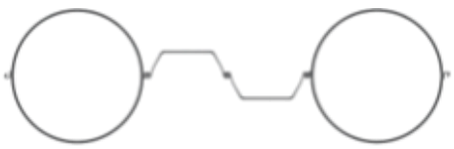
TYPE…..-3

Section	Width (w)	Height) (h)	Thickness (t)	Weight Per Pile	Elastic Section Modulus	Moment of Inertia	Coating Area (both sides per pile)
	mm	mm	mm	kg/m	cm³	cm⁴	m²/m
Type IIIw-2	1200	360	13.0	163.20	2,040	36,713	3.80
Type IVw-2	1200	420	18.0	212.40	3,040	63,837	3.96
Type IIIw-3	1800	360	13.0	244.80	2,470	53,922	5.70
Type IVw-3	1800	420	18.0	318.60	3,680	93,766	5.94

COMBINED WALL PROPERTIES ESC PIPE-S COMBI WALL

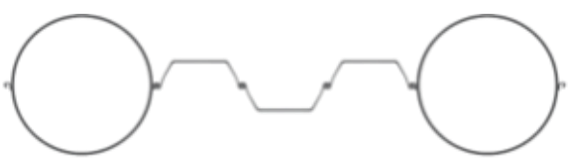
INTERLOCKING CLUTCH

PIPE-DOUBLE U



Properties of Pipe Pile				Type IIIw-2 Infill Sheet Pile					Type IVw-2 Infill Sheet Pile				
Pipe OD	Pipe t	Pipe (w/ clutch) Mass	System Width w	Coating Both Sides	System Inertia	Section Modulus	$Mass_{60\%}$*	$Mass_{100\%}$*	Coating Both Sides**	System Inertia	Section Modulus	$Mass_{60\%}$	$Mass_{100\%}$
mm	mm	kg/m	mm	m^2/m	cm^4/m	cm^3/m	kg/m^2	kg/m^2	m^2/m	cm^4/m	cm^3/m	kg/m^2	kg/m^2
762.0	**9.52**	198.7	2,025	6.19	196,323	2,545	107.2	178.7	6.35	223,447	2,896	121.8	203.0
762.0	**12.70**	256.7	2,025	6.19	246,883	3,200	124.4	207.4	6.35	274,007	3,551	139.0	231.7
914.4	**9.52**	234.5	2,177	6.67	314,034	3,155	109.6	182.6	6.83	341,158	3,427	123.1	205.2
914.4	**11.13**	269.5	2,177	6.67	359,172	3,608	119.2	198.7	6.83	386,296	3,880	132.8	221.3
914.4	**12.70**	304.4	2,177	6.67	402,719	4,045	128.9	214.8	6.83	429,843	4,318	142.4	237.3
1066.8	**12.70**	352.1	2,330	7.15	621,224	4,999	132.7	221.2	7.31	648,348	5,217	145.4	242.3
1066.8	**15.87**	433.4	2,330	7.15	760,541	6,120	153.6	256.1	7.31	787,665	6,338	166.3	277.2
1219.2	**15.87**	493.0	2,482	7.63	1,123,102	7,422	158.6	264.4	7.79	1,150,226	7,602	170.5	284.2
1219.2	**19.05**	585.8	2,482	7.63	1,330,523	8,793	181.0	301.7	7.79	1,357,647	8,972	192.9	321.6
1371.6	**15.87**	552.7	2,635	8.11	1,590,169	8,784	162.7	271.2	8.27	1,617,293	6,035	117.5	195.8
1371.6	**19.05**	657.3	2,635	8.11	1,888,413	10,432	186.5	310.8	8.27	1,915,537	7,148	133.5	222.6
1524.0	**15.87**	612.4	2,787	8.59	2,174,978	10,223	166.7	277.8	8.75	2,202,102	7,118	121.9	203.2
1524.0	**19.05**	728.9	2,787	8.59	2,587,306	12,161	191.7	319.5	8.75	2,614,430	8,451	139.1	231.8
1676.4	**17.48**	736.3	2,939	9.07	3,171,204	12,849	183.3	305.5	9.23	3,198,328	9,058	135.1	225.2
1676.4	**19.05**	800.5	2,939	9.07	3,443,091	13,951	196.4	327.3	9.23	3,470,215	9,828	144.3	240.5
1828.8	**20.65**	942.1	3,092	9.55	4,831,473	17,062	214.2	356.9	9.71	4,858,597	12,173	158.7	264.5
1828.8	**25.40**	1151.5	3,092	9.55	5,888,358	20,794	254.7	424.5	9.71	5,915,482	14,821	187.5	312.5
1981.2	**22.22**	1095.6	3,244	10.02	6,597,705	20,498	232.5	387.4	10.18	6,624,829	14,805	173.7	289.6
1981.2	**25.40**	1247.0	3,244	10.02	7,500,469	23,303	260.4	434.0	10.18	7,527,593	16,822	193.8	323.1
2133.6	**22.22**	1179.1	3,397	10.50	8,250,945	22,737	236.8	394.6	10.66	8,278,069	16,618	178.8	298.0

PIPE-TRIPLE U

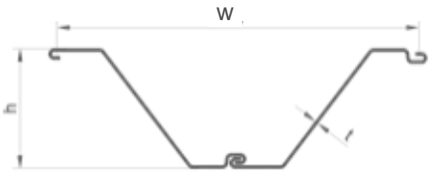


Properties of Pipe Pile				Type IIIw-3 Infill Sheet Pile					Type IVw-3 Infill Sheet Pile				
Pipe OD	Pipe t	Pipe (w/ clutch) Mass	System Width w	Coating Both Sides	System Inertia	Section Modulus	$Mass_{60\%}$*	$Mass_{100\%}$*	Coating Both Sides**	System Inertia	Section Modulus	$Mass_{60\%}$	$Mass_{100\%}$
mm	mm	kg/m	mm	m^2/m	cm^4/m	cm^3/m	kg/m^2	kg/m^2	m^2/m	cm^4/m	cm^3/m	kg/m^2	kg/m^2
762.0	**9.52**	198.7	2,625	8.09	213,531	2,135	101.4	169.0	8.33	253,375	2,533	118.2	197.1
762.0	**12.70**	256.7	2,625	8.09	264,091	2,641	114.6	191.0	8.33	303,935	3,039	131.5	219.2
914.4	**9.52**	234.5	2,777	8.57	331,242	2,609	103.5	172.6	8.81	371,086	2,922	119.5	199.1
914.4	**11.13**	269.5	2,777	8.57	376,380	2,964	111.1	185.2	8.81	416,224	3,278	127.0	211.7
914.4	**12.70**	304.4	2,777	8.57	419,927	3,307	118.6	197.7	8.81	459,771	3,621	134.6	224.3
1066.8	**12.70**	352.1	2,930	9.05	638,432	4,085	122.2	203.7	9.29	678,276	4,340	137.4	228.9
1066.8	**15.87**	433.4	2,930	9.05	777,749	4,977	138.9	231.5	9.29	817,593	5,232	154.0	256.7
1219.2	**15.87**	493.0	3,082	9.53	1,140,310	6,069	143.6	239.4	9.77	1,180,154	6,281	158.0	263.3
1219.2	**19.05**	585.8	3,082	9.53	1,347,731	7,173	161.7	269.5	9.77	1,387,575	7,385	176.1	293.4
1371.6	**15.87**	552.7	3,235	10.01	1,607,377	4,058	82.8	138.1	10.25	1,647,221	3,142	68.4	114.0
1371.6	**19.05**	657.3	3,235	10.01	1,905,621	4,811	93.7	156.2	10.25	1,945,465	3,711	76.6	127.7
1524.0	**15.87**	612.4	3,387	10.49	2,192,186	4,853	86.8	144.6	10.73	2,232,030	3,757	71.7	119.4
1524.0	**19.05**	728.9	3,387	10.49	2,604,514	5,766	98.6	164.3	10.73	2,644,358	4,451	80.6	134.4
1676.4	**17.48**	736.3	3,539	10.97	3,188,412	6,256	96.8	161.4	11.21	3,228,256	4,846	79.6	132.7
1676.4	**19.05**	800.5	3,539	10.97	3,460,299	6,789	103.1	171.9	11.21	3,500,143	5,254	84.5	140.8
1828.8	**20.65**	942.1	3,692	11.45	4,848,681	8,508	114.3	190.4	11.69	4,888,525	6,600	93.4	155.6
1828.8	**25.40**	1151.5	3,692	11.45	5,905,566	10,362	134.4	224.0	11.69	5,945,410	8,026	108.9	181.5
1981.2	**22.22**	1095.6	3,844	11.92	6,614,913	10,458	126.0	209.9	12.16	6,654,757	8,140	102.8	171.4
1981.2	**25.40**	1247.0	3,844	11.92	7,517,677	11,885	140.2	233.6	12.16	7,557,521	9,244	113.8	189.7
2133.6	**22.22**	1179.1	3,997	12.40	8,268,153	11,855	130.7	217.8	12.64	8,307,997	9,265	106.9	178.2

**$Mass_{60\%}$ refers to a combined wall with a sheet pile length at 60% of the King Pipe Pile Length. $Mass_{100\%}$ refers to equal sheet pile and King Pipe Pile Lengths. Please refer to our 'Useful Equations' section for the formula to calculate other length combinations.*

***Coating Area excludes internal area of pipe and interlocks*

ESC-CRZ INFILL SHEET PILES



Section	Width (w)	Height (h)	Thickness (t)	Cross Sectional Area	Weight Per Pair	Elastic Section Modulus	Moment of Inertia	Coating Area (both side per double pile)
	mm	mm	mm	cm²	kg/m	cm³	cm⁴	m²/m
ESC-CRZ14-1540	1540	345	10.0	213.4	167.48	2,129	37,642	4.30
ESC-CRZ19-1400	1400	421	9.5	206.7	160.74	2,605	55,187	4.36
ESC-CRZ26-1400	1400	460	12.2	273.4	213.40	3,636	83,773	4.50
ESC-CRZ38-1400	1400	560	13.0	323.9	254.28	5,411	151,607	5.36
ESC-CRZ48-1400	1400	590	15.0	398.1	312.54	6,767	199,984	5.36

COMBINED WALL PROPERTIES ESC PIPE-CRZ COMBI WALL

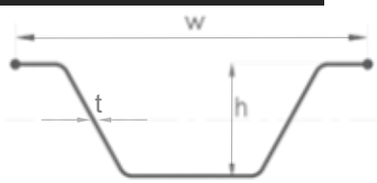
INTERLOCKING CLUTCH

Combination Section (Pipe Pile/Sheet Pile)	Properties of Pipe Pile: Outer Diameter	Pipe Thickness	Pipe (w/ clutch) Mass	Properties of Combined Wall: System Width	System Inertia	Section Modulus	Mass per Unit Area: $Mass_{60\%}$*	$Mass_{100\%}$*	Cross Sectional Area	Coating Both Sides of Wall
	mm	mm	kg/m	mm	cm⁴/m	cm³/m	kg/m²	kg/m²	cm²/m	m²/m
ESC609.6/ESC-CRZ14-1540	609.6	6.35	109.47	2243	41,198	**1,352**	94.96	130.18	163.91	6.94
ESC609.6/ESC-CRZ19-1400	609.6	9.52	155.89	2103	64,677	**2,122**	121.44	157.72	198.86	7.00
ESC609.6/ESC-CRZ26-1400	609.6	12.70	204.95	2108	90,096	**2,956**	159.70	207.04	261.81	7.16
ESC762/ESC-CRZ14-1540	762.0	7.92	162.29	2395	71,407	**1,874**	110.97	143.95	181.57	7.41
ESC762/ESC-CRZ19-1400	762.0	9.52	191.67	2255	95,122	**2,497**	129.10	162.93	205.63	7.47
ESC762/ESC-CRZ26-1400	762.0	12.70	252.68	2260	129,932	**3,410**	170.05	214.20	271.06	7.63
ESC914.4/ESC-CRZ14-1540	914.4	9.52	227.45	2547	123,525	**2,702**	129.91	160.92	203.29	7.89
ESC914.4/ESC-CRZ19-1400	914.4	11.13	262.93	2407	156,745	**3,428**	150.53	182.22	230.32	7.95
ESC914.4/ESC-CRZ26-1400	914.4	12.70	300.41	2412	186,322	**4,075**	179.10	220.45	279.14	8.11
ESC1066.8/ESC-CRZ14-1540	1066.8	11.13	304.76	2700	204,426	**3,833**	151.22	180.47	228.30	8.37
ESC1066.8/ESC-CRZ19-1400	1066.8	12.70	345.15	2560	249,785	**4,683**	173.68	203.49	257.52	8.43
ESC1066.8/ESC-CRZ26-1400	1066.8	15.87	429.31	2565	314,763	**5,901**	218.71	257.61	326.58	8.59
ESC1219.2/ESC-CRZ19-1400	1219.2	12.70	392.88	2712	343,325	**5,632**	181.52	209.65	265.47	8.91
ESC1219.2/ESC-CRZ26-1400	1219.2	15.87	488.96	2717	430,541	**7,063**	228.40	265.11	336.22	9.07
ESC1219.2/ESC-CRZ38-1400	1219.2	19.05	581.83	2717	531,842	**8,724**	271.60	314.34	398.93	9.93
ESC1219.2/ESC-CRZ48-1400	1219.2	19.05	596.33	2754	542,262	**8,895**	286.96	341.80	432.36	10.23
ESC1371.6/ESC-CRZ19-1400	1371.6	14.30	493.66	2865	509,504	**7,429**	207.05	233.68	296.17	9.39
ESC1371.6/ESC-CRZ26-1400	1371.6	15.87	548.60	2870	570,439	**8,318**	237.05	271.82	344.84	9.55
ESC1371.6/ESC-CRZ38-1400	1371.6	19.05	653.43	2870	698,010	**10,178**	282.13	322.59	409.53	10.41
ESC1371.6/ESC-CRZ48-1400	1371.6	19.05	667.93	2907	705,769	**10,291**	296.55	348.51	441.07	10.71
ESC1524/ESC-CRZ19-1400	1524.0	15.87	605.25	3017	726,932	**9,540**	233.57	258.86	328.32	9.87
ESC1524/ESC-CRZ26-1400	1524.0	19.05	725.03	3022	871,631	**11,439**	283.48	316.49	401.82	10.03
ESC1524/ESC-CRZ38-1400	1524.0	20.65	783.60	3022	962,069	**12,626**	310.97	349.40	443.75	10.89
ESC1524/ESC-CRZ48-1400	1524.0	20.65	798.10	3059	966,247	**12,680**	324.33	373.70	473.30	11.19
ESC1676.4/ESC-CRZ19-1400	1676.4	17.48	730.13	3169	1,006,304	**12,006**	261.75	285.82	362.73	10.35
ESC1676.4/ESC-CRZ26-1400	1676.4	19.05	796.63	3174	1,099,374	**13,116**	292.42	323.85	411.26	10.51
ESC1676.4/ESC-CRZ38-1400	1676.4	20.65	861.21	3174	1,207,525	**14,406**	320.49	357.07	453.59	11.37
ESC1676.4/ESC-CRZ48-1400	1676.4	20.65	875.71	3211	1,208,676	**14,420**	333.10	380.13	481.63	11.67
ESC1828.8/ESC-CRZ19-1400	1828.8	19.05	865.22	3322	1,351,626	**14,782**	290.41	313.37	397.90	10.83
ESC1828.8/ESC-CRZ26-1400	1828.8	20.65	938.82	3327	1,466,345	**16,036**	321.77	351.75	446.87	10.99
ESC1828.8/ESC-CRZ38-1400	1828.8	25.40	1147.65	3327	1,804,423	**19,733**	391.91	426.82	542.49	11.85
ESC1828.8/ESC-CRZ48-1400	1828.8	25.40	1162.15	3364	1,798,957	**19,674**	403.17	448.06	568.28	12.15
ESC1981.2/ESC-CRZ26-1400	1981.2	22.22	1091.48	3479	1,909,769	**19,279**	351.55	380.23	483.19	11.46
ESC1981.2/ESC-CRZ38-1400	1981.2	25.40	1243.12	3479	2,188,741	**22,095**	402.19	435.56	553.68	12.32
ESC1981.2/ESC-CRZ48-1400	1981.2	25.40	1257.62	3516	2,179,468	**22,001**	412.84	455.79	578.24	12.62
ESC2133.6/ESC-CRZ26-1400	2133.6	22.22	1174.99	3632	2,284,863	**21,418**	359.79	387.26	492.21	11.94
ESC2133.6/ESC-CRZ38-1400	2133.6	22.22	1174.99	3632	2,303,542	**21,593**	366.55	398.52	506.55	12.80
ESC2133.6/ESC-CRZ48-1400	2133.6	22.22	1189.49	3669	2,293,496	**21,499**	377.12	418.29	530.56	13.10

**$Mass_{60\%}$ refers to a combined wall with a sheet pile length at 60% of the King Pipe Pile Length. $Mass_{100\%}$ refers to equal sheet pile and King Pipe Pile Lengths. Please refer to our 'Useful Equations' section for the formula to calculate other length combinations.*

***Coating Area excludes internal area of pipe and interlocks*

ESC-S INFILL SHEET PILES



Section	Width (w)	Height (h)	Thickness (t)	Cross Sectional Area	Weight Per Pile	Elastic Section Modulus	Moment of Inertia	Coating Area (both sides per pile)
	mm	mm	mm	cm²/m	kg/m	cm³	cm^4	m²/m
ESC-S8	1440	414	7.75	151.8	119.2	1,900	965	3.79
ESC-S10	1440	416	9.75	187.8	147.4	2,360	1,187	3.79
ESC-S12	1440	423	11.75	227.6	178.7	2,950	1,466	3.82

COMBINED WALL PROPERTIES ESC PIPE-S COMBI WALL

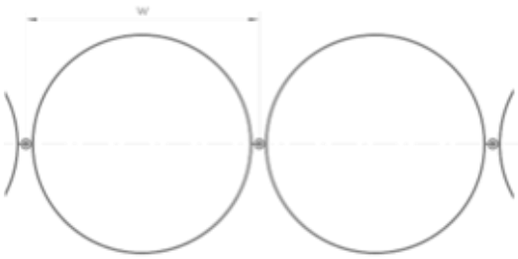
INTERLOCKING CLUTCH

Properties of Pipe Pile					ESC-S8 Infill Sheet Pile				ESC-S10 Infill Sheet Pile				ESC-S12 Infill Sheet Pile			
Pipe OD	Pipe t	Pipe Weight	System Width w	Coating Both Sides	System Inertia	Section Modulus	Mass 60%	Mass 100%	System Inertia	Section Modulus	Mass 60%	Mass 100%	System Inertia	Section Modulus	Mass 60%	Mass 100%
mm	mm	kg/m	mm	m^2/m	cm^4/m	cm^3/m	kg/m^2	kg/m^2	cm^4/m	cm^3/m	kg/m^2	kg/m^2	cm^4/m	cm^3/m	kg/m^2	kg/m^2
914	10.0	222.9	2,410	3.15	136,860	2,995	129	153	140,685	3,075	136	165	144,800	3,165	146	182
914	12.0	266.9	2,410	3.15	159,950	3,500	147	171	163,775	3,580	154	183	167,765	3,670	164	200
914	14.0	310.7	2,410	3.15	182,730	3,995	165	189	186,555	4,080	172	201	190,425	4,165	182	219
914	16.0	354.3	2,410	3.15	205,205	4,490	183	207	209,025	4,570	190	219	212,780	4,655	200	236
1016	12.0	297.1	2,520	3.47	205,565	4,045	153	176	209,235	4,115	160	187	212,835	4,190	169	204
1016	14.0	346.0	2,520	3.47	235,850	4,640	172	196	239,520	4,715	179	207	242,970	4,780	189	224
1016	16.0	394.6	2,520	3.47	265,770	5,230	192	215	269,440	5,300	199	226	272,735	5,365	208	243
1016	18.0	443.0	2,520	3.47	295,330	5,810	211	234	298,995	5,885	218	245	302,145	5,945	227	262
1219	14.0	416.0	2,720	4.11	368,605	6,045	185	206	372,000	6,100	191	217	374,575	6,145	200	233
1219	16.0	474.7	2,720	4.11	417,155	6,840	207	228	420,550	6,900	213	239	422,900	6,935	222	254
1219	18.0	533.1	2,720	4.11	465,215	7,630	228	250	468,610	7,685	234	260	470,740	7,720	243	275
1219	20.0	591.4	2,720	4.11	512,790	8,410	250	271	516,185	8,465	256	281	518,090	8,500	265	297
1422	16.0	554.8	2,920	4.75	611,460	8,600	220	240	614,620	8,640	226	250	615,970	8,660	234	264
1422	18.0	623.2	2,920	4.75	683,330	9,610	243	263	686,485	9,655	249	273	687,525	9,670	257	287
1422	20.0	691.5	2,920	4.75	754,575	10,610	267	287	757,735	10,655	273	296	758,465	10,670	281	311
1422	22.0	759.6	2,920	4.75	825,210	11,605	290	310	828,370	11,650	296	320	828,790	11,655	304	334
1524	16.0	595.0	3,020	5.07	725,855	9,525	226	245	728,910	9,565	231	254	729,735	9,575	239	268
1524	18.0	668.5	3,020	5.07	811,760	10,650	250	270	814,815	10,690	256	279	815,280	10,695	264	293
1524	20.0	741.8	3,020	5.07	896,980	11,770	274	294	900,030	11,810	280	303	900,140	11,810	288	317
1524	22.0	814.9	3,020	5.07	981,510	12,880	298	318	984,560	12,920	304	327	984,315	12,915	312	341
1626	18.0	713.8	3,130	5.39	953,070	11,720	256	275	956,025	11,755	262	284	955,905	11,760	269	297
1626	20.0	792.1	3,130	5.39	1,053,675	12,965	281	300	1,056,625	12,995	287	309	1,056,100	12,990	294	322
1626	22.0	870.3	3,130	5.39	1,153,520	14,185	306	325	1,156,470	14,225	312	334	1,155,540	14,210	319	347
1626	24.0	948.2	3,130	5.39	1,252,610	15,405	331	350	1,255,560	15,440	337	359	1,254,230	15,425	244	372
1829	18.0	803.9	3,330	6.03	1,273,280	13,920	268	285	1,276,050	13,950	273	294	1,274,725	13,935	280	306
1829	20.0	892.3	3,330	6.03	1,408,805	15,405	294	312	1,411,580	15,435	299	320	1,409,735	15,415	307	333
1829	22.0	980.4	3,330	6.03	1,543,425	16,875	321	338	1,546,200	16,905	326	347	1,543,845	16,880	333	359
1829	24.0	1068.3	3,330	6.03	1,677,145	18,335	347	365	1,679,920	18,370	352	373	1,677,055	18,335	359	385
2032	20.0	992.4	3,530	6.66	1,822,570	17,935	306	322	1,825,185	17,960	310	330	1,821,965	17,930	317	342
2032	22.0	1090.5	3,530	6.66	1,997,795	19,660	334	350	2,000,410	19,685	338	358	1,996,560	19,650	345	370
2032	24.0	1188.5	3,530	6.66	2,171,965	21,375	361	378	2,174,575	21,400	366	386	2,170,105	21,355	372	397
2032	26.0	1286.2	3,530	6.66	2,345,085	23,080	389	405	2,347,700	23,105	394	413	2,342,605	23,055	400	425
2540	22.0	1366.1	4,040	8.26	3,424,015	26,960	360	374	3,426,300	26,975	364	381	3,418,465	26,915	370	391
2540	24.0	1489.2	4,040	8.26	3,725,570	29,335	390	405	3,727,855	29,350	394	412	3,719,075	29,280	400	422
2540	26.0	1612.0	4,040	8.26	4,025,675	31,695	421	435	4,027,960	31,715	425	442	4,018,240	31,640	430	452
2540	28.0	1734.6	4,040	8.26	4,324,335	34,050	451	466	4,326,620	34,065	455	473	4,315,965	33,980	461	482
2997	22.0	1614.1	4,500	9.70	5,067,380	33,815	378	391	5,069,435	33,830	382	398	5,057,765	33,750	387	407
2997	24.0	1759.6	4,500	9.70	5,516,175	36,810	411	424	5,518,225	36,825	415	430	5,505,295	36,735	419	439
2997	26.0	1905.0	4,500	9.70	5,963,145	39,790	443	456	5,965,195	39,805	447	462	5,951,005	39,710	452	471
2997	28.0	2050.2	4,500	9.70	6,408,295	42,765	475	488	6,410,350	42,775	479	195	6,394,905	42,675	484	503

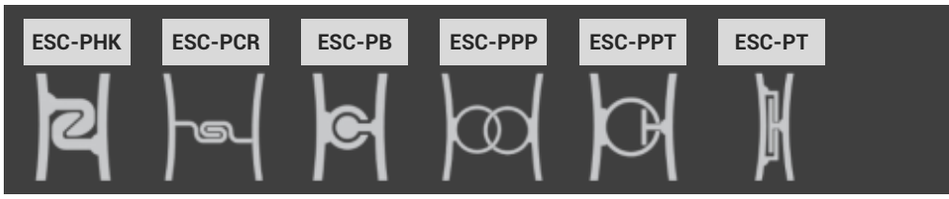
**Mass$_{60\%}$ refers to a combined wall with a sheet pile length at 60% of the King Pipe Pile Length. Mass$_{100\%}$ refers to equal sheet pile and King Pipe Pile Lengths. Please refer to our 'Useful Equations' section for the formula to calculate other length combinations.*

***Coating Area excludes internal of pipe and interlocks*

COMBINED WALL PROPERTIES **ESC PIPE-PIPE COMBI WALL**

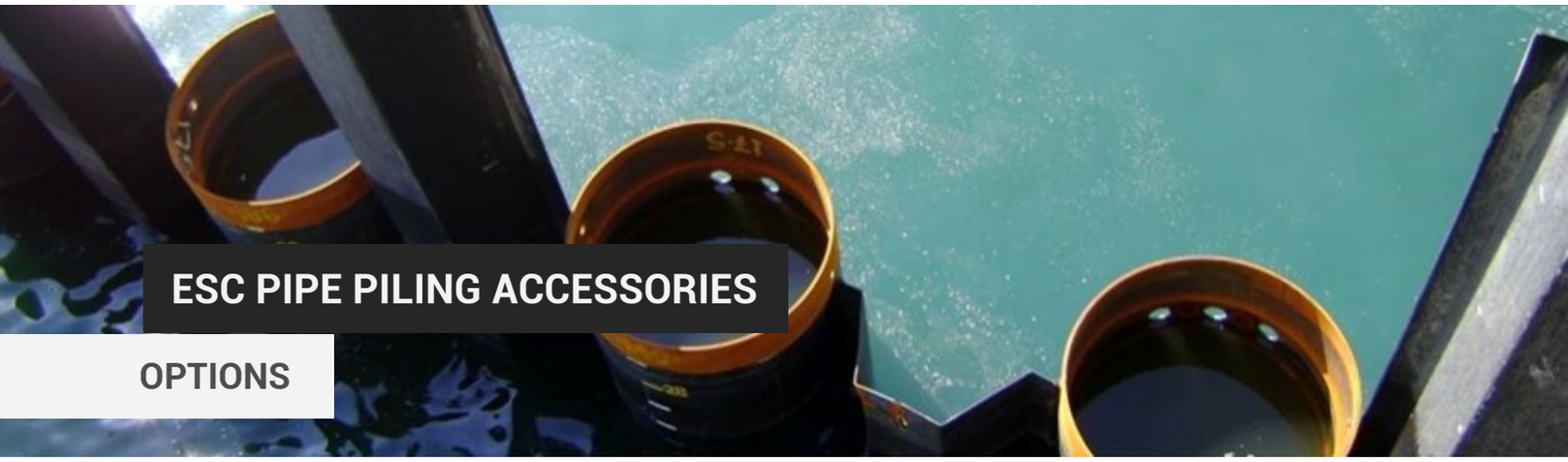


INTERLOCKING CLUTCH OPTIONS



* System Width is indicative for the ESC-PB Series which has a unit width of 84mm and a mass of 19.8kg/m, Other interlock options will have different widths. Contact us at engineering@escpile.com for more details.

Pipe-Pipe System	Outside Diameter	Wall Thickness	Combined System Width*	Pile Weight	Pile Weight with Connector	Combined Section Modulus	Combined System Inertia
	mm	mm	mm	kg/m	kg/m	cm^3/m	cm^4/m
ESC-PB609.6 x 9.5	609.6	9.5	693.6	140.6	160.4	3,810	116,270
ESC-PB609.6 x 12.7	609.6	12.7	693.6	186.9	206.7	5,020	152,990
ESC-PB609.6 x 15.9	609.6	15.9	693.6	232.8	252.6	6,190	188,520
ESC-PB762 x 9.5	762	9.5	846	176.3	196.1	4,930	187,930
ESC-PB762 x 12.7	762	12.7	846	234.7	254.5	6,510	248,080
ESC-PB762 x 15.9	762	15.9	846	292.6	312.4	8,050	306,670
ESC-PB914.4 x 12.7	914.4	12.7	998.4	282.4	302.2	8,010	366,300
ESC-PB914.4 x 15.9	914.4	15.9	998.4	352.3	372.1	9,930	453,780
ESC-PB914.4 x 19.1	914.4	19.1	998.4	421.7	441.5	11,800	539,380
ESC-PB1066.8 x 12.7	1066.8	12.7	1150.8	330.1	349.9	9,520	507,660
ESC-PB1066.8 x 15.9	1066.8	15.9	1150.8	412.1	431.9	11,810	629,860
ESC-PB1066.8 x 19.1	1066.8	19.1	1150.8	493.5	513.3	14,060	749,810
ESC-PB1219.2 x 12.7	1219.2	12.7	1303.2	377.9	397.7	11,030	672,180
ESC-PB1219.2 x 15.9	1219.2	15.5	1303.2	460.1	479.9	13,360	814,720
ESC-PB1219.2 x 19.1	1219.2	19.1	1303.2	565.3	585.1	16,320	995,050
ESC-PB1371.6 x 15.90	1371.6	15.93	1455.6	532.6	552.4	15,620	1,070,920
ESC-PB1371.6 x 19.1	1371.6	19.1	1455.6	637.1	656.9	18,590	1,275,120
ESC-PB1371.6 x 22.2	1371.6	22.2	1455.6	738.8	758.6	21,460	1,472,010
ESC-PB1524 x 15.90	1524	15.9	1608	591.4	611.2	17,480	1,332,020
ESC-PB1524 x 19.1	1524	19.1	1608	708.9	728.7	20,870	1,590,010
ESC-PB1524 x 22.2	1524	22.2	1608	822.2	842	24,100	1,836,780
ESC-PB1676.4 x 19.1	1676.4	19.1	1760.4	780.6	800.4	23,140	1,939,740
ESC-PB1676.4 x 22.2	1676.4	22.2	1760.4	905.7	925.5	26,750	2,242,040
ESC-PB1676.4 x 25.4	1676.4	25.4	1760.4	1034.2	1054	30,430	2,550,510
ESC-PB1828.8 x 19.1	1828.8	19.1	1912.8	852.4	872.2	25,420	2,324,300
ESC-PB1828.8 x 22.2	1828.8	22.2	1912.8	989.1	1008.9	29,390	2,687,790
ESC-PB1828.8 x 25.4	1828.8	25.4	1912.8	1129.7	1149.5	33,450	3,059,050
ESC-PB1961.2 x 22.2	1961.2	22.2	2045.2	1061.6	1081.4	31,690	3,107,900
ESC-PB1961.2 x 25.4	1961.2	25.4	2045.2	1212.6	1232.4	36,080	3,538,460
ESC-PB2133.6 x 22.2	2133.6	22.2	2217.6	1156	1175.8	34,690	3,700,750
ESC-PB2133.6 x 25.4	2133.6	25.4	2217.6	1320.6	1340.4	39,510	4,215,110



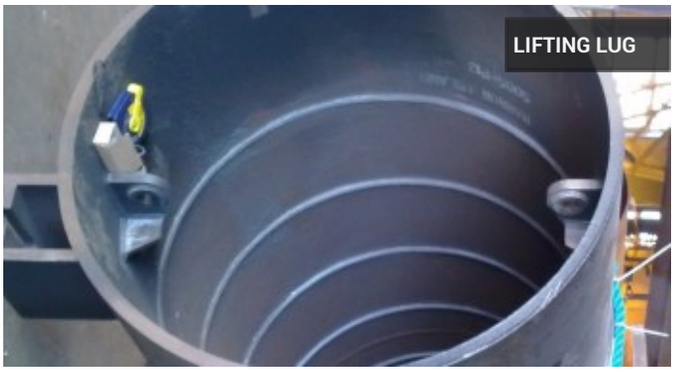
ESC PIPE PILING ACCESSORIES

OPTIONS

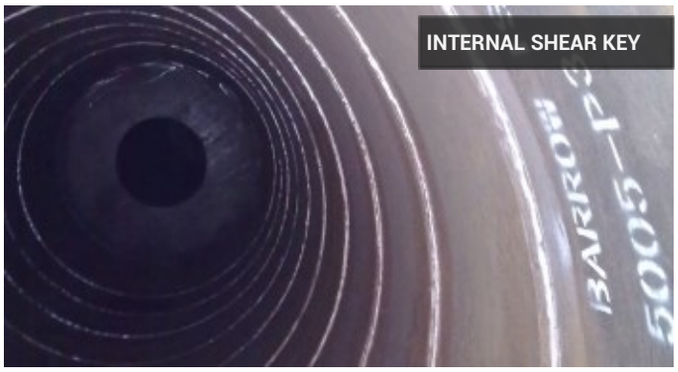
ESC can supply a wide range of welded accessories and markings for Pipe Piles. Shear Keys can be welded internally and externally to provide more rigid embedment. All components are welded as per AWS D1.1 and other standards upon request by client. Featured are some of the typical components that are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

MARKINGS

TIE ROD WELDED CONNECTOR



LIFTING LUG

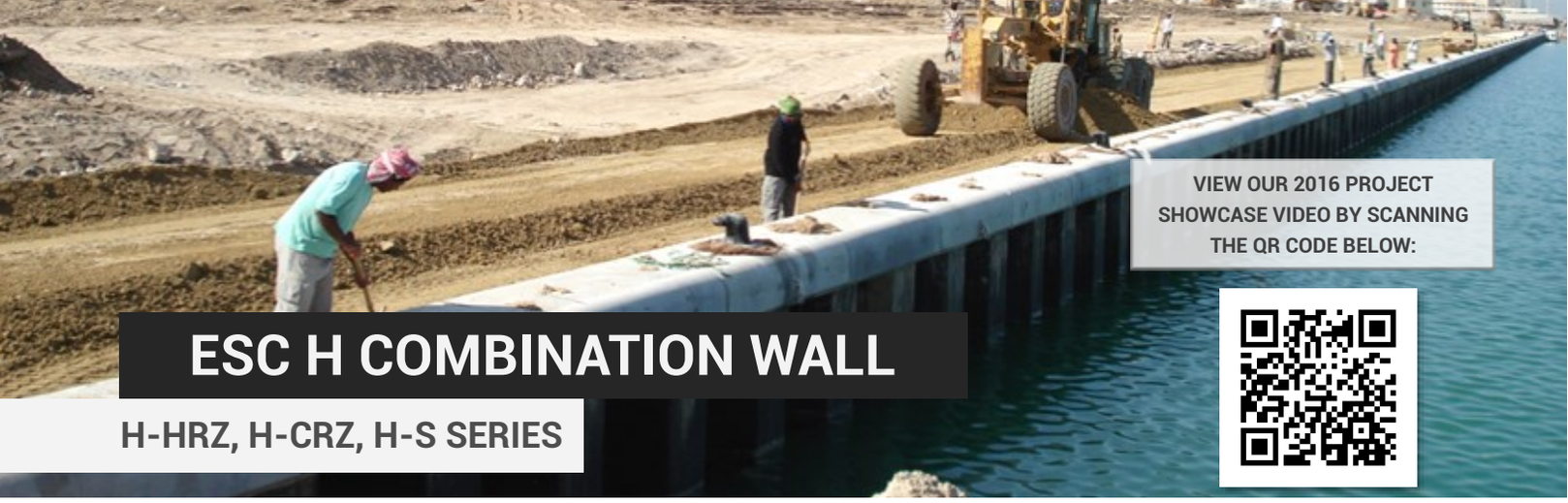


INTERNAL SHEAR KEY

EXTERNAL SHEAR KEY

FENDER FLANGE CONNECTION

PIPE PILE SHOE



VIEW OUR 2016 PROJECT SHOWCASE VIDEO BY SCANNING THE QR CODE BELOW:

ESC H COMBINATION WALL

H-HRZ, H-CRZ, H-S SERIES

A H Pile Combination Wall System consists of Steel H Piles that withstand most of the loading and Infill Sheet Piles that transmit pressure loads to the H Piles. H Piles can range in sizing from traditional Hot Rolled Beam to fabricated I Beam designed by ESC.

The H Piles serve two purposes from a structural standpoint, the first being as a retaining member that resists horizontal hydrostatic and earth pressures. The second purpose is to act as a bearing pile, resisting vertical loads. H Pile Combination Walls are generally utilised when a standard series of sheet piles do not have the strength to resist the required design loads. Integration with Tie Back Systems and other anchorages is simple and ESC can offer the full configuration as part of its piling solution package. Steel grades can be found in the Cold Formed Sheet Pile Steel Grade section of the catalogue. Frequently infill sheet piles are not required to be the same length as the king H piles – typically between 60 to 100% of the H Pile length.

The ESC Advantage

- ✓ Design flexibility of Hot Rolled and Fabricated Beams
- ✓ Comprehensive Range of Interlocks & Infill Sheet Piles
- ✓ Competitive Pricing
- ✓ Free of Charge Design
- ✓ Ability to supply small and large quantities
- ✓ Full Suite of Components: Tie Rods, Walings and more

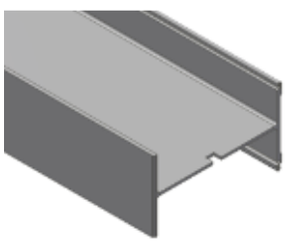
What Our Engineers Say

"H Piles can be driven in the most difficult driving conditions due to the high radius of gyration of the section which provides superior stiffness. They can be used in a wide range of applications. "

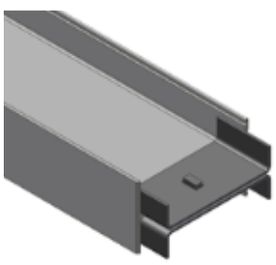
H-PILE SPLICING

ESC is proud to present its ESC-HSP H-Pile Splicing Assembly, which allows H Piles to be delivered and installed in shorter lengths and spliced as they are driven on site. This can save logistical costs and handling costs.

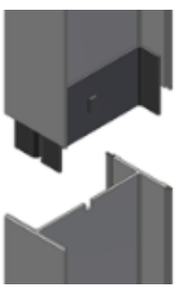
1. Both Ends of the H Pile are slotted in the flange prior to installation



2. The ESC-HSP Splicing Assembly is fitted over the bottom end of the top H Pile and fully welded on.

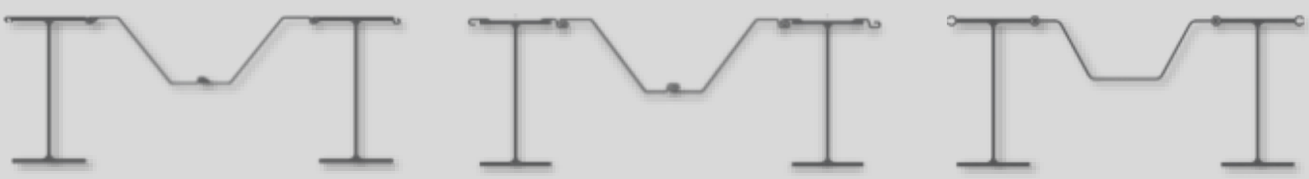


3. Upper H Pile is lifted over and positioned on the already installed H Pile through the flange slot.



4. Once fully aligned, the bottom H Pile is fully welded to the ESC-HSP Splicing Assembly

Combined Wall Profiles

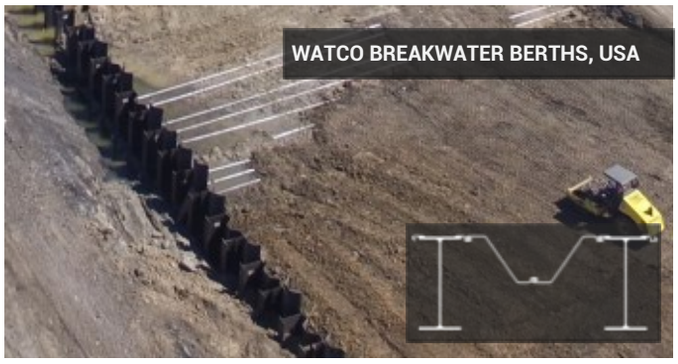


H-HRZ SERIES H-CRZ SERIES H-S SERIES

PROJECT REFERENCES

FUJAIRAH BREAKWATER BERTH, UAE

FUJAIRAH BREAKWATER BERTH, UAE


WATCO BREAKWATER BERTHS, USA

JOHOR BAHRU COMBI WALL, MALAYSIA

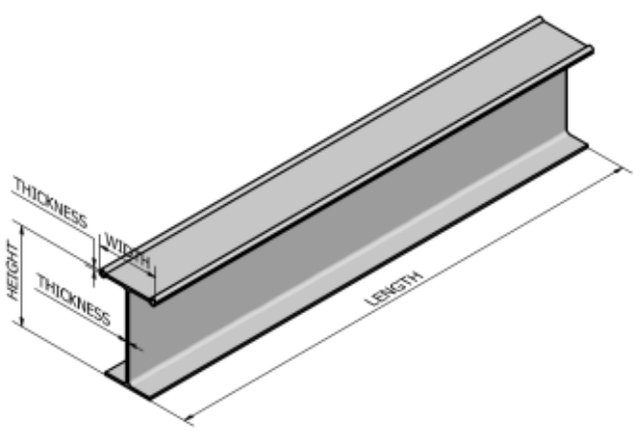
OHAU CHANNEL DIVERSION, NEW ZEALAND

LARKIN LOT BOUNDARY PROTECTION, MALAYSIA

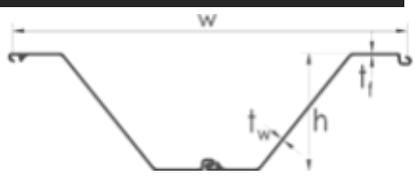
AL JAZEERAH PORT, UAE

DELIVERY TOLERANCES

Component Standard	H50/20A to H70/30C EN 10248	All other ESC H Piles EN 10249
Mass	± 5%	± 5%
Length	± 200mm	± 50mm
Height	± 7.0mm	± 10.0mm
Thickness (≤12.5mm)	+2.0/-1.0mm	± 0.46mm
Thickness (>12.5mm)	+2.5/-1.5mm	± 0.46mm
Width	± 2% of width	± 2% of width
Squareness of Ends	2% of width	2% of width
Bending	0.2% of length	0.2% of length
Curving	0.2% of length	0.2% of length
Twisting	0.2% of length but no more than 100mm	0.2% of length but no more than 100mm



ESC-HRZ INFILL SHEET PILES



Section	Width (w)	Height (h)	Thickness (t_f)	Thickness (t_w)	Cross Sectional Area	Weight Per Pile	Elastic Section Modulus	Moment of Inertia	Coating Area * (both sides per double pile)
	mm	mm	mm	mm	cm²	kg/m	cm³	cm⁴	m²/m
ESC-HRZ14-1540	1540	345	9.5	9.5	101.8	159.2	2094.4	35,990	3.92
ESC-HRZ19-1400	1400	421	9.5	9.5	101.8	160.4	2632	55,412	3.94
ESC-HRZ26-1400	1400	460	12.2	12.2	131.2	206	3640	83,776	4.10

*excludes internal section of interlock

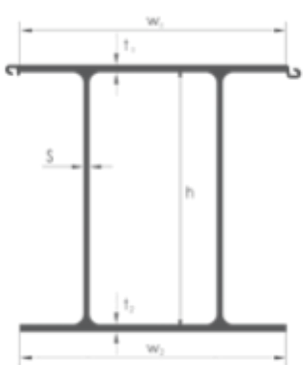
ESC-H PILES WITH HOT ROLLED Z INTERLOCK

SINGLE H PILE H…-1 SERIES

King Pile Section	h	W1	W2	S	t1	t2	Cross Sectional Area	Mass	Section Modulus	Moment of Inertia	Coating Area*(front)	Coating Area* (back)
	mm	mm	mm	mm	mm	mm	cm^2	kg/m	cm^3	cm^4	m^2/m	m^2/m
ESC-880A-1H	820	460	475	16	20	22	344.2	273.97	9,732	411,083	0.66	3.19
ESC-880B-1H	835	460	470	18	22	22	370.2	294.38	10,162	447,090	0.66	3.21
ESC-880C-1H	862	460	462	20	20	22	380.9	302.75	10,594	472,543	0.66	3.25
ESC-1080A-1H	1,086	460	473	22	20	20	439.9	349.13	14,111	800,695	0.66	3.72
ESC-1080B-1H	1,085	460	465	22	22	24	464.6	368.48	15,570	867,862	0.66	3.69
ESC-1080C-1H	1,089	460	465	22	26	26	491.9	389.88	16,643	944,994	0.66	3.69
ESC-1080D-1H	1,093	460	467	24	28	28	531.7	421.13	17,992	1,021,037	0.66	3.70
ESC-1180A-1H	1,108	460	475	26	28	28	558.5	442.23	18,878	1,080,029	0.66	3.74
ESC-1180B-1H	1,108	460	477	26	30	30	576.8	456.56	19,812	1,130,671	0.66	3.74
ESC-1180C-1H	1,116	460	464	28	32	32	613.5	485.34	20,881	1,205,270	0.66	3.73
ESC-1180D-1H	1,117	460	472	28	34	34	633.8	501.32	21,999	1,264,288	0.66	3.74

*excludes internal section of interlock

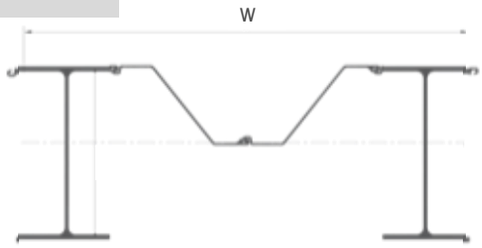
DOUBLE H PILE H…-2 SERIES



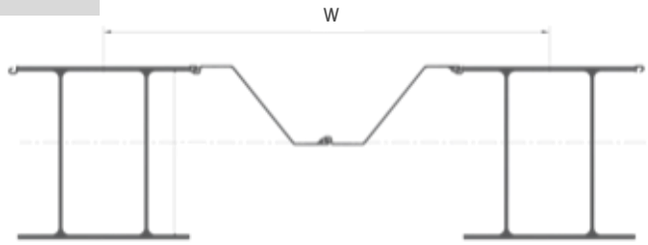
King Pile Section	h	W1	W2	S	t1	t2	Cross Sectional Area	Mass	Section Modulus	Moment of Inertia	Coating Area* (front)	Coating Area* (back)
	mm	mm	mm	mm	mm	mm	cm^2	kg/m	cm^3	cm^4	m^2/m	m^2/m
ESC-880A-2H	820	932	955	16	22	22	686.7	542.82	19,517	820,152	1.13	3.70
ESC-880B-2H	843	932	974	18	22	22	730.2	576.96	20,899	896,669	1.13	3.76
ESC-880C-2H	866	932	997	18	22	22	743.5	587.44	21,972	961,844	1.13	3.83
ESC-1080A-2H	1,071	932	951	22	20	24	889.7	702.22	29,313	1,598,285	1.13	4.19
ESC-1080B-2H	1,081	932	951	22	24	24	929.7	733.56	31,375	1,728,384	1.13	4.20
ESC-1080C-2H	1,075	932	935	22	28	28	994.3	784.33	34,266	1,881,603	1.13	4.17
ESC-1080D-2H	1,068	932	932	22	32	32	1,061.5	837.02	37,267	2,031,920	1.13	4.16
ESC-1180A-2H	1,098	932	979	24	30	30	1,094.8	863.16	38,805	2,147,172	1.13	4.26
ESC-1180B-2H	1,110	932	980	26	30	30	1,142.8	900.89	40,082	2,240,771	1.13	4.28
ESC-1180C-2H	1,100	932	998	26	34	34	1,216.1	958.38	43,727	2,406,141	1.13	4.28
ESC-1180D-2H	1,111	932	1,007	28	34	34	1,266.6	998.02	45,069	2,508,248	1.13	4.31

COMBINED WALL PROPERTIES **ESC H-S COMBI WALL**

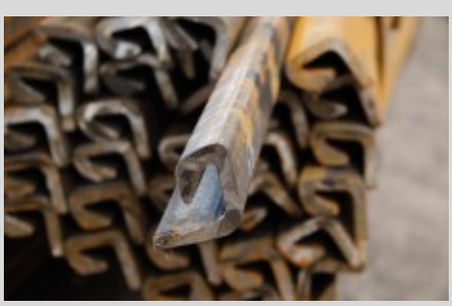
H…-1 SERIES



H…-2 SERIES



H Pile Section	ESC-HRZ14-1540 Infill Sheet Pile					ESC-HRZ19-1400 Infill Sheet Pile					ESC-HRZ26-1400 Infill Sheet Pile				
	System Width	System Inertia	Section Modulus	Mass 60%	Mass 100%	System Width	System Inertia	Section Modulus	Mass 60%	Mass 100%	System Width	System Inertia	Section Modulus	Mass 60%	Mass 100%
	mm	cm^4/m	cm^3/m	kg/m^2	kg/m^2	mm	cm^4/m	cm^3/m	kg/m^2	kg/m^2	mm	cm^4/m	cm^3/m	kg/m^2	kg/m^2
ESC-880A-1H	2,066	216,395	5,123	178.8	209.7	1,926	242,209	5,734	192.2	225.5	1,926	256,936	6,083	206.4	249.2
ESC-880B-1H	2,066	233,824	5,315	188.7	219.5	1,926	260,904	5,930	202.8	236.1	1,926	275,631	6,265	217.0	259.8
ESC-880C-1H	2,066	246,144	5,518	192.8	223.6	1,926	274,120	6,146	207.2	240.5	1,926	288,847	6,476	221.4	264.1
ESC-1080A-1H	2,066	404,978	7,137	215.2	246.0	1,926	444,500	7,834	231.2	264.6	1,926	459,227	8,093	245.4	288.2
ESC-1080B-1H	2,066	437,489	7,849	224.6	255.4	1,926	479,374	8,600	241.3	274.6	1,926	494,101	8,864	255.5	298.3
ESC-1080C-1H	2,066	474,823	8,362	234.9	265.8	1,926	519,422	9,148	252.4	285.7	1,926	534,148	9,407	266.6	309.4
ESC-1080D-1H	2,066	511,630	9,016	250.1	280.9	1,926	558,904	9,849	268.6	301.9	1,926	573,631	10,108	282.8	325.6
ESC-1180A-1H	2,066	540,183	9,442	260.3	291.1	1,926	589,533	10,305	279.6	312.9	1,926	604,260	10,562	293.8	336.6
ESC-1180B-1H	2,066	564,695	9,895	267.2	298.0	1,926	615,827	10,791	287.0	320.3	1,926	630,554	11,049	301.2	344.0
ESC-1180C-1H	2,066	600,803	10,409	281.2	312.0	1,926	654,560	11,340	302.0	335.3	1,926	669,287	11,595	316.2	359.0
ESC-1180D-1H	2,066	629,370	10,951	288.9	319.7	1,926	685,202	11,923	310.3	343.6	1,926	699,929	12,179	324.5	367.2
ESC-880A-2H	2,538	337,329	8,027	251.5	276.6	2,398	365,123	8,689	266.5	293.3	2,398	376,951	8,970	277.9	312.3
ESC-880B-2H	2,538	367,478	8,565	265.0	290.1	2,398	397,031	9,254	280.7	307.5	2,398	408,859	9,529	292.1	326.5
ESC-880C-2H	2,538	393,158	8,981	269.1	294.2	2,398	424,210	9,690	285.1	311.9	2,398	436,038	9,961	296.5	330.9
ESC-1080A-2H	2,538	643,922	11,810	314.3	339.4	2,398	689,615	12,648	333.0	359.7	2,398	701,443	12,865	344.4	378.7
ESC-1080B-2H	2,538	695,183	12,620	326.7	351.8	2,398	743,868	13,503	346.0	372.8	2,398	755,696	13,718	357.4	391.8
ESC-1080C-2H	2,538	755,553	13,759	346.7	371.8	2,398	807,763	14,710	367.2	394.0	2,398	819,591	14,926	378.6	413.0
ESC-1080D-2H	2,538	814,779	14,944	367.4	392.5	2,398	870,447	15,965	389.2	415.9	2,398	882,275	16,182	400.6	435.0
ESC-1180A-2H	2,538	860,190	15,546	377.7	402.8	2,398	918,509	16,600	400.1	426.8	2,398	930,337	16,814	411.5	445.9
ESC-1180B-2H	2,538	897,069	16,046	392.6	417.7	2,398	957,541	17,128	415.8	442.6	2,398	969,369	17,340	427.2	461.6
ESC-1180C-2H	2,538	962,226	17,487	415.2	440.3	2,398	1,026,503	18,655	439.8	466.5	2,398	1,038,331	18,870	451.2	485.6
ESC-1180D-2H	2,538	1,002,458	18,012	430.9	456.0	2,398	1,069,083	19,210	456.3	483.1	2,398	1,080,911	19,422	467.7	502.1



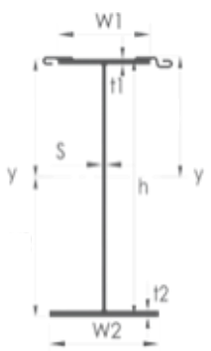
ESC-CRZ INFILL SHEET PILES

Section	Width (w)	Height (h)	Thickness (t)	Cross Sectional Area	Weight Per Pile	Elastic Section Modulus	Moment of Inertia	Coating Area* (both sides per double pile)
	mm	mm	mm	cm²	kg/m	cm³	cm⁴	m²/m
ESC-CRZ14-1540	1540	345	10	213.4	167.50	2,129	36,722	4.27
ESC-CRZ19-1400	1400	421	9.5	206.7	162.24	2,605	54,774	4.35
ESC-CRZ26-1400	1400	460	12.2	273.4	214.64	3,636	83,626	4.48

*excludes internal section of interlock

ESC-H PILES WITH COLD ROLLED Z INTERLOCK

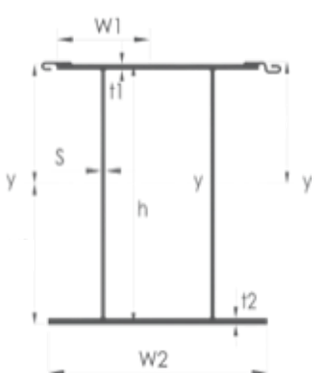
SINGLE H PILE H…-1 SERIES



King Pile Section	h	W1	W2	S	t1	t2	Cross Sectional Area	Mass	Section Modulus	Section Modulus	Moment of Inertia	Coating Area* (front)	Coating Area* (back)
	mm	mm	mm	mm	mm	mm	cm^2	kg/m	cm^3	cm^3	cm^4	m^2/m	m^2/m
880A-1C	818	414	458	16	20	20	347.2	273	9,273	10,635	410,899	0.56	3.36
880B-1C	823	414	469	16	22	22	367.2	288	10,174	11,338	447,481	0.56	3.39
880C-1C	845	414	472	18	22	22	387.4	304	10,790	11,893	484,558	0.56	3.44
1080A-1C	1,070	414	450	22	20	20	447.7	351	13,994	15,703	800,267	0.56	3.84
1080B-1C	1,075	414	470	22	22	24	478.6	376	16,087	16,874	894,796	0.56	3.88
1080C-1C	1,078	414	464	22	26	26	502.3	394	16,973	18,278	958,819	0.56	3.87
1080D-1C	1,102	414	476	22	28	28	527.7	414	18,644	19,660	1,065,528	0.56	3.94
1180A-1C	1,118	414	465	22	30	30	544.8	428	19,587	20,752	1,138,135	0.56	3.94
1180B-1C	1,117	414	435	24	32	32	572.7	450	19,938	21,616	1,170,438	0.56	3.87
1180C-1C	1,128	414	487	24	34	34	609.1	478	22,662	23,026	1,301,446	0.56	4.00
1180D-1C	1,127	414	466	26	36	36	639.4	502	23,221	23,944	1,342,122	0.56	3.94

*excludes internal section of interlock

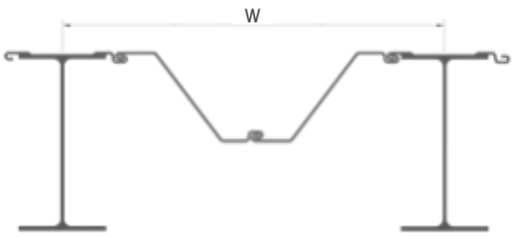
DOUBLE H PILE H…-2 SERIES



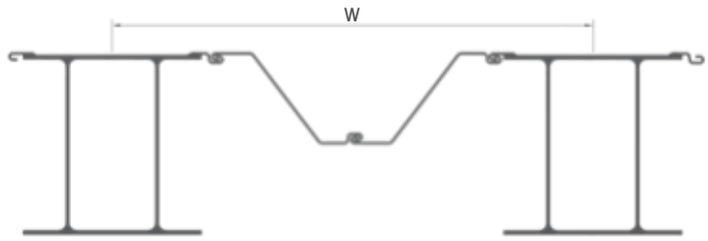
King Pile Section	h	W1	W2	S	t1	t2	Cross Sectional Area	Mass	Section Modulus	Section Modulus	Moment of Inertia	Coating Area* (front)	Coating Area* (back)
	mm	mm	mm	mm	mm	mm	cm^2	kg/m	cm^3	cm^3	cm^4	m^2/m	m^2/m
880A-2C	821	885	947	16	20	22	683.0	536	19,940	19,397	820,055	1.03	4.03
880B-2C	834	885	947	18	22	22	735.8	578	20,962	21,166	890,450	1.03	4.03
880C-2C	841	885	949	18	22	24	757.0	594	22,204	21,616	939,013	1.03	4.03
1080A-2C	1,027	885	914	20	26	26	906.1	711	30,481	31,136	1,599,570	1.03	3.98
1080B-2C	1,073	885	932	22	24	24	935.4	734	31,605	32,039	1,725,462	1.03	4.01
1080C-2C	1,073	885	900	22	28	28	995.6	782	34,278	35,067	1,879,878	1.03	3.97
1080D-2C	1,087	885	970	24	28	28	1,062.6	834	37,316	36,672	2,031,733	1.03	4.04
1180A-2C	1,095	885	954	24	30	30	1,096.8	861	39,053	38,555	2,146,737	1.03	4.02
1180B-2C	1,095	885	954	24	32	32	1,131.7	888	40,827	40,154	2,239,982	1.03	4.01
1180C-2C	1,105	885	979	24	34	34	1,179.9	926	43,264	42,388	2,406,463	1.03	4.03
1180D-2C	1,100	885	975	26	36	36	1,252.5	983	45,237	44,318	2,507,796	1.03	4.03

COMBINED WALL PROPERTIES **ESC H-CRZ COMBI WALL**

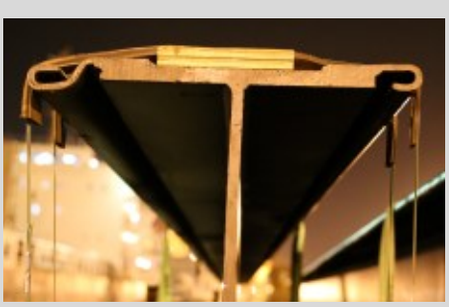
ESC…-1C SERIES



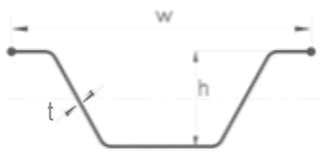
ESC…-2C SERIES



H Pile Section	ESC-CRZ14-1540 Infill Sheet Pile					ESC-CRZ19-1400 Infill Sheet Pile					ESC-CRZ26-1400 Infill Sheet Pile				
	System Width	System Inertia	Section Modulus	Mass 60%	Mass 100%	System Width	System Inertia	Section Modulus	Mass 60%	Mass 100%	System Width	System Inertia	Section Modulus	Mass 60%	Mass 100%
	mm	cm^4/m	cm^3/m	kg/m^2	kg/m^2	mm	cm^4/m	cm^3/m	kg/m^2	kg/m^2	mm	cm^4/m	cm^3/m	kg/m^2	kg/m^2
ESC-880A-1C	2,067	216,556	5,605	205.5	212.9	1,927	241,657	6,254	217.7	225.6	1,927	256,830	6,642	245.0	252.8
ESC-880B-1C	2,067	234,254	5,935	213.1	220.5	1,927	260,640	6,604	225.9	233.8	1,927	275,613	6,983	253.2	261.1
ESC-880C-1C	2,067	252,192	6,190	220.8	228.2	1,927	279,882	6,870	234.1	242.0	1,927	294,855	7,237	261.3	269.2
ESC-1080A-1C	2,067	404,930	7,946	243.7	251.1	1,927	443,716	8,707	258.7	266.6	1,927	458,689	9,001	285.9	293.8
ESC-1080B-1C	2,067	450,662	8,499	255.4	262.8	1,927	492,771	9,293	271.3	279.2	1,927	407,744	9,575	298.5	306.4
ESC-1080C-1C	2,067	481,636	9,181	264.5	271.8	1,927	525,995	10,027	280.9	288.8	1,927	540,968	10,312	308.1	316.0
ESC-1080D-1C	2,067	533,261	9,839	274.1	281.4	1,927	581,371	10,727	291.3	299.1	1,927	596,344	11,003	318.4	326.3
ESC-1180A-1C	2,067	568,388	10,364	280.7	287.9	1,927	619,050	11,287	298.4	306.1	1,927	634,023	11,560	325.6	333.3
ESC-1180B-1C	2,067	584,016	10,786	291.4	298.5	1,927	635,813	11,743	309.8	317.5	1,927	650,786	12,019	337.0	344.7
ESC-1180C-1C	2,067	647,396	11,454	304.9	312.3	1,927	703,799	12,452	324.4	332.3	1,927	718,771	12,717	351.6	359.5
ESC-1180D-1C	2,067	667,075	11,901	316.5	323.9	1,927	724,907	12,933	336.8	344.7	1,927	739,880	13,200	364.0	371.9
ESC-880A-2C	2,538	337,580	7,985	271.2	277.2	2,398	364,816	8,904	284.9	291.2	2,398	376,848	8,914	306.7	313.1
ESC-880B-2C	2,538	365,316	8,684	287.6	293.6	2,398	394,172	9,369	302.2	308.5	2,398	406,204	9,655	324.0	330.4
ESC-880C-2C	2,538	384,451	9,195	294.1	300.1	2,398	414,423	9,912	309.1	315.5	2,398	426,455	10,200	331.0	337.3
ESC-1080A-2C	2,538	644,717	12,550	340.3	346.2	2,398	689,885	13,429	357.9	364.3	2,398	701,917	13,663	379.8	386.1
ESC-1080B-2C	2,538	694,320	12,892	349.3	355.3	2,398	742,384	13,785	367.5	373.9	2,398	754,416	14,008	389.4	395.7
ESC-1080C-2C	2,538	755,161	14,087	368.0	373.9	2,398	806,777	15,050	387.2	393.6	2,398	818,809	15,274	409.1	415.4
ESC-1080D-2C	2,538	814,994	14,710	388.7	394.7	2,398	870,103	15,705	409.2	415.5	2,398	882,135	15,922	431.0	437.4
ESC-1180A-2C	2,538	860,307	15,451	399.3	405.2	2,398	918,061	16,488	420.4	426.7	2,398	930,093	16,704	442.2	448.6
ESC-1180B-2C	2,398	897,046	16,080	434.0	416.0	2,398	956,946	17,154	431.8	438.1	2,398	968,978	17,370	453.6	460.0
ESC-1180C-2C	2,398	962,642	16,956	449.7	430.9	2,398	1,026,371	18,079	447.5	453.9	2,398	1,038,402	18,291	469.4	475.7
ESC-1180D-2C	2,538	1,002,568	17,717	447.4	453.4	2,398	1,068,628	18,885	471.3	477.7	2,398	1,080,660	19,097	493.2	499.5



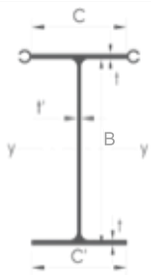
ESC-S INFILL SHEET PILES

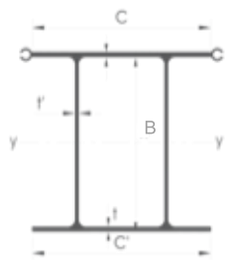


Section	Width (w)	Height (h)	Thickness (t)	Cross Sectional Area	Weight Per Pile	Elastic Section Modulus	Moment of Inertia	Coating Area* (both sides per pile)
	mm	mm	mm	cm²/m	kg/m	cm³	cm⁴	m²/m
ESC-S8	1440	414	7.75	151.8	119.2	1,900	965	3.79
ESC-S10	1440	416	9.75	187.8	147.4	2,360	1,187	3.79
ESC-S12	1440	423	11.75	227.6	178.7	2,950	1,466	3.82

*excludes internal section of interlock

ESC-H PILES WITH PIPE-BAR INTERLOCK



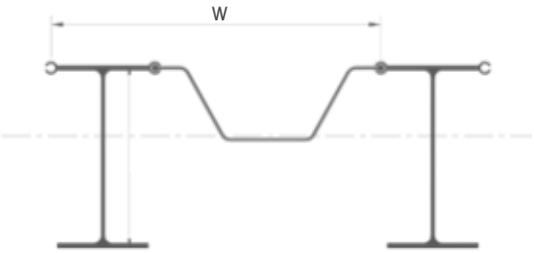


H Pile Section	SINGLE H PILE H…-1 SERIES											DOUBLE H PILE H…-2 SERIES										
	B	C	C'	t	t'	Section Area	Mass	Section Modulus	Moment of Inertia	Coating (front)	Coating (back)	B	C	C'	t	t'	Section Area	Mass	Section Modulus	Moment of Inertia	Coating Area* (front)	Coating Area* (back)
	mm	mm	mm	mm	mm	cm²	kg/m	cm³	cm⁴	m²/m	m²/m	mm	mm	mm	mm	mm	cm²	kg/m	cm³	cm⁴	m²/m	m²/m
H50/20A	496	199	199	14	9	135.5	106	1,840	56,840	0.42	1.76	496	398	398	14	9	236.8	186	3,265	100,855	0.72	1.98
H50/20B	500	200	200	16	10	148.5	117	2,070	63,380	0.42	1.77	500	400	400	16	10	262.8	206	3,700	113,240	0.72	1.99
H50/20C	506	201	201	19	11	165.5	130	2,400	72,730	0.42	1.77	506	402	402	19	11	296.8	233	4,320	131,100	0.73	2.00
H60/30A	582	300	300	17	12	208.7	164	3,725	125,660	0.52	2.23	582	600	600	17	12	383.2	301	6,830	230,410	0.80	2.55
H60/30B	588	300	300	20	12	226.7	178	4,205	141,665	0.52	2.23	588	600	600	20	12	419.2	329	7,770	231,685	0.81	2.56
H60/30C	594	302	302	23	14	256.6	202	4,825	161,615	0.52	2.24	594	604	604	23	14	479.0	376	8,970	300,660	0.81	2.57
H70/30A	692	300	300	20	13	245.7	193	5,240	205,800	0.52	2.44	692	600	600	20	13	457.2	359	9,700	380,710	0.91	2.76
H70/30B	700	300	300	24	13	269.7	212	6,000	235,750	0.52	2.45	700	600	600	24	13	505.2	397	11,190	439,550	0.92	2.77
H70/30C	704	300	390	26	13	298.4	234	7,560	275,300	0.52	2.63	704	600	780	26	13	562.6	442	13,310	484,895	0.92	2.96
H85/40A	872	427	557	16	14	309.3	243	9,225	419,350	0.65	3.44	872	854	1,114	16	14	584.4	459	16,530	751,455	1.09	3.90
H85/40B	876	427	557	18	14	329.0	258	10,120	457,640	0.65	3.45	876	854	1,114	18	14	623.8	490	18,220	823,910	1.10	3.90
H85/40C	880	427	557	20	14	348.6	274	11,020	496,160	0.65	3.45	880	854	1,114	20	14	663.0	521	19,925	896,975	1.10	3.91
H90/40A	899	400	490	22	18	383.9	301	11,485	535,230	0.62	3.32	899	800	980	22	18	733.6	576	21,150	985,585	1.12	3.75
H90/40B	903	400	490	24	18	401.7	315	12,290	571,930	0.62	3.32	903	800	980	24	18	769.2	604	22,705	1,056,440	1.12	3.76
H90/40C	907	400	490	26	18	419.5	329	13,100	608,900	0.62	3.33	907	800	980	26	18	804.8	632	24,260	1,127,910	1.13	3.76
H100/40A	1,119	400	460	22	16	395.4	310	14,180	834,685	0.62	3.70	1,119	800	920	22	16	756.6	594	26,475	1,558,620	1.34	4.13
H100/40B	1,123	400	460	24	16	412.6	324	15,130	889,585	0.62	3.71	1,123	800	920	24	16	791.0	621	28,340	1,666,290	1.34	4.14
H100/40C	1,127	400	460	26	16	429.8	338	16,085	944,815	0.62	3.71	1,127	800	920	26	16	825.4	648	30,215	1,774,700	1.35	4.14
H110/40A	1,152	400	460	26	20	477.8	375	17,345	1,037,040	0.62	3.75	1,152	800	920	26	20	921.4	723	32,675	1,953,735	1.37	4.19
H110/40B	1,160	400	460	30	20	512.2	402	19,290	1,153,400	0.62	3.76	1,160	800	920	30	20	990.2	777	36,500	2,182,540	1.38	4.20
H110/40C	1,168	400	460	34	20	546.6	429	21,245	1,271,215	0.62	3.77	1,168	800	920	34	20	1,059.0	831	40,350	2,414,465	1.39	4.21
H110/50A	1,160	500	560	30	22	594.2	467	22,965	1,367,390	0.72	4.06	1,160	1,000	1,120	30	22	1,154.2	906	43,840	2,610,465	1.38	4.60
H110/50B	1,168	500	560	34	22	636.6	500	25,360	1,512,235	0.72	4.06	1,168	1,000	1,120	34	22	1,239.0	973	48,575	2,896,560	1.39	4.61
H110/50C	1,176	500	560	38	22	679.0	533	27,760	1,658,960	0.72	4.07	1,176	1,000	1,120	38	22	1,323.8	1,039	53,325	3,186,550	1.40	4.62

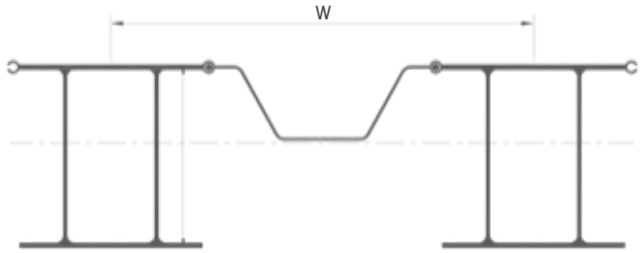
*excludes internal section of interlock

COMBINED WALL PROPERTIES **ESC H-S COMBI WALL**

H…-1 SERIES



H…-2 SERIES



H Pile Section	ESC-S8 Infill Sheet Pile					ESC-S10 Infill Sheet Pile					ESC-S12 Infill Sheet Pile				
	System Width	System Inertia	Section Modulus	Mass 60%	Mass 100%	System Width	System Inertia	Section Modulus	Mass 60%	Mass 100%	System Width	System Inertia	Section Modulus	Mass 60%	Mass 100%
	mm	cm^4/m	cm^3/m	kg/m^2	kg/m^2	mm	cm^4/m	cm^3/m	kg/m^2	kg/m^2	mm	cm^4/m	cm^3/m	kg/m^2	kg/m^2
H50/20A-1	1,700	57,090	1,850	98	133	1,700	62,525	2,025	108	149	1,710	71,890	2,180	123	175
H50/20B-1	1,700	60,905	1,990	104	139	1,700	66,335	2,170	114	155	1,710	75,905	2,330	129	180
H50/20C-1	1,700	66,360	2,190	112	146	1,700	71,785	2,365	122	163	1,710	81,590	2,535	137	188
H60/30A-1	1,800	92,115	2,730	125	157	1,800	97,240	2,885	134	173	1,810	108,060	3,040	148	197
H60/30B-1	1,800	101,005	3,000	133	165	1,800	106,130	3,150	142	181	1,810	117,130	3,305	156	204
H60/30C-1	1,800	111,960	3,340	145	178	1,800	117,085	3,495	155	194	1,810	128,315	3,655	169	217
H70/30A-1	1,800	136,630	3,480	141	173	1,800	141,755	3,610	150	189	1,810	154,850	3,755	164	213
H70/30B-1	1,800	153,265	3,900	151	184	1,800	158,390	4,030	161	200	1,810	171,730	4,180	175	223
H70/30C-1	1,800	175,235	4,810	164	196	1,800	180,365	4,950	173	212	1,810	195,400	5,110	187	235
H85/40A-1	1,930	238,430	5,245	157	188	1,930	243,220	5,350	166	202	1,940	262,120	5,500	179	224
H85/40B-1	1,930	258,300	5,715	166	196	1,930	263,085	5,820	174	212	1,940	282,295	5,965	187	232
H85/40C-1	1,930	278,280	6,180	174	204	1,930	283,070	6,290	182	219	1,940	302,550	6,430	195	240
H90/40A-1	1,900	302,795	6,500	191	221	1,900	307,650	6,600	199	236	1,910	327,475	6,760	212	258
H90/40B-1	1,900	322,110	6,920	198	229	1,900	326,965	7,025	207	244	1,910	346,965	7,180	220	265
H90/40C-1	1,900	341,565	7,350	205	236	1,900	346,420	7,450	214	251	1,910	366,580	7,600	227	273
H100/40A-1	1,900	460,380	7,820	195	226	1,900	494,125	8,405	211	248	1,910	521,215	8,555	224	270
H100/40B-1	1,900	489,270	8,320	202	233	1,900	523,190	8,910	218	255	1,910	550,455	9,050	231	277
H100/40C-1	1,900	518,335	8,825	210	240	1,900	552,430	9,410	226	262	1,910	579,855	9,550	238	284
H110/40A-1	1,900	566,870	9,480	229	260	1,900	571,725	9,560	238	275	1,910	600,135	9,725	251	297
H110/40B-1	1,900	628,100	10,505	244	274	1,900	632,955	10,585	252	289	1,910	661,610	10,740	265	311
H110/40C-1	1,900	690,095	11,535	258	289	1,900	694,955	11,615	267	303	1,910	723,800	11,755	279	325
H110/50A-1	2,000	703,680	11,820	264	293	2,000	708,290	11,895	272	307	2,010	735,395	12,030	284	327
H110/50B-1	2,000	776,090	13,015	280	309	2,000	780,705	13,090	289	324	2,010	807,880	13,215	300	344
H110/50C-1	2,000	849,440	14,215	297	326	2,000	854,055	14,290	305	340	2,010	881,265	14,405	317	360
H50/20A-2	1,900	74,297	2,653	130	161	1,900	79,155	2,800	139	176	1,910	88,440	2,975	152	198
H50/20B-2	1,900	80,732	2,888	140	171	1,900	85,590	3,040	149	186	1,910	95,000	3,224	163	208
H50/20C-2	1,900	90,032	3,228	154	185	1,900	94,890	3,375	163	200	1,910	104,440	3,560	176	222
H60/30A-2	2,100	128,830	4,097	172	200	2,100	133,225	4,215	180	213	2,110	143,280	4,375	192	233
H60/30B-2	2,100	143,720	4,557	186	214	2,100	148,115	4,670	194	227	2,110	158,250	4,830	205	247
H60/30C-2	2,100	161,960	5,122	208	236	2,100	166,355	5,240	216	249	2,110	176,570	5,400	227	269
H70/30A-2	2,100	200,395	5,422	200	228	2,100	204,790	5,515	208	241	2,110	216,900	5,665	219	261
H70/30B-2	2,100	228,405	6,152	218	246	2,100	232,800	6,245	226	259	2,110	244,985	6,385	237	279
H70/30C-2	2,100	250,000	6,987	231	259	2,100	254,395	7,090	239	272	2,110	267,360	7,240	250	291
H85/40A-2	2,400	330,079	7,342	212	236	2,400	333,925	7,400	219	248	2,410	349,130	7,530	229	265
H85/40B-2	2,400	360,294	8,012	224	248	2,400	364,140	8,070	231	260	2,410	379,390	8,195	241	278
H85/40C-2	2,400	390,759	8,682	237	261	2,400	394,605	8,745	244	273	2,410	409,885	8,865	253	290
H90/40A-2	2,340	437,546	9,456	265	290	2,340	441,490	9,510	272	302	2,350	457,235	9,640	282	319
H90/40B-2	2,340	467,776	10,086	276	301	2,340	471,720	10,145	283	313	2,350	487,455	10,270	293	331
H90/40C-2	2,340	498,261	10,726	288	313	2,340	502,205	10,780	295	325	2,350	517,935	10,900	305	342
H100/40A-2	2,340	727,911	12,021	284	309	2,340	731,855	12,560	291	321	2,350	799,541	13,445	312	349
H100/40B-2	2,340	774,161	12,786	295	319	2,340	778,105	13,330	302	331	2,350	846,050	14,210	322	360
H100/40C-2	2,340	727,911	12,021	284	309	2,340	731,855	12,560	291	321	2,350	799,540	13,440	312	349
H110/40A-2	2,340	850,526	14,341	327	352	2,340	854,470	14,375	334	364	2,350	876,665	14,495	344	381
H110/40B-2	2,340	948,126	15,916	349	373	2,340	952,070	15,950	356	385	2,350	974,105	16,060	365	402
H110/40C-2	2,340	1,047,061	17,496	371	395	2,340	1,051,005	17,530	378	407	2,350	1,072,890	17,630	387	424
H110/50A-2	2,540	1,097,821	18,459	384	407	2,540	1,101,455	18,485	391	418	2,550	1,121,445	18,570	399	434
H110/50B-2	2,540	1,154,231	19,359	396	420	2,540	1,157,865	19,385	403	431	2,550	1,177,765	19,465	412	446
H110/50C-2	2,540	1,268,211	21,164	421	445	2,540	1,271,845	21,190	428	456	2,550	1,291,590	21,260	437	471

ESC TIE ROD SYSTEM

ANCHORAGE SYSTEMS

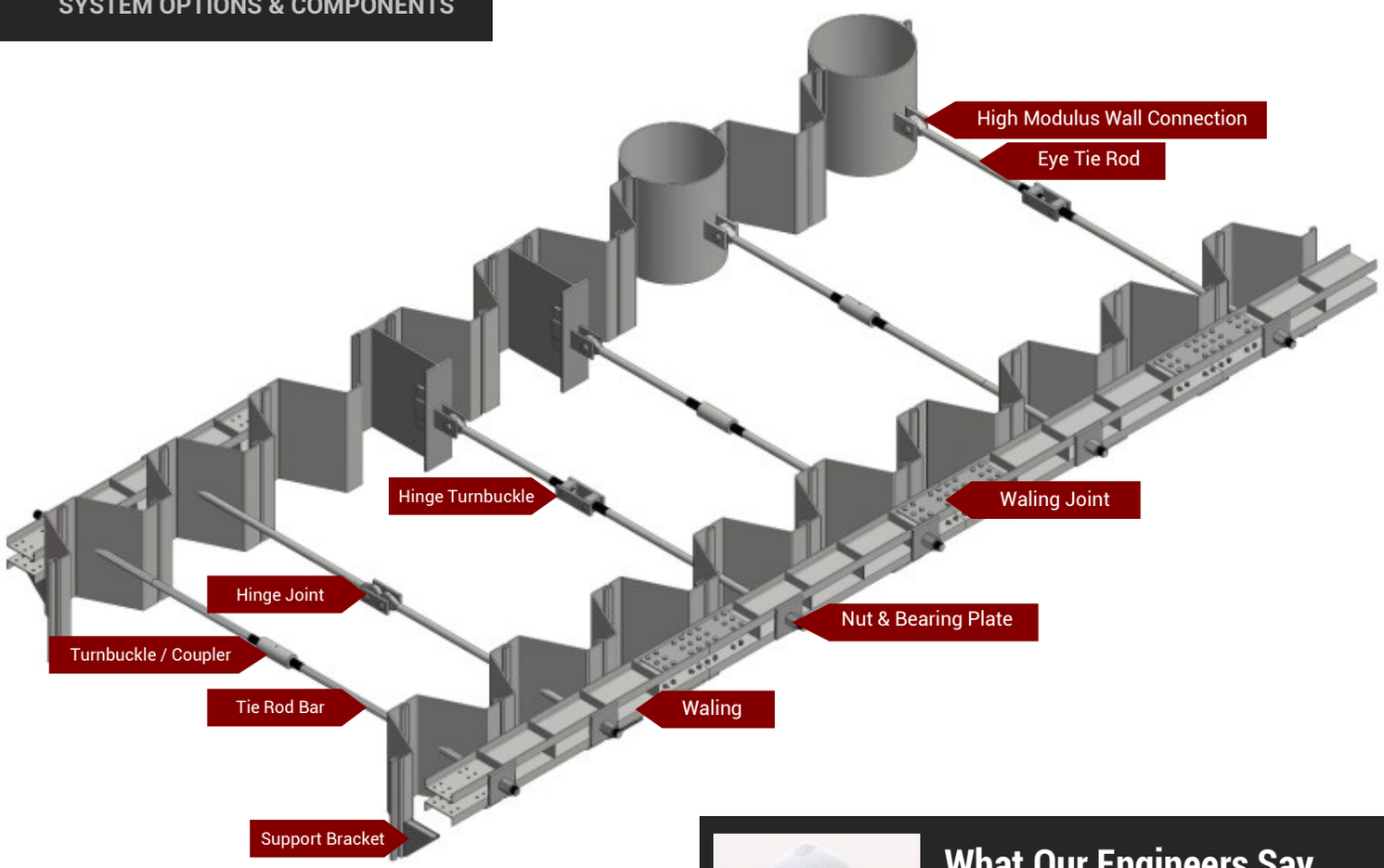
SBB TUGS JETTY, UAE

ESC is proud to offer a full suite of options for designing, fabricating and supplying full Tie Rod System Assemblies at competitive delivery schedules. Provided in this catalogue are the standard sizes for the typical components. 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 Configurations

- ✓ Sheet Pile Main Wall tied to Sheet Pile Anchor Wall
- ✓ Sheet Pile Main Wall tied to Concrete Block Anchor Wall
- ✓ H Pile Combi Wall tied to Sheet Pile Anchor Wall
- ✓ Pipe Pile Combi Wall tied to Sheet Pile Anchor Wall
- ✓ Other Special Configurations—Pipe Combi Wall tied to H Pile Combi Wall

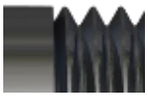
SYSTEM OPTIONS & COMPONENTS



What Our Engineers Say

"Unlike other companies, ESC can design and deliver an entire retaining wall system giving you a hassle-free, one-stop solution with no worries of interfacing issues between sheet pile and tie rod components."

TIE ROD BAR SIZING - CUT THREAD



Code	Thread	Bar ø	Mass	Grade 460		Grade 500		Grade 550		Grade 650		Grade 700	
		mm	kg/m	YL kN	UL kN	YL kN	UL kN	YL kN	UL kN	YL kN	UL kN	YL kN	UL kN
CT01	**M48x5**	48	14.2	656	869	713	926	784	1,069	926	1,212	998	1,254
CT02	**M56X5.5**	56	19.3	905	1,201	984	1,279	1,083	1,476	1,279	1,673	1,378	1,732
CT03	**M68X6**	68	28.5	1,367	1,813	1,486	1,932	1,635	2,229	1,932	2,527	2,081	2,616
CT04	**M72X6**	72	32.0	1,551	2,057	1,686	2,192	1,854	2,529	2,192	2,866	2,360	2,967
CT05	**M76X6**	76	35.6	1,746	2,315	1,898	2,467	2,088	2,847	2,467	3,226	2,657	3,340
CT06	**M85X6**	85	44.5	2,227	2,954	2,421	3,147	2,663	3,632	3,147	4,116	3,390	4,261
CT07	**M90X6**	90	49.9	2,520	3,342	2,739	3,561	3,013	4,109	3,561	4,657	3,835	4,821
CT08	**M95X6**	95	55.6	2,831	3,754	3,077	4,000	3,385	4,616	4,000	5,231	4,308	5,416
CT09	**M100X6**	100	61.7	3,160	4,190	3,435	4,465	3,778	5,152	4,465	5,839	4,808	6,045
CT10	**M105X6**	105	68.0	3,507	4,650	3,812	4,955	4,193	5,717	4,955	6,480	5,336	6,708
CT11	**M110X6**	110	74.6	3,872	5,134	4,208	5,471	4,629	6,312	5,471	7,154	5,892	7,407
CT12	**M115X6**	115	81.5	4,255	5,642	4,625	6,012	5,087	6,937	6,012	7,862	6,475	8,139
CT13	**M125X10**	125	96.3	4,712	6,248	5,121	6,658	5,634	7,682	6,658	8,706	7,170	9,014
CT14	**M130X10**	130	104.2	5,133	6,807	5,580	7,254	6,138	8,370	7,254	9,486	7,812	9,820
CT15	**M135X10**	135	112.4	5,573	7,390	6,058	7,875	6,663	9,086	7,875	10,298	8,481	10,661
CT16	**M140X10**	140	120.8	6,031	7,997	6,555	8,522	7,211	9,833	8,522	11,144	9,177	11,537
CT17	**M150X12**	150	138.7	6,785	8,997	7,375	9,587	8,112	11,062	9,587	12,537	10,325	12,980
CT18	**M155X12**	155	148.1	7,289	9,666	7,923	10,300	8,715	11,884	10,300	13,469	11,092	13,944
CT19	**M160X12**	160	157.8	7,811	10,358	8,490	11,038	9,339	12,736	11,038	14,434	1,187	14,943
CT20	**M165X12**	165	167.9	8,351	11,075	9,078	11,801	9,985	13,617	11,801	15,432	12,709	15,977

TIE ROD BAR SIZING - ROLLED THREAD

Code	Thread	Bar ø	Mass	Grade 460		Grade 500		Grade 550		Grade 650		Grade 700	
		mm	kg/m	YL kN	UL kN	YL kN	UL kN	YL kN	UL kN	YL kN	UL kN	YL kN	UL kN
RT01	**M48x5**	45	12.48	656	869	713	926	784	1,069	926	1,212	998	1,254
RT02	**M56x5**	53	17.32	905	1,201	984	1,279	1,083	1,476	1,279	1,673	1,378	1,732
RT03	**M68x6**	63	24.5	1,367	1,813	1,486	1,932	1,635	2,229	1,932	2,527	2,081	2,616
RT04	**M72x6**	68	28.5	1,551	2,057	1,686	2,192	1,854	2,529	2,192	2,866	2,360	2,967
RT05	**M76x6**	70	30.2	1,746	2,315	1,898	2,467	2,088	2,847	2,467	3,226	2,657	3,340
RT06	**M85x6**	80	39.5	2,227	2,954	2,421	3,147	2,663	3,632	3,147	4,116	3,390	4,261
RT07	**M90x6**	85	44.5	2,520	3,342	2,739	3,561	3,013	4,109	3,561	4,657	3,835	4,821
RT08	**M95x6**	90	49.9	2,831	3,754	3,077	4,000	3,385	4,616	4,000	5,231	4,308	5,416
RT09	**M100x6**	95	55.6	3,160	4,190	3,435	4,465	3,778	5,152	4,465	5,839	4,808	6,045
RT10	**M105x6**	100	61.7	3,507	4,650	3,812	4,955	4,193	5,717	4,955	6,480	5,336	6,708
RT11	**M110x6**	105	68.0	3,872	5,134	4,208	5,471	4,629	6,312	5,471	7,154	5,892	7,407
RT12	**M115x6**	110	74.6	4,255	5,642	4,625	6,012	5,087	6,937	6,012	7,862	6,475	8,139
RT13	**M125x10**	120	88.8	4,712	6,248	5,121	6,658	5,634	7,682	6,658	8,706	7,170	9,014
RT14	**M135x10**	130	104.2	5,573	7,390	6,058	7,875	6,663	9,086	7,875	10,298	8,481	10,661
RT15	**M140x10**	135	112.4	6,031	7,997	6,555	8,522	7,211	9,833	8,522	11,144	9,177	11,537
RT16	**M150x12**	145	129.6	6,785	8,997	7,375	9,587	8,112	11,062	9,587	12,537	10,325	12,980

TIE ROD BAR SIZING - UPSET THREAD

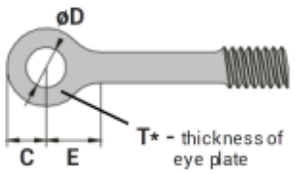
Code	Thread	Bar ø	Mass	Grade 460		Grade 500		Grade 550		Grade 650		Grade 700	
		mm	kg/m	YL kN	UL kN	YL kN	UL kN	YL kN	UL kN	YL kN	UL kN	YL kN	UL kN
UT01	**M48X5**	40	9.9	578	767	628	817	691	942	817	1,068	880	1,106
UT02	**M56X5.5**	45	12.5	732	970	795	1,034	875	1,193	1,034	1,352	1,113	1,400
UT03	**M60X5.5**	50	15.4	903	1,198	982	1,276	1,080	1,473	1,276	1,669	1,374	1,728
UT04	**M68X6**	55	18.7	1,093	1,449	1,188	1,544	1,307	1,782	1,544	2,019	1,663	2,091
UT05	**M72X6**	60	22.2	1,301	1,725	1,414	1,838	1,555	2,121	1,838	2,403	1,979	2,488
UT06	**M76X6**	65	26.1	1,526	2,024	1,659	2,157	1,825	2,489	2,157	2,821	2,323	2,920
UT07	**M85X6**	70	30.2	1,770	2,348	1,924	2,501	2,117	2,886	2,501	3,271	2,694	3,387
UT08	**M90X6**	75	34.7	2,032	2,695	2,209	2,872	2,430	3,313	2,872	3,755	3,093	3,888
UT09	**M95X6**	80	39.5	2,312	3,066	2,513	3,267	2,765	3,770	3,267	4,273	3,519	4,423
UT10	**M100X6**	85	44.5	2,610	3,461	2,837	3,688	3,121	4,256	3,688	4,823	3,972	4,994
UT11	**M105X6**	90	49.9	2,926	3,881	3,181	4,135	3,499	4,771	4,135	5,407	4,453	5,598
UT12	**M110X6**	95	55.6	3,261	4,324	3,544	4,607	3,899	5,316	4,607	6,025	4,962	6,238
UT13	**M115X6**	100	61.7	3,613	4,791	3,927	5,105	4,320	5,890	5,105	6,676	5,498	6,912
UT14	**M125X10**	105	68.0	3,983	5,282	4,330	5,628	4,762	6,494	5,628	7,360	6,061	7,620
UT15	**M130X10**	110	74.6	4,372	5,797	4,752	6,177	5,227	7,127	6,177	8,078	6,652	8,363
UT16	**M135X10**	115	81.5	4,778	6,336	5,193	6,751	5,713	7,790	6,751	8,829	7,271	9,140
UT17	**M140X10**	120	88.8	5,202	6,899	5,655	7,351	6,220	8,482	7,351	9,613	7,917	9,953
UT18	**M150X12**	125	96.3	5,645	7,486	6,136	7,977	6,750	9,204	7,977	10,431	8,590	10,799
UT19	**M155X12**	130	104.2	6,106	8,097	6,637	8,628	7,300	9,955	8,628	11,282	9,291	11,680
UT20	**M160X12**	135	112.4	6,584	8,731	7,157	9,304	7,873	10,735	9,304	12,167	10,020	12,596
UT21	**M165X12**	140	120.8	7,081	9,390	7,697	10,006	8,467	11,545	10,006	13,085	10,776	13,547

CONNECTION OPTIONS

Steel Grades

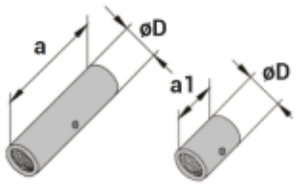
The standard steel grade for Tie Rod System Connection options is S355. The sizing of components is designed for Grade 550, cut thread. ESC can provide full design options for other grades (Grade 460, 500, 650 & 700) and thread forms.

Eye Tie Rod



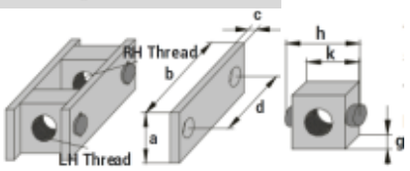
Eye Tie Rods are special bars with upset threads on one end, with the other end of the bar pressed and drilled into a flat eye shape which can be used to connect to a hinge joint or connection plate for high modulus walls.

Turnbuckle/Coupler



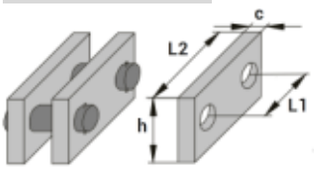
Turnbuckles and couplers are the most common connections to extend the full assembly length of the tie rod system. Typical adjustment length is 90mm, but greater lengths are available on request. The minimum engagement length for full joint strength is one outer diameter.

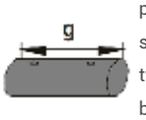
Hinge Turnbuckle



Hinge Turnbuckles are utilised to account for possible settlement, as the two connection points are hinged.

Hinge Joint



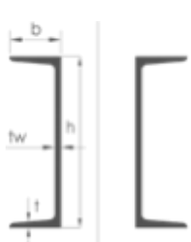


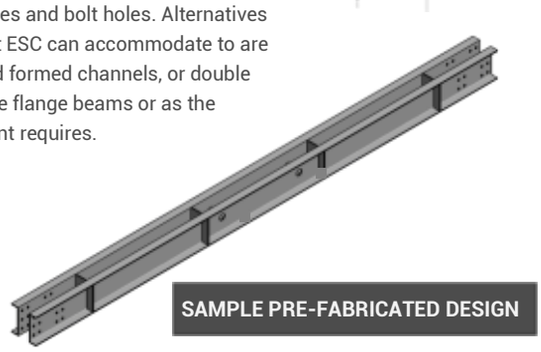
Hinge Joints are generally provided for tie rods with extreme overall lengths or possible settlements. The standard design includes two eye tie rods connected by hinge plates and pins.

Thread	Eye Tie Rods					Turnbuckle			Coupler			Hinge Turnbuckle								Hinge Joint					
	Code	C	T*	E	øD	Code	a	D	Code	a1	D	Code	a	b	c	d	g	k	h	Code	c	h	L1	L2	g
M48X5	**ETR01**	55	36	76	39	**TB01**	290	90	**CP01**	110	90	**HT01**	90	395	35	240	55	100	220	**HJ01**	35	90	130	230	165
M56X5.5	**ETR02**	61	41	83	44	**TB02**	310	100	**CP02**	130	100	**HT02**	100	430	45	255	60	100	240	**HJ02**	45	100	145	260	190
M60X5.5	**ETR03**	68	43	97	50	**TB03**	320	110	**CP03**	140	110	**HT03**	110	445	50	260	75	110	250	**HJ03**	45	110	160	280	190
M68X6	**ETR04**	75	46	105	55	**TB04**	340	120	**CP04**	160	120	**HT04**	125	485	50	270	80	120	270	**HJ04**	50	125	170	310	205
M72X6	**ETR05**	81	51	113	60	**TB05**	350	130	**CP05**	170	130	**HT05**	135	500	50	280	80	120	270	**HJ05**	50	135	185	330	210
M76X6	**ETR06**	88	56	120	65	**TB06**	350	135	**CP06**	170	135	**HT06**	145	510	50	280	80	120	270	**HJ06**	50	145	200	335	215
M85X6	**ETR07**	95	61	133	70	**TB07**	380	150	**CP07**	200	150	**HT07**	170	555	50	295	95	170	320	**HJ07**	50	170	210	380	220
M90X6	**ETR08**	101	66	141	75	**TB08**	380	160	**CP08**	200	160	**HT08**	185	565	50	295	95	170	320	**HJ08**	50	185	225	410	225
M95X6	**ETR09**	108	71	148	80	**TB09**	400	165	**CP09**	220	165	**HT09**	200	595	50	305	95	180	330	**HJ09**	50	200	240	430	230
M100X6	**ETR10**	115	71	161	85	**TB10**	410	175	**CP10**	230	175	**HT10**	215	615	50	310	105	190	340	**HJ10**	50	215	260	460	230
M105X6	**ETR11**	121	76	170	89	**TB11**	430	185	**CP11**	250	185	**HT11**	235	645	50	325	115	205	355	**HJ11**	50	235	275	500	235
M110X6	**ETR12**	128	81	178	94	**TB12**	430	190	**CP12**	250	190	**HT12**	250	655	50	320	115	205	355	**HJ12**	50	250	290	540	240
M115X6	**ETR13**	135	86	186	100	**TB13**	450	200	**CP13**	270	200	**HT13**	270	685	50	335	125	220	370	**HJ13**	50	270	300	560	245
M125X10	**ETR14**	143	92	193	105	**TB14**	470	210	**CP14**	290	210	**HT14**	295	725	50	345	135	230	380	**HJ14**	50	295	320	570	250
M130X10	**ETR15**	149	97	200	110	**TB15**	470	220	**CP15**	290	220	**HT15**	315	735	50	340	150	260	410	**HJ15**	50	315	330	630	255
M135X10	**ETR16**	156	97	209	115	**TB16**	480	225	**CP16**	300	225	**HT16**	335	755	50	345	160	280	430	**HJ16**	50	335	345	650	255
M140X10	**ETR17**	162	102	225	120	**TB17**	500	235	**CP17**	320	235	**HT17**	355	785	50	360	160	280	430	**HJ17**	50	355	355	680	260
M150X12	**ETR18**	170	107	232	125	**TB18**	540	250	**CP18**	360	250	**HT18**	395	845	50	390	170	290	440	**HJ18**	50	395	370	740	265
M155X12	**ETR19**	176	112	246	130	**TB19**	560	255	**CP19**	380	255	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
M160X12	**ETR20**	182	117	253	135	**TB20**	560	265	**CP20**	380	265	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
M165X12	**ETR21**	189	122	260	140	**TB21**	580	275	**CP21**	400	275	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

WALING CHANNEL

The Waling Assembly transmits forces from the sheet piling to the anchorage whilst simultaneously aligning and stiffening the wall. ESC offers standard hot rolled channel sections presented, but can also provide full options such as splicing plates and bolt holes. Alternatives that ESC can accommodate to are cold formed channels, or double wide flange beams or as the client requires.





SAMPLE PRE-FABRICATED DESIGN

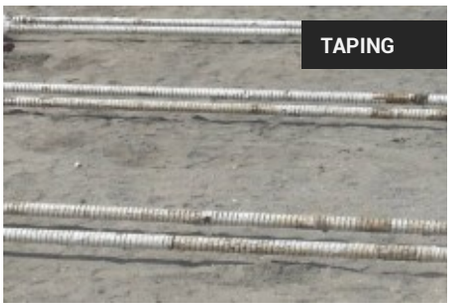
Section	Values for a single channel section								
	h	b	t_w	t	Sectional Area	Mass per Unit Length	Moment of Inertia	Section Modulus	Coating Area
	mm	mm	mm	mm	cm^2	kg/m	cm^4	cm^3	m^2/m
WC01	180	70	9.0	10.5	29.29	22.99	1,370	**152**	0.60
WC02	200	73	7.0	11.0	28.83	22.63	1,780	**178**	0.65
WC03	200	75	9.0	11.0	32.83	25.77	1,914	**191**	0.66
WC04	220	77	7.0	11.5	31.84	24.99	2,394	**218**	0.71
WC05	220	79	9.0	11.5	36.24	28.45	2,571	**234**	0.71
WC06	250	78	7.0	12.0	34.91	27.40	3,359	**269**	0.77
WC07	250	80	9.0	12.0	39.91	31.33	3,620	**290**	0.78
WC08	280	82	7.5	12.5	40.02	31.42	4,753	**340**	0.85
WC09	280	84	9.5	12.5	45.62	35.81	5,118	**366**	0.85
WC10	320	88	8.0	14.0	48.50	38.07	7,511	**469**	0.95
WC11	320	90	10.0	14.0	54.90	43.10	8,057	**504**	0.95
WC12	360	96	9.0	16.0	60.89	47.80	11,874	**660**	1.05
WC13	360	98	11.0	16.0	68.09	53.45	12,652	**703**	1.06
WC14	400	100	10.5	18.0	75.04	58.91	17,577	**879**	1.14
WC15	400	102	12.5	18.0	83.04	65.19	18,644	**932**	1.15

CORROSION PROTECTION OPTIONS

Corrosion Protection of Tie Rod Systems can be achieved with the following methods or a combination of these methods. Other less common options include encapsulation and Teflon coating.

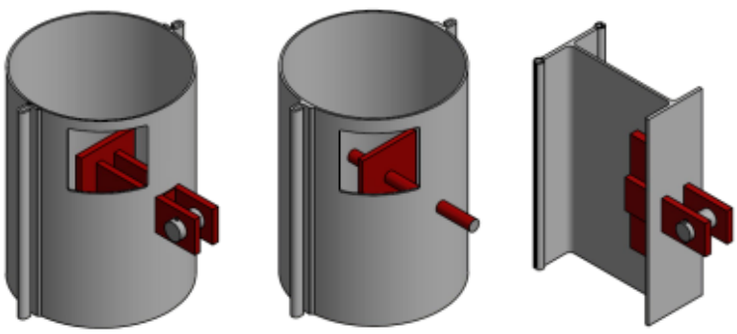
GALVANIZATION

EPOXY COATING


TAPING

HIGH MODULUS WALL CONNECTIONS

ESC can design and fabricate a wide variety of Tie Rod connections for both King Pipe & H Piles that are easy to handle and install. Parameters required in the design of the connection are: preferred connection type, King Pile sizing and Tie Rod Bar sizing and strength. Presented are some typical designs but ESC can offer a full suite of options depending on the application and project requirements.



OTHER ACCESSORIES

ESC is able to supply the following accessories in addition to those specified in the previous sections:

- ✓ Captive Nuts
- ✓ Swivel Nuts
- ✓ Angle Seating
- ✓ Bearing Plates
- ✓ Support Brackets
- ✓ Tie Rod Spreader Beam
- ✓ Washers
- ✓ Spacers (for Z Piles)

TIE ROD SPREADER BEAM

PROJECT REFERENCES

SBB TUGS JETTY, UAE

OT2 OIL TERMINAL, UAE

WATCO BREAKWATER BERTH, USA

JUBAIL SUPPLY BASE, SAUDI ARABIA

MARINE FENDER SYSTEMS

INTRODUCTION

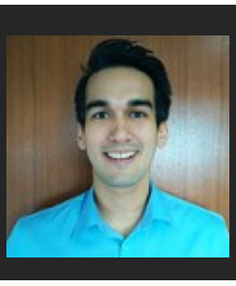
Marine Rubber Fenders are critical for the energy absorption of a berthing vessel into the berth structure. A single tanker can be over 100,000 tons so safe energy absorption in worst case scenarios is paramount. The marine fenders primary job is to protect the berthing structure without damaging the vessel hull for all potential vessel types, sizes and approach scenarios. ESC offers a full range of fender options to compliment its marine steel piling products.

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 UMHW PE Pads, Closed Steel Frames
- ✓ Anchoring Bolts & Brackets
- ✓ Shear, Weight & Tension Chains
- ✓ Cathodic Protection Anodes

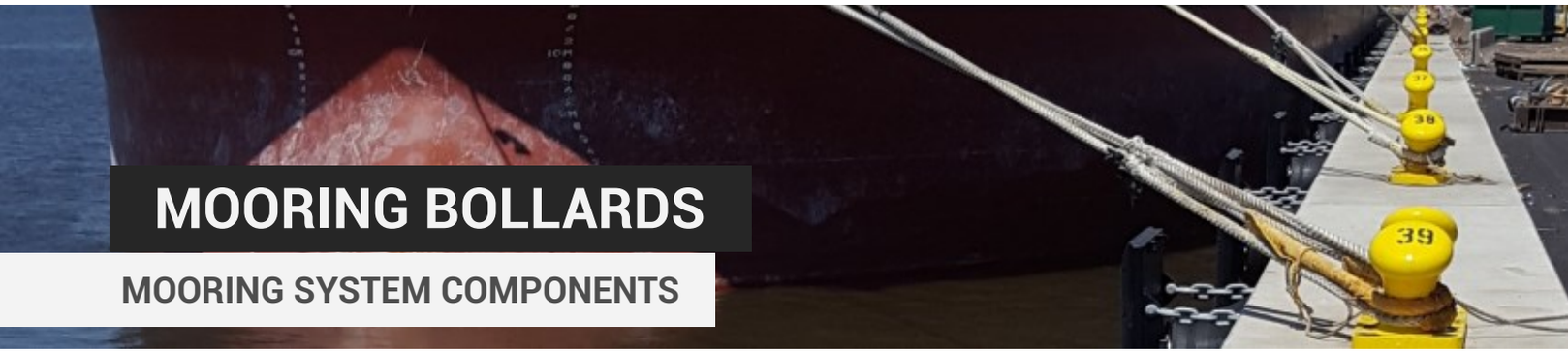
ESC offers complete Marine Rubber Fender Systems

- ✓ 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
- ✓ Intimate understanding for integration into berthing structure
- ✓ 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 in-house testing equipment all the way up to 2,000 metric tons compression



What Our Engineers Say

"ESC's design engineers around the world are well equipped to provide a competitive end-to-end engineered fender product and solution"



MOORING BOLLARDS

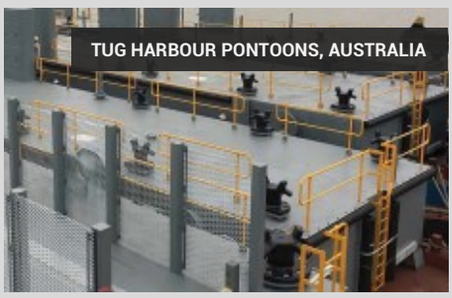
MOORING SYSTEM COMPONENTS

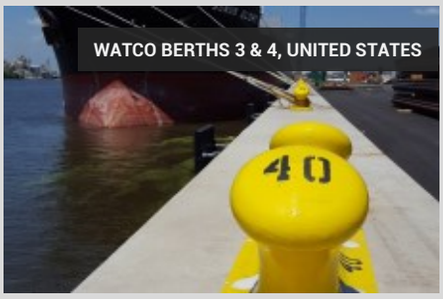
ESC offers a full range of Mooring Bollards

- ✓ 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

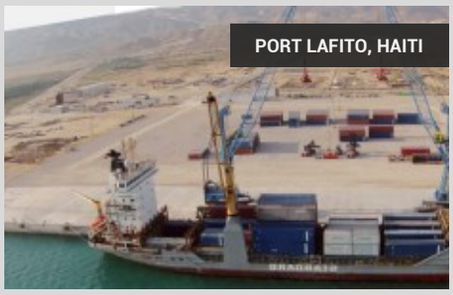
Section	Rating (metric tons)															
	5	10	15	20	25	30	35	50	70	75	80	100	150	200	250	300
T Head		✓	✓		✓	✓	✓	✓			✓	✓	✓	✓	✓	✓
T-Horn			✓			✓		✓			✓	✓	✓	✓		
Kidney			✓			✓		✓				✓	✓	✓		
Cleat	✓	✓	✓	✓	✓	✓	✓									
Double Bitt				✓		✓		✓		✓		✓	✓	✓		
Single Bitt		✓	✓			✓		✓		✓		✓	✓	✓		
Pillar		✓	✓			✓		✓		✓		✓	✓	✓		
Pillar(Jpn)			✓		✓		✓	✓	✓			✓	✓	✓		
T-Head(Jpn)	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓	✓		
Tricorn						✓		✓				✓	✓	✓	✓	✓

PROJECT REFERENCES


TUG HARBOUR PONTOONS, AUSTRALIA



WATCO BERTHS 3 & 4, UNITED STATES


PORT LAFITO, HAITI

CATHODIC PROTECTION

CORROSION PROTECTION METHODS

Cathodic Protection involves electrically connecting a sacrificial element that preferentially corrodes instead of the sheet pile or steel structure. Sacrificial elements are typically constituted of 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)

COATINGS

CORROSION PROTECTION SYSTEMS

WATCH THE ESC PIPE PILE COATING SPRAY APPLICATION PROCESS

OIL TANK PROTECTION BARRIER WITH FIREPROOF COATING, NETHERLANDS

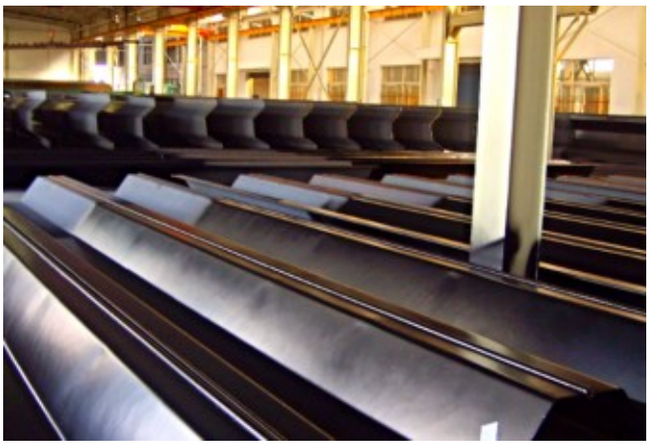
ESC is committed to providing high quality Corrosion Protection Systems that prevent corrosion and extend the life of steel structures: whether it be sheet piles, combined walls, tie rod systems or steel structure fabrications.

The ESC Advantage

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

COAL TAR EPOXY

Coal Tar Epoxy (CTE) Coatings are the most commonly utilised corrosion protection for steel sheet piles and common in steel structures, due to their low-cost, high resistance to exposures in sea water, oil and chemicals. ESC can provide competitive solutions to the project requirements. CTE offers excellent water and crude oil resistance, corrosion resistance and good resistance against chemically polluted water. It can be applied and can also cure at low temperatures (below freezing point is possible). CTE also offers good resistance to abrasion. ESC uses internationally recognized coatings qualified to numerous standards. ESC can recommend the most suitable and economical coating system and also ensure that the coating is adequately protected during handling and transportation.



GLASS FLAKE EPOXY COATING

Glass Flake Epoxy Coatings are ideal for applications where there is expected to be impact and high abrasion environments. The product is typically shot blasted to the required surface roughness and then paint is applied via spray. Several layers may be required to obtain the Dry Film Thickness (DFT) specification. ESC applies strict quality controls and careful packing to ensure the coating is in pristine condition when the product arrives on your site.

HOT DIP GALVANIZING & DUPLEX SYSTEMS

Hot Dip Galvanization may be appropriate or required for certain applications. The process of Hot Dip Galvanization involves coating the steel product with a layer of zinc. This is achieved by immersing the steel products in a hot bath of molten zinc producing an aesthetic metallic silver surface. ESC has experience and the strategic partnerships to effectively apply such systems to it's sheet piles, tie rod systems and steel structures. ESC can also offer duplex coating systems, where the steel structure is galvanized then coated.

ESC CONNECTORS

SPECIFICATION

HOT ROLLED

ESC Hot Rolled Interlocks can be used in a variety of configurations. Note that they can also be used to interlock with non-ESC sheet piles. Please contact engineering@escpile.com for more information.

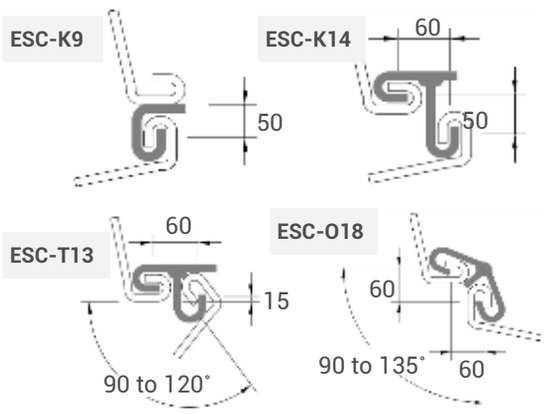
ESC-6E ESC-6J ESC-9E ESC-9J ESC-9HJ ESC-10HJ

Compatibility engaging with

Engaged with	ESC-6E	ESC-9E	ESC-6J	ESC-9J	ESC-9HJ	ESC-10HJ
ESC-HRZ14-770 to ESC_HRZ38-700	✓	✓	×	×	×	×
Type IIIw & Type IVw	×	×	✓	✓	×	×
NS-SP-10H & NS-SP-25H	×	×	×	×	✓	✓

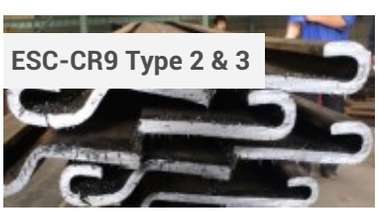
COLD FORMED

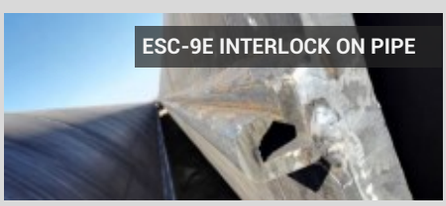
Type 1 Type 2 Type 3

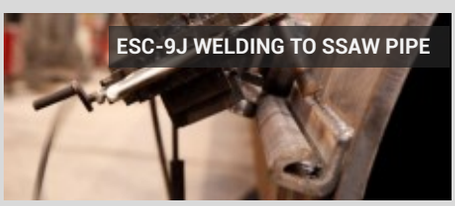


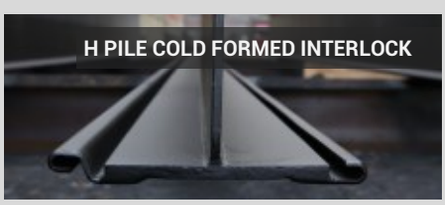
Compatibility engaging with

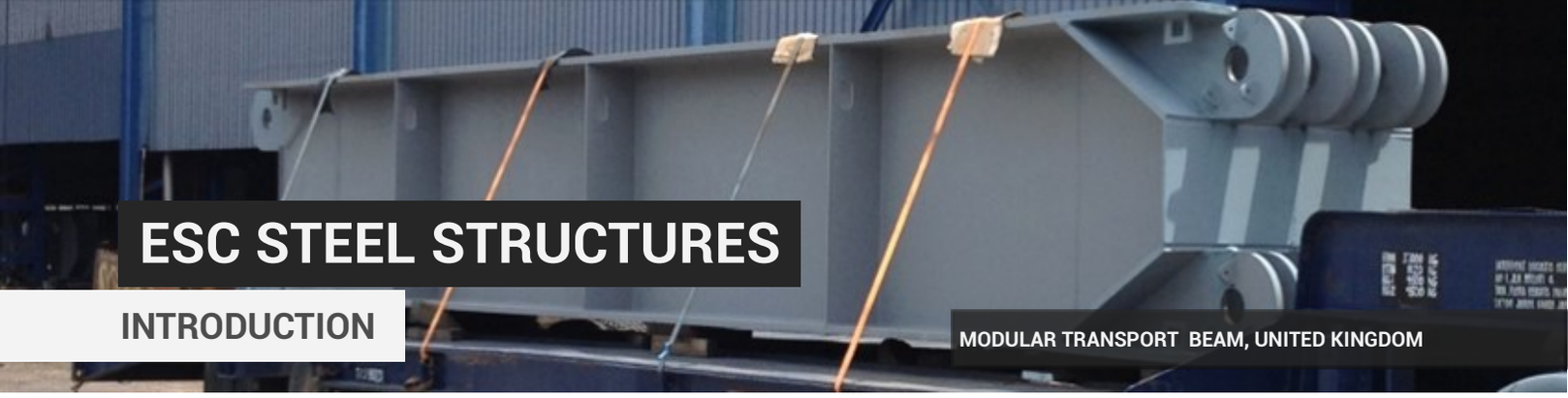
Engaged with	ESC-CR6	ESC-CR9	ESC-CR12	ESC-CR16
ESC-CRZ11 to ESC-CRZ13	✓	×	×	×
ESC-CRZ14 to ESC-CRZ35	×	✓	×	×
ESC-CRZ26 to ESC-CRZ36	×	×	✓	×
ESC-CRZ36 to ESC-CRZ50	×	×	×	✓
ESC-CRU8 to ESC-CRZ12	✓	×	×	×
ESC-CRU13 to ESC-CRU32	×	✓	×	×
ESC-CRU25 to ESC-CRU29	×	✓	✓	×
ESC-CRU35 to ESC-CRU46	×	×	×	✓











ESC STEEL STRUCTURES

INTRODUCTION

MODULAR TRANSPORT BEAM, UNITED KINGDOM

ESC has expanded over the last 5 years to fabricating and supplying steel structures for various industries. ESC is committed to delivering timely fabrication of steel structures and components to client specifications, standards and delivery requirements.

ESC's services to complement it's steel structure fabrication capability includes:

- ✓ Detailed Design Drafting Services—shop drawing, connection detailing, installation drawings
- ✓ Structural Calculations
- ✓ Finite Element Analysis
- ✓ Raw Material Procurement
- ✓ Inspection & Testing (3rd Party Independent or ESC)
- ✓ Logistics
- ✓ Full Quality Documentation and MDR with full traceability
- ✓ Project Management/Coordination with client and other contractors

Steel Structure Portfolio

- ✓ Port Structures—Dolphins, walkways, fender structures
- ✓ Offshore Structures—Pontoons, Wind Turbine Foundation
- ✓ Pre-Fabricated Steel Building Structures
- ✓ Steel Bridge components— girders, arch, columns, formwork
- ✓ Pressure Vessels & Process Modules
- ✓ Steel Towers & Jacket Structures
- ✓ Heavy Duty Handling Structures
- ✓ Steel Caissons
- ✓ Steel Storage Silos & Tanks
- ✓ Special Fabrications
- ✓ Miscellaneous Components: access ladders, guard rails, scaffolding

Company Certifications

ESC and its prequalified factories offer a diversified set of international certifications enabling it to undertake complex projects around the world in adherence to country and/or region specific standards. The certifications cover special fabrication, welding, testing, quality management systems and corrosion protection systems.

ESC Personnel Certifications

ESC's highly skilled and multi-disciplinary personnel are adept to handling projects of various scopes, complexities and requirements. ESC's continual investment in company and personnel certification translates to high quality products that meets the most rigorous international standards.

BRIDGE STRUCTURE

STEEL STRUCTURES

KUMUSI BRIDGE, PAPUA NEW GUINEA

ESC has a growing track record of providing high quality bridge structure fabrications in conformance to various international and project standards. Due to a wide client reach, ESC is able to offer a wide range of steel grades for example ASTM A709-50W Weathering Steel and also conform to regional legal requirements such as CE marking. Other important components can be provided such as formwork, elastomeric bearing sets, bolting, hand rails and scuppers. A full suite of CAD tools, state of the art machinery, skilled operators and welders, certified quality team, knowledgeable logistics personnel, project management staff and calibrated dimensional measurement equipment all ensure good end product quality delivered on time and on budget.

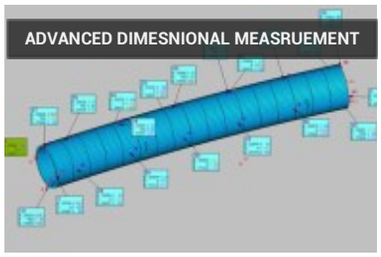
Bridge Structure Capabilities

- ✓ Heavy truss structures
- ✓ Multiple plate girders
- ✓ Trapezoidal box girders
- ✓ Movable Bridges - eg Bascule, Swing
- ✓ Box or Pipe Arch
- ✓ Temporary or Modular bridges
- ✓ Special Bridges

3D CAD SOFTWARE FOR CLIENT MODELS

FABRICATION

TRIAL ASSEMBLY



ADVANCED DIMESNIONAL MEASRUEMENT

CLIENT INSPECTION

HOT DIP GALVANIZATION & PROTECTIVE PACKING

LOADING SUPERVISION

SITE INSTALLATION

PROJECT REFERENCES

AL ITTIHAD FOOTBRIDGE, UAE

4 BRIDGES IN ORO PROVINCE, PNG

GIRDER & FORMWORKS, AUSTRALIA

PORT & OFFSHORE STRUCTURES

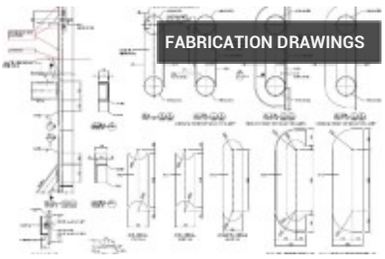
STEEL STRUCTURES

MARE HARBOR DOLPHIN PILES, UNITED KINGDOM

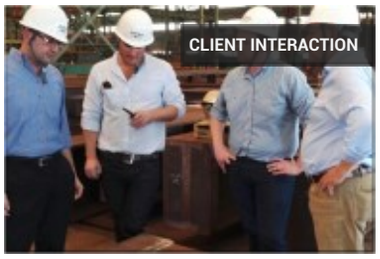
ESC can provide full fabricated sets and assemblies for the construction and upgrade of port facilities alongside its extensive piling product range. ESC has worked with reputable clients around the world on prestigious and challenging projects.

Capabilities

- ✓ Pipe piling with fabricated components—shear rings, grouting pipes, lifting eyes, flange mounting, stiffeners
- ✓ Fender Mounting Brackets & Structures
- ✓ Spreader Beams and handling equipment
- ✓ Cast components— bollards, anodes
- ✓ Walkways—gangway, catwalks complete with stairs, grating, hand rails
- ✓ Mechanical structures
- ✓ Miscellaneous components— access ladders, signage, edge protectors, chains


FABRICATION DRAWINGS

FABRICATION


CLIENT INTERACTION

COATING

DIMENSIONAL INSPECTION

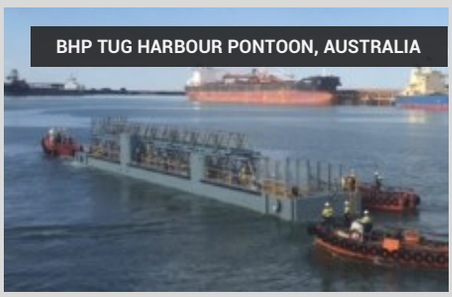
PROTECTIVE PACKING & LOADING SUPERVISION

PROJECT REFERENCES

HINKLEY POINT C JETTY PILES, UK

BHP TUG HARBOUR PONTOON, AUSTRALIA

PORT ACTUATION CYLINDERS, AUSTRALIA


BHP TUG HARBOUR PONTOON, AUSTRALIA

BHP TUG HARBOUR GANGWAY, AUSTRALIA

MARE HARBOUR DOLPHIN PILES, FALKLANDS

PREFABRICATED STEEL BUILDING

STEEL STRUCTURES

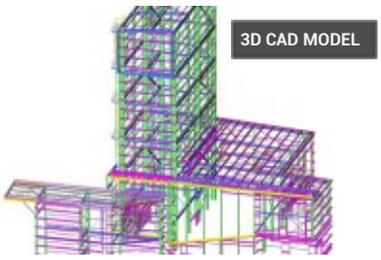
SP BREWERY UPGRADES, PAPUA NEW GUINEA

Prefabricated steel buildings offer numerous advantages to both conventional building materials and on-site construction. Building erection can take a fraction of the time—as low as one third. ESC offers a reliable solution to such prefabricated structures.

Capabilities

- ✓ Commercial and Industrial buildings—factories, processing plants, offices, warehouses
- ✓ Agricultural buildings—barns, dairies, equipment storage sheds, offices and more
- ✓ Aircraft Hangers for planes, jets and helicopters
- ✓ Automotive, boat and other vehicle dealerships

The building systems can provide numerous practical advantages like column free design for maximum work space, great structural integrity against natural force such as wind and snow.


3D CAD MODEL

FABRICATION

CLIENT INTERACTION

COATING

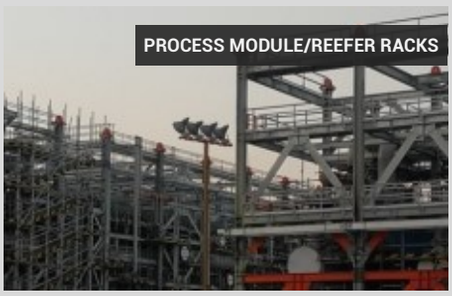
PROTECTIVE PACKING

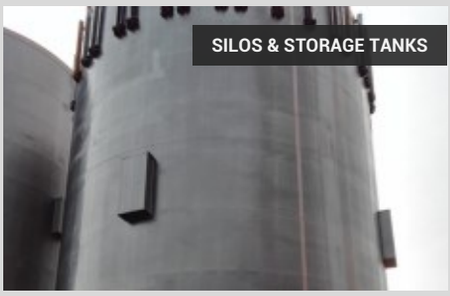
HOT DIP GALVANIZATION & PROTECTIVE PACKING

OTHER CAPABILITIES

STEEL STRUCTURES

PRESSURE VESSEL


PROCESS MODULE/REEFER RACKS


SILOS & STORAGE TANKS

TOWERS & JACKET STRUCTURES

HEAVY DUTY FABRICATION

LARGE STEEL CAISSONS

WATCH TRENCH BOX ASSEMBLY AND INSTALLATION ANIMATION

ABU DHABI SHORING WORKS, UAE

ESC TRENCH BOX

ESC SHORING SYSTEMS

ESC has fully developed its Trench Box Series (also commonly known as Trench Shields) used as a two-sided excavation support system. It is a used as a temporary earth retaining structure which allows safe access to an excavation that has been cut vertically. Stability is ensured within the trench whilst providing a minimal excavation footprint for works to be carried out. This helps prevent any damage to nearby utilities and structures.

ESC Trench Box Features

- ✓ Comprehensive Range of Sizes
- ✓ Four Point Lifting System
- ✓ Tapered Toe with Reinforced Top Rails
- ✓ Through Wall connections with reinforced collars
- ✓ Highly Resistant to Installation Loads from an Excavator or other equipment
- ✓ Ease of assembly & disassembly despite numerous reuses
- ✓ Simple components that are easily replaceable or repairable
- ✓ Custom box sizes are available.

What Our Engineers Say

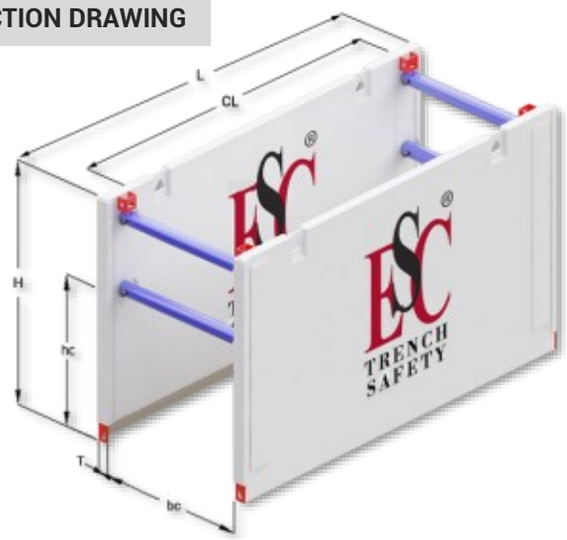
"ESC trench boxes are designed to be handled and installed by an excavator. No special equipment or expertise is required so it is fast and easy to install and ideal for pipe and cable works in most ground conditions."

COMMON SIZES

Type	Model	Box Length L (m)	Box Height H (m)	Panel Thickness T (mm)	Clear Height CH (m)	Clear Length CL (m)	Safe Working Load (kPa)	Panel Weight kg
Top Box	**TT40/10/16**	4.0	1.6	100	-	3.6	40	702
Base Box	**TB40/10/24**	4.0	2.4	100	1.47	3.6	40	1007

* Base and top box in 3.0m and 3.5m length available. Custom boxes available on request.

SECTION DRAWING

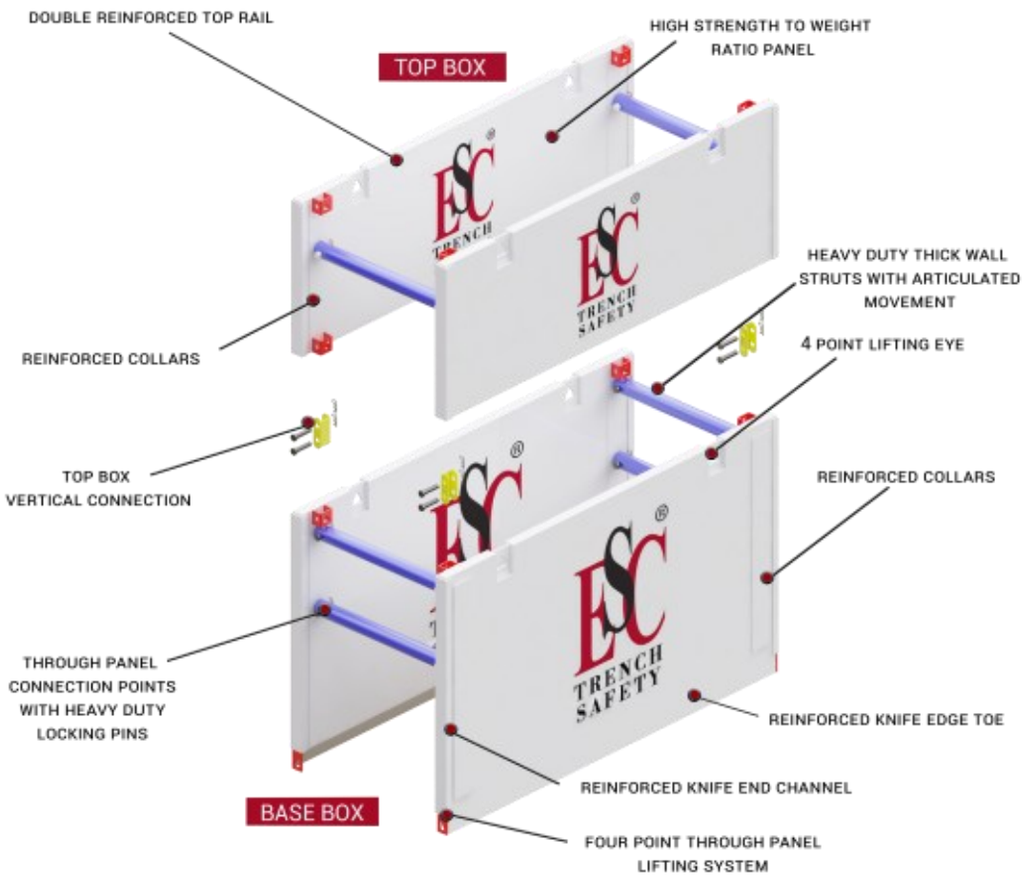


Safety Guide

- ✓ Soil pressure must be assessed by qualified professional engineer.
- ✓ Assembly as per ESC procedures
- ✓ Tapered Toe with Reinforced Top Rails
- ✓ Recommended maximum depth 5.6m

PROJECT REFERENCES

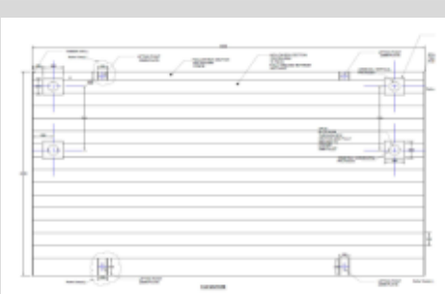
DESIGN VERIFICATION

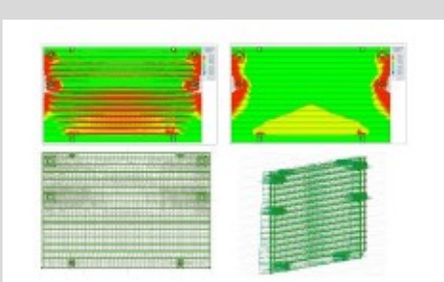


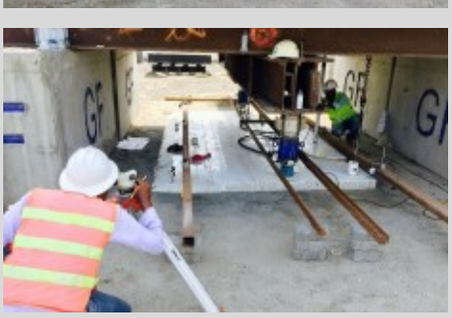
ESC completed third party verified structural calculations and professionally completed Finite Element Analysis of the proprietary ESC Trench Box design system, with special attention on the spreader connections to the panels. A wide range of loading conditions was simulated to verify the robustness of the system.

The international standards applied in the structural design included: EN 1990: Eurocode 0, EN 1991: Euro-code 1, EN 1992: Euro -code 2, EN 1997: Euro-code 7, EN 13331-1 and EN 13331-2.

Full scale field test by a licensed independent third party was also completed to verify the design calculations with a focus on the most critically loaded areas and potential weak points. A specially designed test rig was constructed to simulate the soil loads with a series of strain gauges situated throughout the trench panel structure to measure deflection of the structure under various loading combinations.



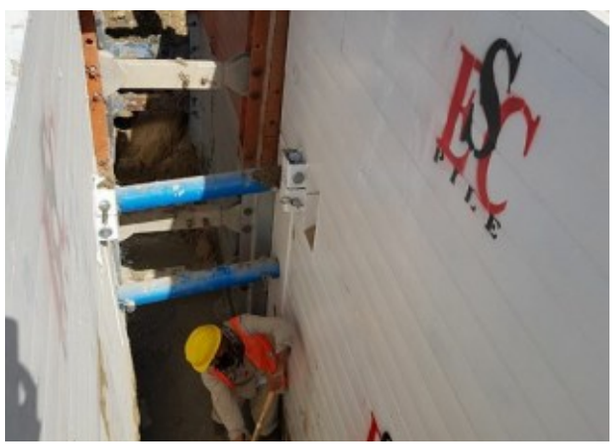




ESC TOP EXTENSION BOX

To provide safe access to excavations of above 2m, ESC has developed a range of Top Extension Boxes, compatible with the standard Trench Box range with easy assembly and disassembly.

PROJECT & PRODUCT PHOTOS



STRUTTING SYSTEM

INTRODUCTION

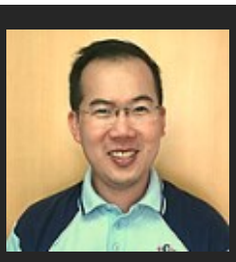
JOHOR CONVENTION CENTRE, MALAYSIA

ESC has been involved in difficult project sites from its inception over 20 years ago. Part of the ESC Sheet Piling Solution has often included full design of the strutting system. Using the in-house expertise of ESC's global network of engineers, ESC is well equipped to design and also fabricate full strutting system assemblies. ESC's capabilities include:

- ✓ Drafting Services—shop drawing, layout
- ✓ Structural Calculations—completed by certified Professional Engineers
- ✓ Finite Element Analysis
- ✓ Raw Material Procurement
- ✓ Fabrication to international standards and project specific requirements.
- ✓ Inspection & Testing (3rd Party Independent or ESC)
- ✓ Logistics
- ✓ Full Quality Documentation and MDR with full traceability
- ✓ Project Management and Coordination with client & contractors

Strutting System Capabilities

- ✓ Standard Struts
- ✓ Reusable Modular Struts
- ✓ Hydraulically Activated Struts
- ✓ Pipe or Beam Strutting Sections
- ✓ Project Specific Novel Designs



What Our Engineers Say

"ESC first designed, fabricated supplied and successfully installed its first pre-fabricated strutting system in 1993 adjacent to a Singapore landmark with a 10m excavation depth."

PROJECT PHOTOS

JBCC, MALAYSIA

CIRCULAR COFFERDAM, UAE

M.WORLDWIDE BASEMENT, MALAYSIA

OCBC BUILDING, MALAYSIA

SHAH GAS FIELD, UAE

AETNA BUILDING, MALAYSIA

WATERTIGHTNESS

METHODS & DESIGN

ADELAIDE HIGHWAY CONSTRUCTION WATERTIGHT COFFERDAM, AUSTRALIA

Achieving water tightness of a sheet pile wall can be challenging, given the site conditions, difficulty in sealant applications, high interlock temperatures during driving and other factors. ESC has addressed these issues through its design and extensive experience and is willing to deliver both standard and tailored solutions to project requirements.

Sheet Pile Design

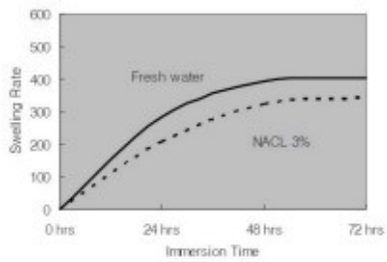
Through either Hot Rolling, which results in a tight fit interlock with a greater number of contact points, or Cold Forming, where the clutch turnover is optimised geometrically, ESC ensures that the sheet pile design allows minimal seepage whilst still providing enough room for easy driving.

ESC offers the widest sheet piles in the world, with up to 70% fewer clutches and thus leak paths compared to a standard U type wall. Tie Backs also typically provide another leak path, which can be mitigated by designing the tieback to act at the retained side of the main wall.

ESC-DPS-500 Interlock Sealant

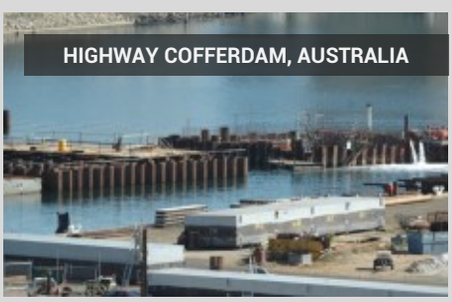
ESC's DPS-500 sealant is a hydrophilic polyurethane which has effective application for sheet pile interlocks. It has a high expansion coefficient with over 400% volume increase.

It is a one component system making it easy to handle and apply. It is both lightweight with good surface adhesion which allows easy application even in confined spaces. It can be applied in virtually all weather conditions. It has been extensively used in both freshwater and seawater environments and swells to about 200% volume in 24 hours or less and over 300% volume within 48-72 hours of immersion.



SG MUDA CUTOFF WALL, MALAYSIA

SABAK BERNAM COFFERDAM, MALAYSIA



HIGHWAY COFFERDAM, AUSTRALIA

DESIGN & PRODUCTION STANDARDS

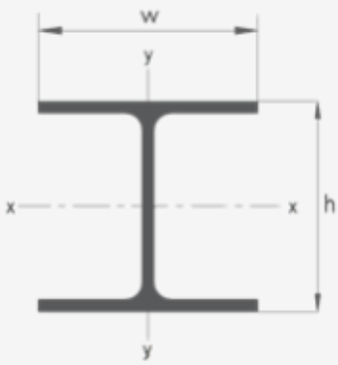
Subject	Standard	Title
Design	BS 5950	Structural use of steelwork in building.
Design	BS EN 1003-5	Design of steel structures - Part 5:Piling.
Manufacturing	API 5L PSL1	Specification for Line Pipe
Manufacturing	API 5L PSL 2	Specification for Line Pipe
Manufacturing	API 2B	Specification for the Fabrication of Structural Steel Pipe
Manufacturing	ASTM A252	Standard Specification for Welded and Seamless Steel Pipe Piles
Manufacturing	ASTM A671	Standard Specification for Electric-Fusion-Welded Steel Pipe for Atmospheric and Low Temperatures.
Manufacturing	ASTM A691	Standard Specification for Carbon and Alloy Steel Pipe, Electric-Fusion-Welded for High-Pressure Service at High Temp.
Manufacturing	EN 10219	Cold Formed Welded Structural Hollow Sections of Non-Alloy and Fine Grain Steels.
Manufacturing	EN 10210	Hot Finished Structural Hollow Section of Non-Alloy and Fine Grain Steels.
Manufacturing	EN 10208	Steel Pipes for Pipelines for Combustible Fluid.
Manufacturing	BS EN 10248	Hot Rolled Sheet Piling of Non Alloy Steels.
Manufacturing	BS EN 10249	Cold Formed Sheet Piling of Non-Alloy Steels
Manufacturing	AS 1163	Structural Steel Hollow Sections.
Manufacturing	AS 1579	Arc-Welded Steel Pipes and Fittings for Water and Wastewater.
Manufacturing	ASTM A139	Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe.
Manufacturing	ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
Manufacturing	AWWA-C200	Steel Water Pipe-6in. (150mm) and Larger.
Manufacturing	CSA Z245	Canadian Standard - Steel Pipe
Manufacturing	GB/T 3091	Low Pressure Fluid Conveying Welded Steel Pipe
Manufacturing	SY/T 5040	Welded Piling Pipe
Manufacturing	GB/T 9711	Oil and Gas Industry: Steel Pipe for Pipeline.
Welding	AWS D1.1	Structural Welding Code - Steel
Welding	AS 1554.1	Structural Steel Welding - Welding of Steel Structures.
Welding	AS 1554.2	Structural Steel Welding - Stud Welding.
Welding	BS EN 1011	Welding - Recommendations for welding of metallic materials
Welding	CSA W59	Welded Steel Construction (Metal Arc Welding)
Welding	GB50661-2011	Welding of Structural Steel
Welding	JGJ 81	Technical Specification for Welding of Steel Structure.
Coatings	ISO 8501	Preparation of steel substrates before application of paints and related products.
Coatings	ISO 8503	Preparation of steel substrates before application of paints and related products.
Coatings	ISO 12944	Paints and varnishes - Corrosion protection of steel structures by protective paint systems.

ESC HP PILES

SPECIFICATION

AD AIRPORT SHORING WORKS, UAE

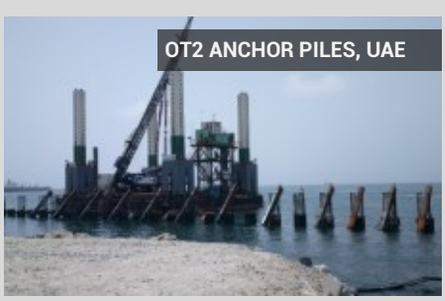
ESC HP Piles are standard H shaped bearing piles with an equal web and flange thickness. They can be used in a wide range of applications: from soldier pile with timber lagging walls, foundation structures and battered steel H-Piles.



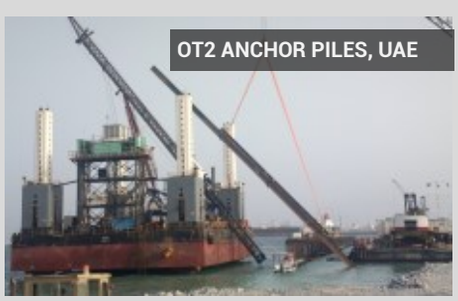
The ESC Advantage

- ✓ Global supply capability
- ✓ Competitive Pricing for small and large quantities
- ✓ Supply of Splicing Assemblies and Toe Points which can allow extreme lengths to be driven.
- ✓ Experienced in component design and installation
- ✓ Wide Range of Steel Grades available: S235, S275, S355, S420, S460, A572 Gr 42, 50, 60 and other equivalent grades.
- ✓ Range of Lengths available: standard 6m & 12m, others available for larger orders

Section	Mass per Unit Length	Height (h)	Width (w)	Thickness (t_f)	Thickness (t_w)	Section Area	Coating Area	x-x I	x-x S	x-x r	y-y I	y-y S	y-y r
	kg/m	mm	mm	mm	mm	cm²	m²/m	cm⁴	cm³	cm	cm⁴	cm³	cm
HP 200 x 54	54	204	207	11.3	11.3	68	1.19	4,950	487	8.5	1,680	162	4.6
HP 250 x 63	63	246	256	10.7	10.5	80	1.47	8,740	711	10.5	2,980	233	6.1
HP 250 x 85	85	254	260	14.4	14.4	108	1.50	12,200	969	10.6	4,200	323	6.2
HP 310 x 79	79	299	306	11.0	11.0	100	1.77	16,400	1,090	12.8	5,290	346	7.3
HP 310 x 94	94	303	308	13.1	13.1	119	1.79	19,600	1,290	12.9	6,370	415	7.3
HP 310 x 110	110	308	310	15.5	15.4	141	1.80	23,700	1,530	13.0	7,740	498	7.4
HP 310 x 125	125	312	312	17.4	17.4	159	1.82	27,100	1,730	13.1	8,870	567	7.5
HP 360 x 109	109	346	370	12.8	12.8	138	2.12	30,300	1,770	14.8	10,900	587	8.9
HP 360 x 132	132	351	373	15.6	15.6	168	2.14	37,600	2,150	14.9	13,600	726	9.0
HP 360 x 152	152	356	376	17.9	17.9	194	2.15	43,700	2,480	15.0	15,800	842	9.0
HP 360 x 174	174	361	378	20.4	20.4	222	2.17	50,800	2,830	15.1	18,400	975	9.1
HP 410 x 131	131	389	398	13.7	13.7	167	2.29	46,295	2,378	16.7	14,425	725	9.3
HP 410 x 151	151	394	400	15.9	15.9	192	2.30	53,978	2,742	16.8	16,971	848	9.4
HP 410 x 181	181	400	403	19.1	19.1	230	2.32	65,675	3,283	16.9	20,859	1,035	9.5
HP 410 x 211	211	406	406	22.2	22.2	269	2.34	77,859	3,832	17.0	24,923	1,227	9.6
HP 410 x 242	242	413	410	25.4	25.4	308	2.36	90,542	4,387	17.2	29,167	1,424	9.7
HP 410 x 272	272	419	413	28.6	28.6	347	2.38	103,738	4,951	17.3	33,595	1,628	9.8



OT2 ANCHOR PILES, UAE



OT2 ANCHOR PILES, UAE

TEMPORARY RETAINING WALL, UAE

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USEFUL EQUATIONS

MOMENT CAPACITY

$$M = Z \times \sigma_{yield}/\alpha$$

PIPE PROPERTIES

$$Mass_{pipe} = 0.024661 \times t \times (D - t)$$

$$I_{pipe\ pile} = \frac{\pi \times [D^4 - (D - 2t)^4]}{640000}$$

COMBINED WALL

$$Mass_{L\%} = 2.5(L_{\%} - 0.6)Mass_{100\%} + 2.5(1 - L_{\%})Mass_{60\%}$$

$$Z_{combi} = \frac{Z_{pipe\ pile}}{w_{combi}} \times \left(\frac{I_{pipe\ pile} + I_{sheet\ pile}}{I_{pipe\ pile}}\right)$$

$$I_{combi} = \frac{I_{pipe\ pile} + I_{sheet\ pile}}{w_{combi}}$$

$$Z_{combi} = \frac{Z_{H\ pile}}{w_{combi}} \times \left(\frac{I_{H\ pile} + I_{sheet\ pile}}{I_{H\ pile}}\right)$$

$$I_{combi} = \frac{I_{H\ pile} + I_{sheet\ pile}}{w_{combi}}$$

LEGEND

I	cm^4/m	Moment of Inertia per unit wall width
I_{combi}	cm^4/m	Moment of Inertia of Combined Wall per unit wall width
$I_{sheetpile}$	cm^4/m	Moment of Inertia of Sheet Pile per unit wall width
$I_{pipepile}$	cm^4/m	Moment of Inertia of Pipe Pile per unit wall width
$I_{pipepile}$	cm^4/m	Moment of Inertia of H Pile per unit wall width
Z	cm^3/m	Elastic Section Modulus per unit wall width
Z_{combi}	cm^3/m	Elastic Section Modulus of Combined Wall Section per unit wall width
$Z_{sheet\ pile}$	cm^3/m	Elastic Section Modulus of Sheet Pile Section per unit wall width
$Z_{pipe\ pile}$	cm^3/m	Elastic Section Modulus of Pipe Pile Section per unit wall width
$Z_{H\ pile}$	cm^3/m	Elastic Section Modulus of H Pile Section per unit wall width
D	mm	Diameter of Pipe Pile
t	mm	Thickness of Pipe Pile
w_{combi}	mm	Unit Width of Combined Wall
$L_{\%}$	%	Percentage of Infill Sheet Pile Length to King Pile Length
M_{Lpipe}	kg/m	Mass per Unit Length of Pipe
$Mass_{100\%}$	kg/m^2	Mass per Unit Area of Combined Section with Infill Sheet Pile as 100% of King Pile Length
$Mass_{60\%}$	kg/m^2	Mass per Unit Area of Combined Section with Infill Sheet Pile as 60% of King Pile Length
$Mass_{L\%}$	kg/m^2	Mass per Unit Area of Combined Section with Infill Sheet Pile as L% of King Pile Length
σ_{yield}	MPa	Yield Strength of Material
M	kNm/m	Moment Capacity per unit length wall

CONVERSION TABLE

Metric to Imperial				Imperial to Metric			
1 cm	=	0.3937	in	1 in	=	2.5400	cm
1 m	=	3.2808	ft	1 ft	=	0.3048	m
1 cm^2	=	0.1550	in^2	1 in^2	=	6.4516	cm^2
1 m^2	=	10.7639	ft^2	1 ft^2	=	0.0929	m^2
1 cm^3	=	0.0610	in^3	1 in^3	=	16.3870	cm^3
1 m^3	=	35.3149	ft^3	1 ft^3	=	0.0283	m^3
1 cm^2 /m	=	0.0472	in^2 /ft	1 in^2 /ft	=	21.166	cm^2 /m
1 N	=	0.2247	lb	1 lb	=	4.4497	N
1 N/mm	=	5.7082	lb/in	1 lb/in	=	0.1752	N/mm
1 N/m	=	0.0685	lb/ft	1 lb/ft	=	14.5989	N/m
1 N/cm^2	=	1.4499	lb/in^2	1 lb/in^2	=	0.6897	N/cm^2
1 N/m^2	=	0.0209	lb/ft^2	1 lb/ft^2	=	47.8968	N/m^2
1 N/cm^3	=	3.6827	lb/in^3	1 lb/in^3	=	0.27154	N/cm^3
1 N/m^3	=	0.0064	lb/ft^3	1 lb/ft^3	=	157.1420	N/m^3
1 kg	=	2.2046	lb	1 lb	=	0.4536	kg
1 kg/m	=	0.6720	lb/ft	1 lb/ft	=	1.4882	kg/m
1 kg/m^2	=	0.2048	lb/ft^2	1 lb/ft^2	=	4.8824	kg/m^2
1 Metric Tons	=	1.1023	US ton	1 US ton	=	0.9072	Metric Tons
1 cm4	=	0.0240	in^4	1 in^4	=	41.6228	cm4
1 cm^4 /m	=	0.007323	in^4 /ft	1 in^4 /ft	=	136.5582	cm^4 /m
1 cm^3	=	0.0610	in^3	1 in^3	=	16.3870	cm^3
1 cm^3 /m	=	0.0186	in^3/ft	1 in^3/ft	=	53.7631	cm^3 /m
1 Nm	=	0.7373	lb.ft	1 lb.ft	=	1.3563	Nm
1 Nm/m	=	2.6968	lb.in/ft	1 lb.in/ft	=	0.3708	Nm/m

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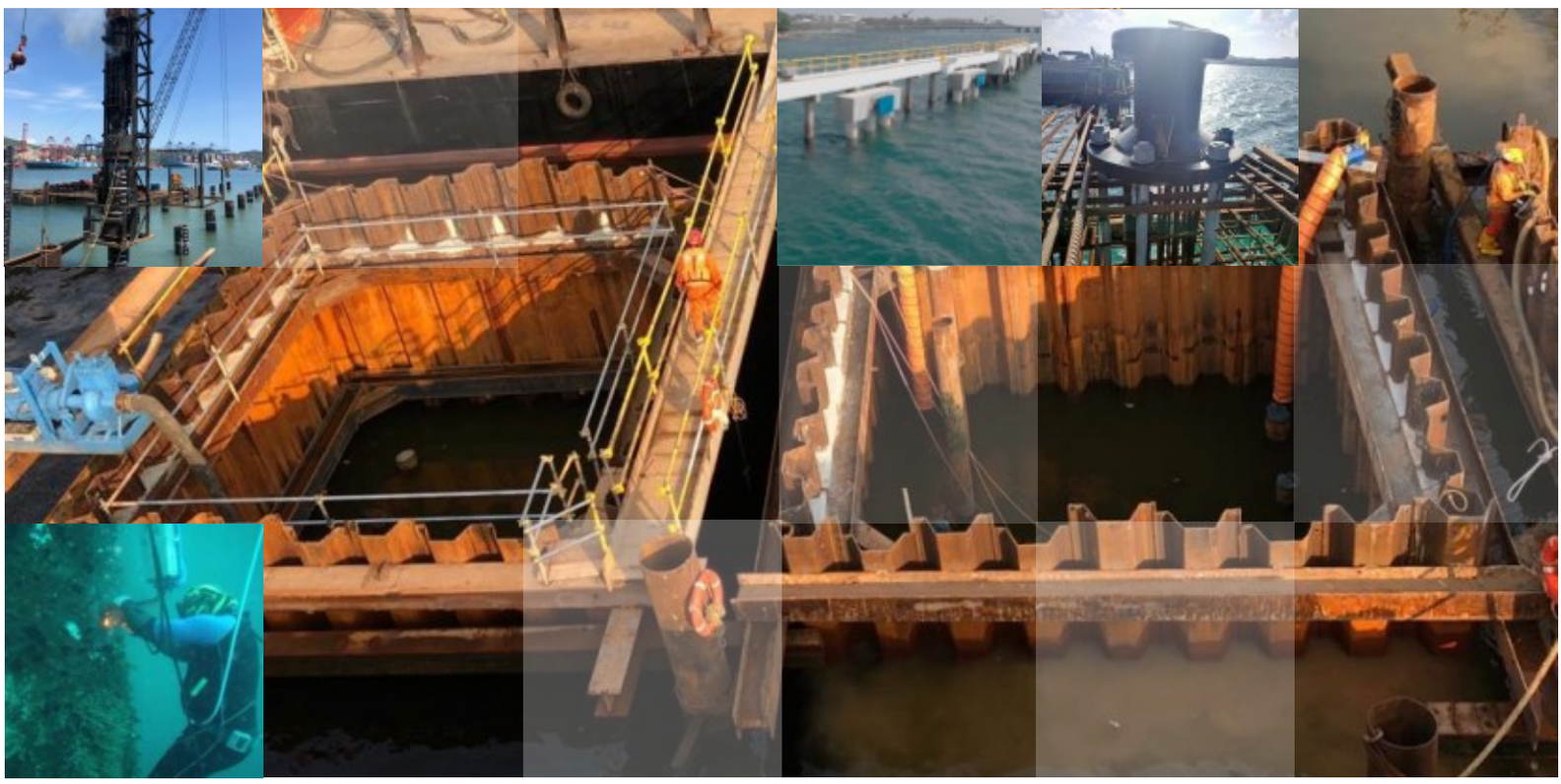

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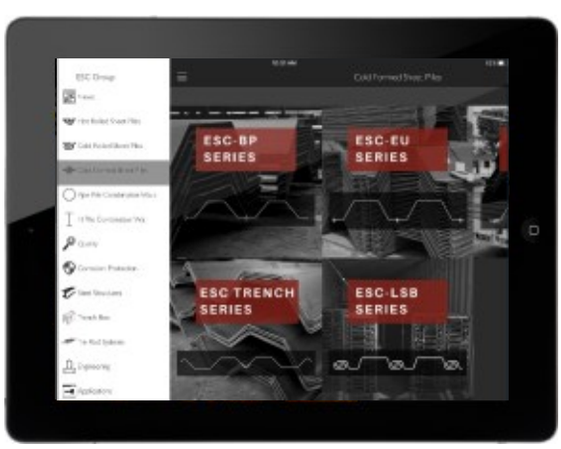

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