



OFFSHORE CONSTRUCTION SPECIALISTS

**PIPELINE PRE-TRENCHING
PRE-QUALIFICATION DOCUMENT**



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1.0 INTRODUCTION

Offshore Construction Specialists (OCS) was formed in 2007 from a core group of experienced marine construction engineers with an extensive track record working with major contractors.

The company provides construction management, engineering and strategic support equipment services primarily to the offshore oil and gas sector focusing on the installation of pipelines, platforms, tanker moorings and related facilities. In addition to engineering, OCS also provides turnkey services for pipeline burial, pipeline pre-commissioning & drying, flexible flow line installation and umbilical installation on a subcontract basis to marine contractors.

OCS has grown steadily since incorporation and now employs 60 personnel of whom over 30 are civil/structural and mechanical engineers along with an equipment group comprising of mechanics and technicians to operate in-house developed equipment. The engineers and technicians work hand in hand to ensure all projects are properly engineered and operationally practical.

Pre Trenching is often a key element of pipeline shore approaches and it is often cost effective to combine trenching in a single package with the other critical pipeline shore approach elements including tidal zone cofferdams, pull winches and holdbacks, pull wire buoyancy etc to take advantage of natural synergies.

OCS owns and operates a multipurpose utility barge, a bespoke customised 160'x40'x10' (48768mm x 12192mm x 3048mm) vessel, constructed specifically for near shore projects, which can be configured into the following operational modes:

- i. **Pipeline pre-trenching or general near shore trenching work (as addressed in this document)**
- ii. Pipelay Operations.
- iii. Pipeline Post Trenching.
- iv. Support vessel on which either Linear pull winch or Horizontal Directional Drilling equipment can be based
- v. Shallow Water Decommissioning projects.
- vi. Miscellaneous Marine Construction support work such as dolphins & Jetty work and free span correction, etc.

Key features of the vessel include:

- 3 nos. spud wells with three 18m x 26"Ø spuds operating from 3 independent winches to keep Ms Pennie in position during pre-trenching using excavators;
- 8 nos 10T air operated winches below deck with centralised controlled – providing a total of 11 point mooring system (where necessary);
- 2 units - CAT 390 Excavator – with modified long arms and 2m³ bucket able to reach to 16m below the barge deck (**critical for efficient pre-trenching operations**)
- 1 unit 90T crane for spud handling and general lifting
- 1 unit – CAT 320 Excavator (convertible to amphibious mode) with standard and modified long arm with a reach of 8.5m below the track.
- Survey and positioning system
- Trench depth monitoring system
- Trailing Arm - This is a rigid arm designed for deployment from OCS Utility Barge UB-01 "Miss Pennie". The arm provides a rigid frame to deploy a dredging head housing 2 submersible dredge pumps and working in water depths up to 25 metres. The trailing arm works with the robust 8-point mooring allowing the Miss Pennie/dredge head to track along the trench line as required. The system can be deployed diverlessly using scanners (**provides a pre-trenching option in water depths beyond the reach of the CAT 390 excavators and also provides an efficient trench**

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cleaning and maintenance solution to keep the trench open while waiting for installation of the pipeline).

In addition to any shore approach planning, crew accommodation, cofferdam requirements, pull winch and hold back requirements need to be considered during planning and preparation for pre trenching projects.

2.0 OCS PIPELINE PRE-TRENCH EXPERIENCE

OCS has undertaken five (05) major pre-trenching projects for different customers, most of the pre-trench scope are integral with shore approach (refer to Pipeline Shore Approach Pre-Qualification);

- a) Shell Exploration Pte Ltd (SEPL) SBM Bukom Pipeline Rejuvenation Phase II Project (Ongoing) – OCS is subcontracted by Sapura Offshore Sdn Bhd (S'pore Branch) for the shore approach support, onshore spool tie in replacement, construction and installation and pre-commissioning of the newly laid 2.7km pipeline:-
 - Shore approach preparation including construction of temporary access rockberm
 - Design and construction of 40m cofferdam with excavated trench,
 - **75m pre-trenching to design profile from cofferdam to offshore side**
 - Beach pull hold back design and installation (actual beach pull by Sapura)
 - Backfill of cofferdam and near shore pre trench location
 - Onshore trench (tie in to existing trench)
 - Removal of existing 48" spool and construction, hydrotest and installation of new tie in spool to new pipeline at LFP.
 - Removal of 100m of existing 48" pipeline
 - Removal of temporary cofferdam and access rockberm
 - Reinstatement of landfall location

This project is currently on going at the time this document revision.

- b) **ESSO Thailand Ltd - Construction, Installation and Precommissioning of 48" Subsea pipeline at Sriracha Refinery in Chonburi Thailand** (Completed Oct 2021).

OCS was contracted by PT Timas to provide construction management, engineering services and suitable equipment and personnel to prepare, plan, manage and execute the installation of a new 48" x 1.7km long Gas Pipeline including .

- shore approach with landfall preparation,
 - design and construction of a 55m cofferdam with pre-trench,
 - **835m pre-trenching to design depth/profile from cofferdam to offshore up to water depth 25m (using trailer arm dredge)**
 - beach pull hold back design and installation,
 - execute the 0.875km beach pull and
 - Backfilling at nearshore trench.
 - Removal of temporary cofferdam and landfall access
 - Reinstatement of landfall location
- c) **HCML (Husky CNOOC Madura Ltd) BD Project Pre Trench/Shore Approach Beach Pull/Post Trench** (Completed Aug 2016) – 16" CWC pipeline, 52km long with 5.8km burial with 4.8km pre-trench and 1km post trench with 2m cover from T.O.P. Near shore location at Pasuruan City, Surabaya, Indonesia:
 - **Pre-Trenching of an open trench for a 4.8km beach pull. The trench depth was 2m T.O.P.**



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- The end of pipeline is at the onshore (landfall point) and soil condition do not allow for a pulling winch foundation and calls for a customised pull barge.
 - Sheet pile Hold Back foundation behind pull barge (in clay environment)
 - 4.8 km beach pull using purpose built buoyancy foam as flotation for cable and pipe
 - Deployment of pull cable with floatations
 - Supporting operation during beach pull (trench maintenance)
 - Back filling of near shore trench.
 - Post Trenching at section after the pre-trench area
- d) Bukit Tua, Ketapang (Petronas, Completed Aug 2014) near shore at offshore Gresik in Surabaya, a 110km long of 12" CWC pipeline from shore LFP to offshore WHP, pre-trenching of first 4km pipeline for beach pull and post trenching of 27km of 12" CWC pipeline to 2m TOP:
- Sheet pile Cofferdam at the beach front due to sandy material from KP110.31 to KP110.2100.
 - **Pre-Trenching of an open trench for a 4km beach pull. The trench depth is 2m T.O.P.**
 - Land Fall Point at KP110.310
 - Sheet pile Hold Back foundation
 - Linear Pull Winch set up on beach front
 - 4km beach pull using purpose built buoyancy foam for cable and pipeline as flotation
 - Deployment of pull cable with cable bouys
 - Supporting operation during beach pull (trench maintenance)
 - Back filling of near shore trench.
- e) APD/Salamander (Serica Kambuna Development project) 2009/2010, 14" CWC pipeline x 13.000 km total burial distance (8km post trench), 2.0m TOP cover, near shore north of Medan, Sumatra, Indonesia; The scope involved the following:-
- **Pre-Trenching of an open trench for a 5km beach pull. The trench depth was 2m T.O.P.**
 - No sheet pile cofferdam was required.
 - The end of pipeline is at the onshore (landfall point) and soil condition do not allow for a pulling winch foundation and calls for a customised pull barge.
 - Sheet pile Hold Back foundation behind pull barge (in clay environment)
 - 5km beach pull using purpose built buoyancy foam as flotation for cable and pipe
 - Deployment of pull cable
 - Supporting operation during beach pull
 - Back filling of near shore trench.
- f) Other projects that OCS personnel were intimately involved in (while employed by major offshore contractor, with experience maintained within OCS) is:-
- Camau Gas Pipeline Project (PetroVietnam - 2006) for the installation of a 297km 18' gas pipeline from offshore (BRB platform to Land Fall Point in Camau) covering near shore excavation, **pre-trenching** and backfilling, beach pull preparatory work (LPW on pull barge), hold back sheet pile wall and a 3 km beach pull operation.

OCS in-house equipment spread is described in detail in this document. OCS is equipped to handle the full range of pre-trenching activities with water depth ranges to 31m. For water depths up to 15m OCS will utilise the 2 x CAT 390 excavators equipped with long boom and 2m³ buckets. For water depths between 15m to 25 metres OCS will use its bespoke trailing arm to pre-trench the required trench profile. When using the trailing arm, 2 high capacity electric dredge pumps delivering a flow of 720m³/hr each, are set up for the operation.

OCS is equipped to handle large projects or discrete project elements depending on the specific needs of the customer. During the preparation for pre trench/shore approach or any offshore work the safety of personnel, equipment and environment plays a vital role in the success of a project and as such, HAZID's

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shall be conducted prior to any operations. These meetings are attended by key engineers and supervisors and all potential risks are identified and mitigation measures put in place to ensure they are as low as reasonably practicable.

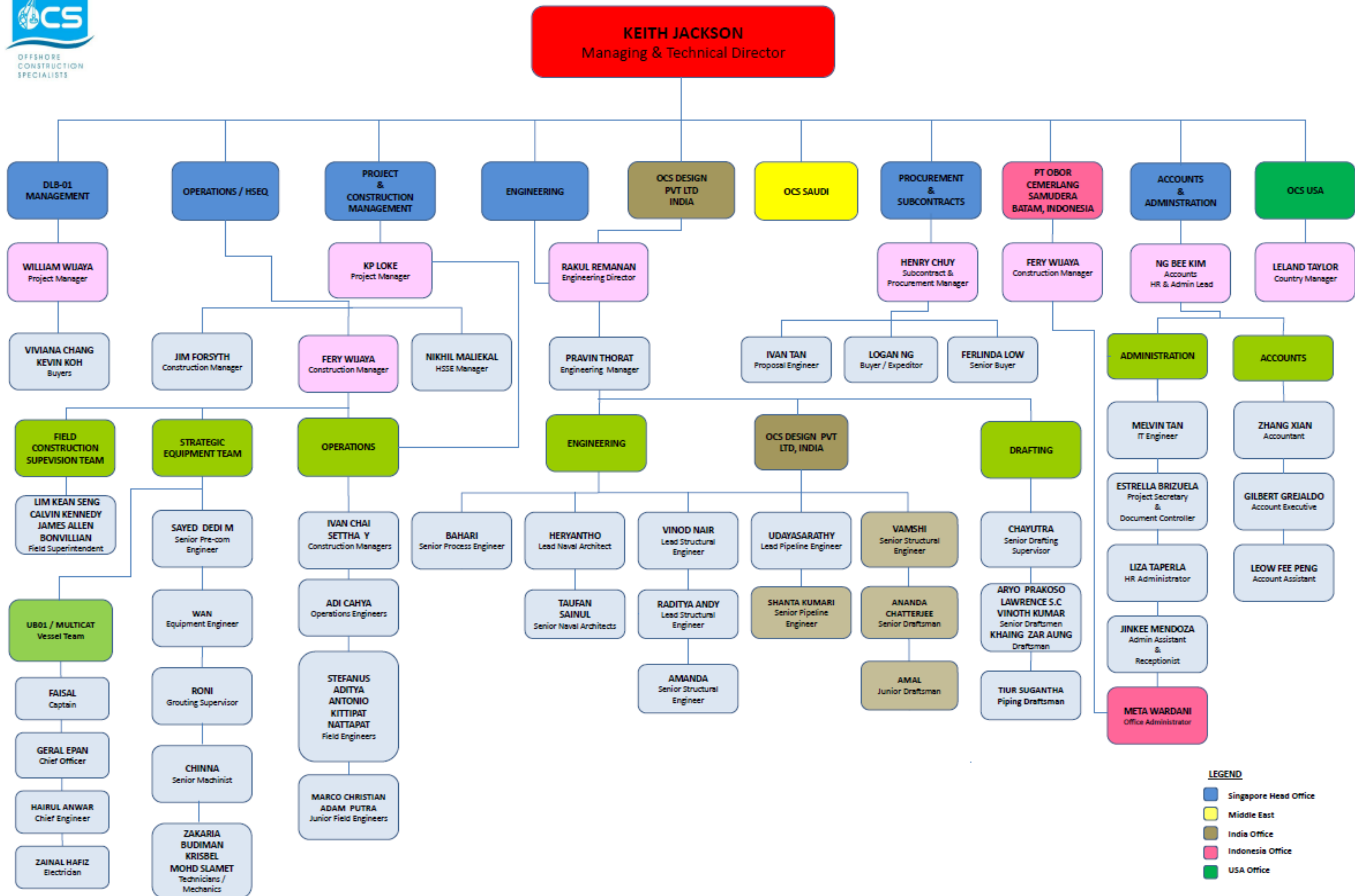
3.0 KEY PERSONNEL CONTACTS

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Henry Chuy	Subcontracts & Procurement Manager	chuy.chunfei@offshore-ocs.com

4.0 OCS ORGANISATION CHART

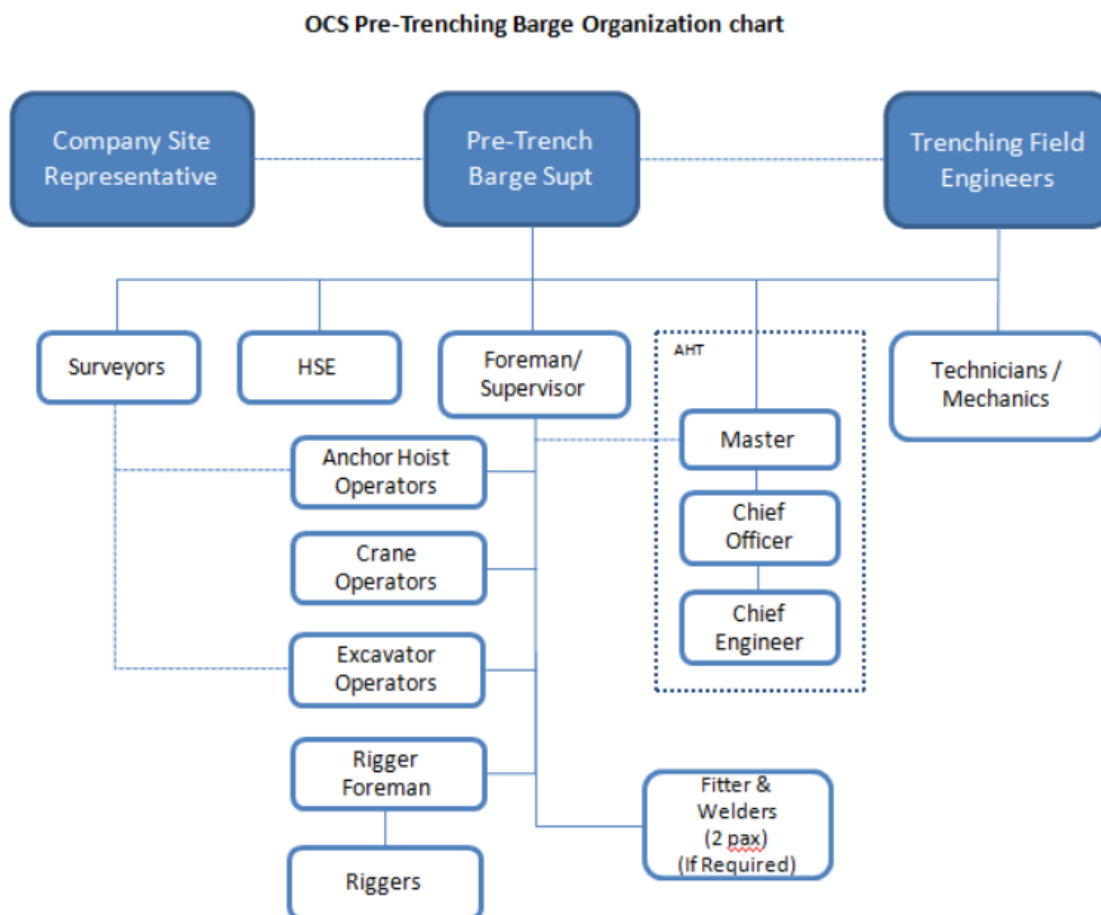
Refer to the next page for OCS Organisation Chart

OCS ORGANISATION CHART



4.1 TYPICAL PRE-TRENCHING BARGE ORGANISATION CHART

The typical organization chart for pre-trenching barge is indicated below.



Key personnel requirements for 24 hour operations specifically for operating the pre trench equipment spread are as follows:

- 1 x Pre-Trench Superintendent
- 1 x Supervisor
- 2 X Field Engineers.
- 4 x Technicians/Mechanic/Electrician (2 per shift)
- 4 x Excavator Operator
- 2 x Winch Operators
- 2 x Crane Operators
- 4 x Riggers

OCS normally provides personnel to cover the entire pre-trenching operation as part of the shore approach while operating from the UB01 Miss Pennie.

5.0 PLANNING AND EXECUTION

OCS will cover the following scope areas during planning and execution of pre trenching projects as part of the shore approach scope.

5.1 Pipeline Pre Trench Scope

OCS will review the scope of work taking particular note of the following:

- Pipeline outside diameter inclusive of all coating/s;
- Burial depth (coverage) required with reference to top-of-pipe (TOP);
- Trench distance required, inclusive of transition zones (if any)
- Seabed material properties, and seabed bathymetry/features
- Operating water depth, inclusive of tidal considerations
- Support equipment requirement

5.2 Pre-Trench

Pre-trenching works requires the excavation of bulk spoil and deposited to nearby area. Depending on the proximity of the shoreline, it can be defined either as a floatation trench or a pipe trench. A floatation trench is one that requires a trench to be excavated to enable the pre-trench barge to access toward shore line. Once the floatation trench is established the pipe trench can proceed. Depth of floatation trench depends on the tide and pipe trench will depend on the required cover. Where the water depth is sufficient for the trench barge to operate no floatation trench will be necessary.

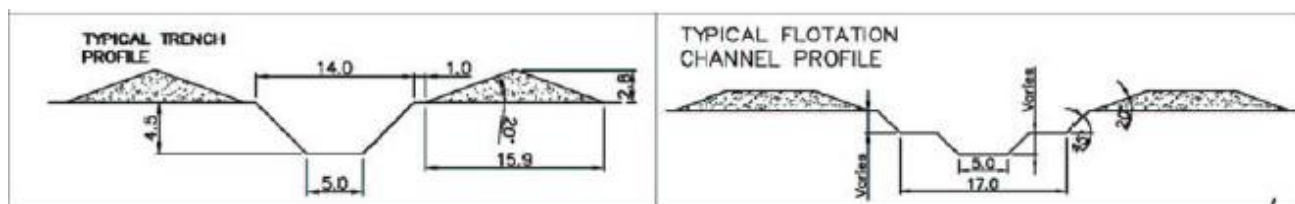




Figure 4.2.1 Type of pre-trench “Floatation trench” or “Pipe trench”

Prior to excavation works, a pre-engineering survey will need to be performed, which will map the bathymetry of the natural seabed, and to mark out the excavation limits. This survey will also mark out the winch location to ensure alignment with the offshore and onshore pipeline. Pre-trenching works will be planned with due considerations to the tides. Tides will be monitored during the works and compare to existing tidal data (or forecasted data) available.

5.3 Equipment Assignment

Based on a review of the scope of work and the other critical parameters listed in 5.1 above OCS will assign the most appropriate equipment spread to the work. If there is hard material at pre-trench locations where excavator bucket may not be able to break up, consideration will be given to the mobilisation of dedicated rock breaker/ ripper to break up the hard material.

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5.4 Execution Procedures

OCS will provide project specific execution procedures for every project which address all elements of the project. These procedures must be approved by the client. OCS will ensure that the procedures address all constraints posed by individual project site conditions and the specific scope of work.

5.5 Equipment Testing

OCS will ensure that all equipment is fully tested before leaving the OCS facility. Client representatives will be invited to witness the testing programme. For more difficult jobs, further specific testing may be required which will be determined on a case by case basis.

5.6 HAZID

Specific HAZID and risk identification sessions will be conducted to identify and propose mitigation measures for site hazards which may be posed by operations.

5.7 Equipment Mobilisation and Demobilisation



OCS will provide a procedure for equipment mobilization and demobilisation which will be in accordance with client requirements. The procedure will ensure the right equipment, properly prepared is in the right place at the right time.

5.8 Personnel

OCS will provide a team of qualified personnel to co-ordinate and operate the equipment on a 24 hour basis. Key personnel will be the same as those who tested and mobilized the equipment. The OCS typical pre-trenching organization chart is shown in Section 4.1.

5.9 Surveys



Typically a pre-construction survey will be conducted prior to commencement of any pre-trenching to confirm the water depth and the seabed profile. During trenching, physical check of the seabed trench will be conducted using the excavator stick where water depths are accessible with the excavators. For areas not accessible with the excavators, the trench depth will be check using the Single Beam Echo Sounder (SBES).

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6.0 OCS CLIENT BASE

OCS has built up a significant customer base during fifteen (15) years of operations. OCS past and present clients are listed below. References can be provided on request:

NO	CLIENT NAME
1	Asia Petroleum Developments / Salamander Energy (Indonesia) [*]
2	Bumi Armada
3	Chevron (Thailand)
4	Clough Sapura JV (Australia) [*]
5	DOF Subsea.
6	EMAS (Singapore)
7	Franklin Offshore (Singapore)
8	Galoc (Philippines)
9	GFI (Thailand)
10	Global Industries (Malaysia)/Technip
11	Hako Offshore (Singapore)
12	Heerema (Netherlands)
13	HESS (Indonesia) [*]
14	Kangean Energy (Indonesia)
15	Larsen & Toubro (Malaysia/ India)
16	M3 Energy (Malaysia)
17	McConnell Dowell CCC JV (Australia)
18	MRTS Engineering Ltd (Russia)
19	Newfield Peninsula Malaysia (Malaysia)
20	Nippon Steel (Indonesia)
21	NorCE (Singapore)
22	NuCoastal (Thailand)
23	Offshore Marine Contractors
24	Origin Energy (Australia)
25	PT Timas Suplindo (Indonesia)
26	Petronas Carigali Ketapang 2 Ltd (Indonesia) – PCK2L
27	Sapura Acergy (Malaysia)
28	Sarku (Malaysia)
29	Sea Drill (Singapore)
30	Star Petroleum (Indonesia)
31	TLO Sapura Crest (Malaysia)
32	Vietsovetropetro (VSP) (Vietnam)
33	PT. Meindo Elang Indah (Indonesia)
34	Esso Thailand Ltd

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7.0 PRE TRENCH - TRACK RECORD

YEAR	PROJECT	CLIENT / OPERATOR	SCOPE OF WORK
2022	SBM Pipeline Rejuvenation Phase II Project	Client: Sapura Offshore Sdn Bhd (Singapore Branch) Operator: Shell Eastern Petroleum (Pte) Ltd	OCS was contracted by Sapura Offshore Sdn Bhd (Singapore Branch) to provide Onshore Beach Pull services where the scope entails access rockberm design and preparation, design and construct a 40m temporary cofferdam, 75m of pre trenching outside the cofferdam and design and installation of a hold back anchor for Linear Pull Winch. The scope also includes new trench to replace the existing onshore Tie In Spool with a new 48" spool to the new pipeline which will be installed by SOSB. Additionally, the scope includes precommissioning of the prefabricated spools and a final leak test for the completed pipeline. (Project is currently ongoing at the time of this document revision)
2021	ESSO Sriracha Thailand Construction, Installation and Precommissioning of 48" Subsea pipeline at Sriracha Refinery Chonburi.	Client: PT Timas Suplindo Operator: Esso Thailand Ltd	OCS was contracted by PT Timas to provide construction management, engineering services and suitable equipment and personnel to prepare, plan, manage and execute the 48" x 1.7km long Gas Pipeline including shore approach with landfall preparation, construction of a 55m cofferdam with pre-trench, 835m pre-trenching to design depth/profile from cofferdam to offshore, beach pull hold back design and installation, 0.875km beach pull and backfilling. Project was completed in Oct 2021
2016	HCML BD Project Pre-Trenching / Shore Approach Beach Pull / Post Trench	Client: PT Timas Suplindo Operator: Husky-CNOOC Madura Ltd (HCML)	OCS was contracted by PT Timas to provide management, engineering services and suitable equipment and personnel to prepare, plan and manage and execute the 16" Gas Pipeline shore approach with 4.8km pre-trenching, hold back design and installation, 4.8km beach pull and a 1km post trench section. Project was completed in August 2016
2014	Petronas Ketapang (Indonesia)	Client : PT Timas Suplindo Operator : Petronas (PCK2L) Indonesia	OCS was contracted by PT Timas laying 110km of 12" pipeline from on shore to offshore with pre-trenching for first 4km and subsequent 4km beach pull The work was completed in 2014

YEAR	PROJECT	CLIENT / OPERATOR	SCOPE OF WORK
2009	Serica Kambuna Field Development	Client: PT Timas Suplindo Operator: Asia Petroleum Development (APD) / Salamander Energy	<ul style="list-style-type: none"> 14" x 39.0 km pipeline, including 5500m beach pull section for nearshore approach Super duplex pipeline section, expansion spool and riser in the platform approach area (400m) Pipeline pre-commissioning (flood, pig, testing) Pre-trenching and pipe burial (post trench) for 13.0 km section of 14" pipeline, 2.0m TOP cover Seabed: Black stiff consolidated silt clay <p>The work was completed in 2009/2010</p>
2005	Camau Gas Pipeline Project	CLIENT : VSP OPERATOR : PVGAS	<ul style="list-style-type: none"> Installation of a 297km 18' gas pipeline from offshore (BRB platform to Land Fall Point) covering near shore excavation and pre trenching, beach pull preparatory work (LPW on pull barge), hold back sheet pile wall. Managed by OCS personnel while they were employed by major offshore contractor

8.0 PRE TRENCHING PRINCIPAL EQUIPMENT

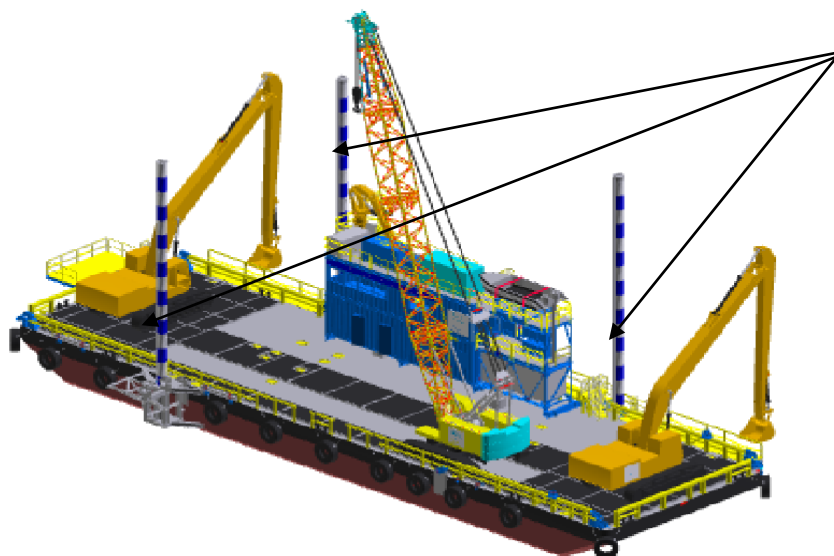
8.1 UB01 Miss Pennie

OCS owns utility barge “UB01 Miss Pennie” which is designed and configured specifically for pre- trenching and includes built in piping for delivery of pressurised air and water for an efficient centrally controlled mooring system and independently controlled spud system.

For further details of the utility barge refer to our separate pre-qualification document “Utility Barge & MultiCat Pre-Qualification”.



Figure 8.1.1 UB01 Ms Pennie General View



Equipped with three 18m spuds for shallow water Pre-Trenching

Figure 8.1.2 UB-01 with 3 Spuds, 2xCAT390 Excavators and 90T crane support for shallow water pre-trenching (Illustration)



Figure 8.1.3 UB-01 with 90T crane and Trailing Arm (standby) support for shallow water pre-trenching using mooring winches (Illustration)



Figure 8.1.4 Configurations for UB01 Ms Pennie with Trailing Arm for Pre Trenching (Illustration)

8.2 CAT 390

OCS owns 2 units of CAT390 with modified long arm.



Figure 8.2.1 CAT390 excavators onshore



Figure 8.2.2 CAT390 excavators onboard UB01 Ms Pennie

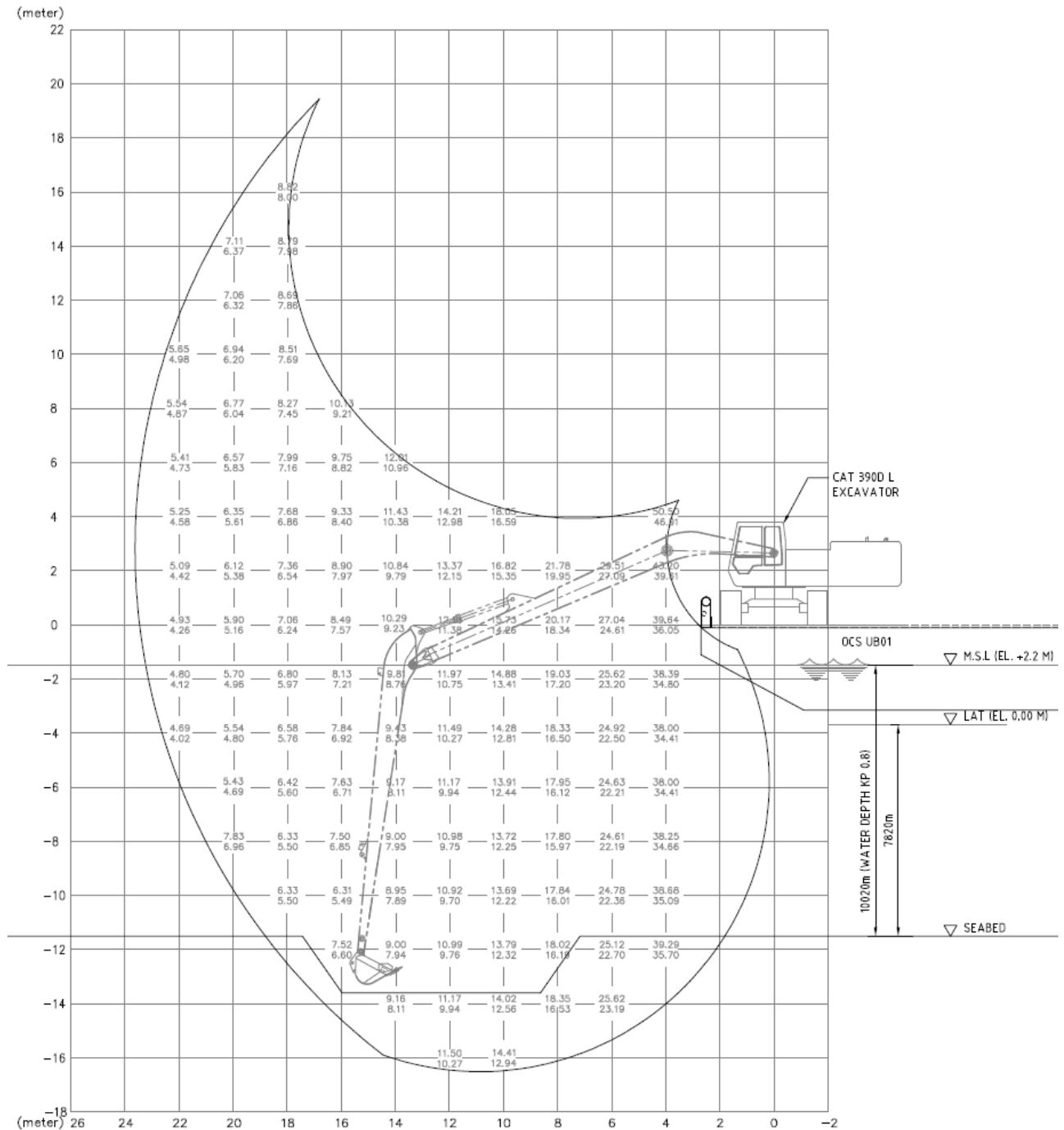


Figure 8.2.3 CAT390 excavator chart with long arm

8.3 CAT 320 (convertible to amphibious mode)

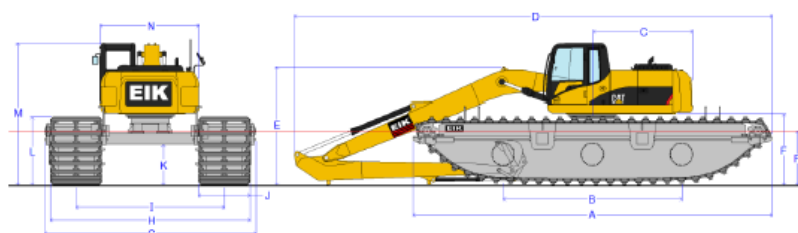
OCS owned CAT 320D2 Excavator is a heavy construction unit, which can be used for near shore trench excavation work either onshore or offshore.

The OCS CAT 320D2 excavator has an optional 14m long reach front that provides 50% larger working envelop than a standard arm reaching to 8.5m below the track.

The OCS CAT 320D2 excavator has supplementary pontoons and hydraulic spuds which can be converted depending on the scope of work. In situations where the excavator is required to operate in shallow and still water the addition of this pontoon module helps to overcome buoyancy effect, enhance the machine stability and increases operational safety. The spuds can be laid flat and rest atop the supplementary pontoons when not in use, lowering the machine's overall centre of gravity, as well as offering an unobstructed, 360 degree swing operation.

General Specifications		
Engine Model	Cat C7.1	
• The Cat C7.1 meets exhaust emissions equivalent to U.S. EPA Tier 2, EU Stage II.		
Engine Power – ISO 14396	104 kW	139 hp
Displacement	7.01 L	4.28 in³
Fuel Tank Capacity	410 L	180.3 gal
Gradeability	30 degree	
Ground Pressure	<0.14 kg/cm²	<1.99 psi
Maximum Traveling Speed	4 km/h	2.5 mph
• Travel speed varies with terrain conditions.		
Final Drive		
Dual speeds hydrostatic drive hydraulic motor.		
2x hydraulic motors per pontoons, 4x hydraulic motors per complete undercarriage system.		

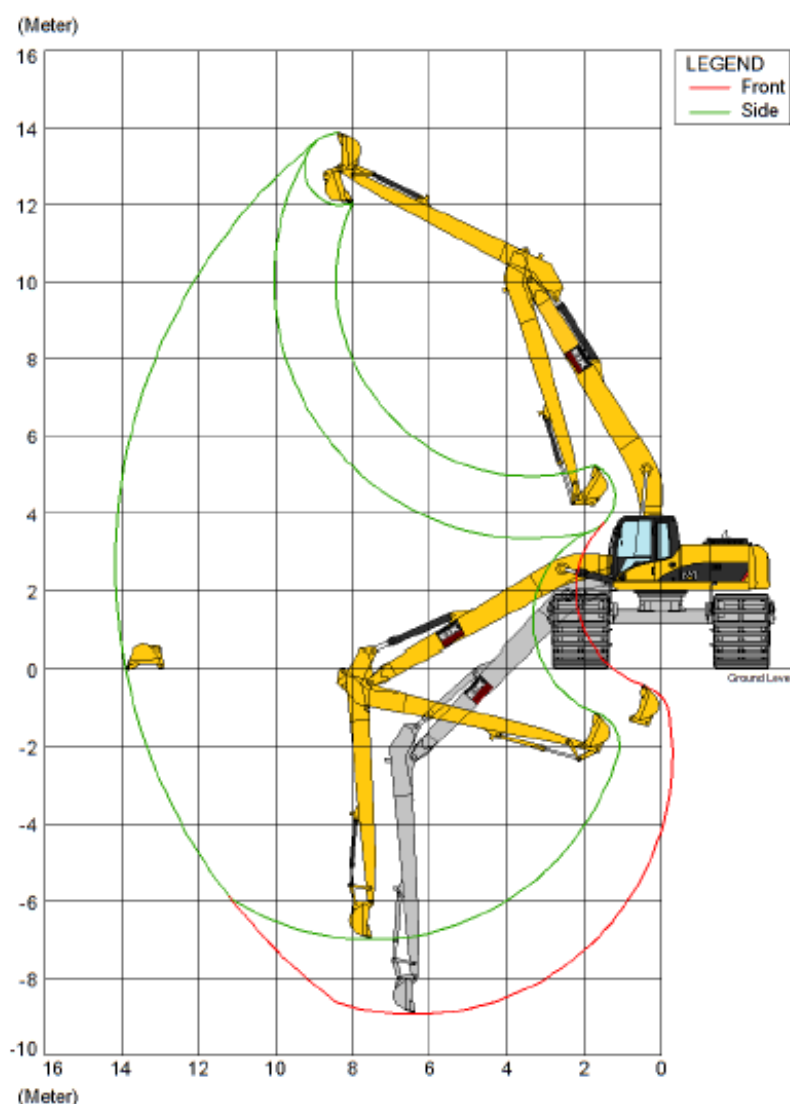
Hydraulic System		
Main System – Max Flow (Total)	404 L/min	106.72 gal/min
Maximum Pressure - Equipment	35,000 kPa	5,076 psi
Maximum Pressure – Equipment (Lift mode ON)	36,000 kPa	5,221 psi
Maximum Pressure – Travel	35,000 kPa	5,076 psi
Maximum Pressure – Swing	25,000 kPa	3,636 psi
Pilot System – Maximum Flow	32.4 L/min	1,977 in³/min
Pilot System – Maximum Pressure	3,900 kPa	556 psi
Weights		
Operating Weight	33,000 kg	72,600 lbs
Float Capacity	39,400 kg	86,680 lbs



A	Max. Track Length	9.65 m	31'8"
B	Track Length On Ground	4.30 m	14'2"
C	Rear Upper Structure Length	2.75 m	9'0"
D	Overall Length	13.12 m	43'0"
E	Height of Boom	3.23 m	10'8"
F	Counterweight Clearance	2.21 m	7'3"
G	Overall Width, min/max	5.29 / 6.09 m	17'4" / 73'1"
H	Undercarriage Width, min/max	4.78 / 5.58 m	18'6" / 18'4"
I	Track Gauge, min/max	3.38 / 4.18 m	11'1" / 13'9"
J	Track Cleat Width	1.62 m	5'4"
K	Min. Ground Clearance	1.29 m	4'3"
L	Track Height	2.05 m	6'9"
M	Overall Cab Height	4.14 m	13'7"
N	Upper Structure Overall Width	2.71 m	8'11"



Figure 8.3.1 Details of CAT 320 excavator



Maximum Cutting Height	13.80 m	45'3"
Maximum Loading Height	11.90 m	39'0"
Maximum Outreach	14.00 m	45'11"
Maximum Digging Depth from Front	8.80 m	28'10"
Max. Digging Depth from Side	7.00 m	22'11"
Bucket Capacity	0.50 m ³	0.65 cy

Specifications are subject to change without prior notice.

Notes: (1) The AM200 is not a ship. It is not fitted with equipment for cruising or working on water.
(2) The AM200 is designed for working on soft terrain. Working or traveling on hard and rough ground is prohibited.

Figure 8.3.2 CAT 320 excavator excavation chart (Long Arm)

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8.4 SCX 900 (90T) Crawler Crane

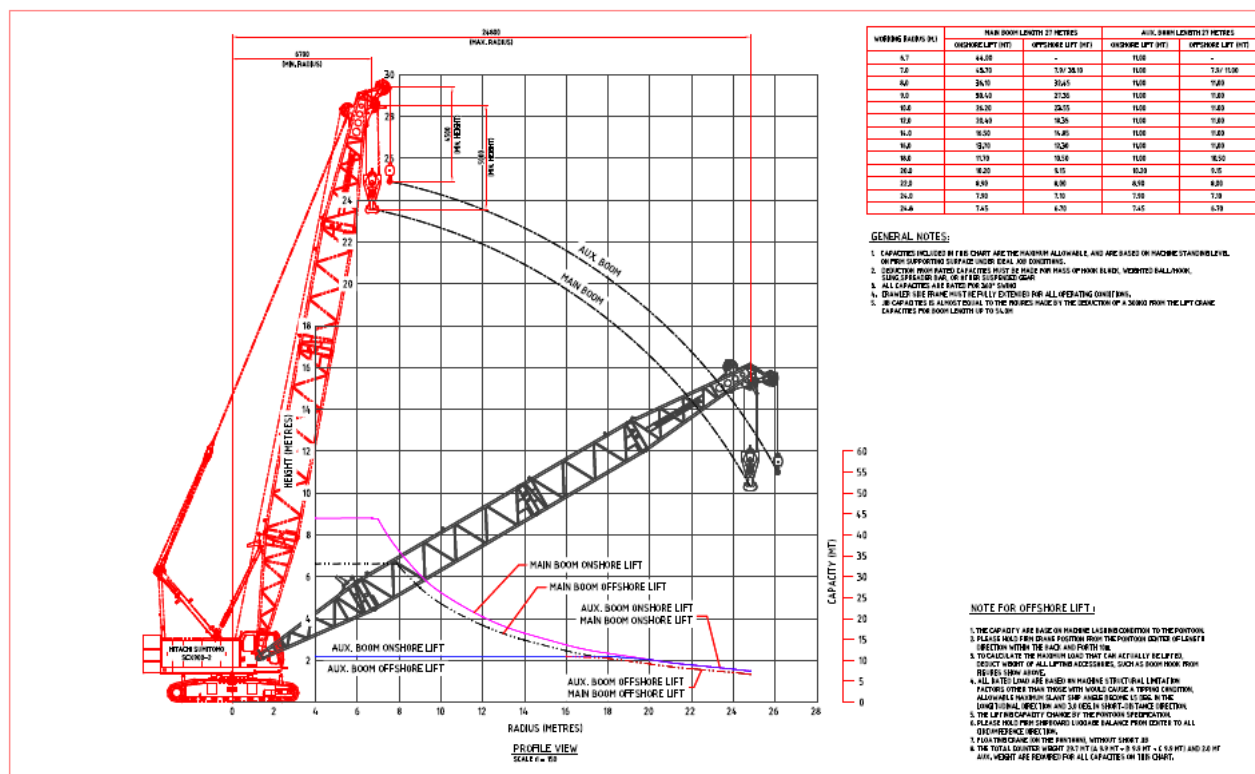


Figure 8.4.1 SCX900-2 crane Lift Chart

FORM B

MINISTRY OF MANPOWER, Singapore

WORKPLACE SAFETY AND HEALTH ACT 2006

WORKPLACE SAFETY AND HEALTH (REGISTRATION AND OTHER SERVICES FEES AND FORMS) REGULATIONS

CERTIFICATE OF TEST/THOROUGH VISUAL EXAMINATION OF LIFTING EQUIPMENT (LE)*

Registration No. : LM966005B

UEN of Owner. : 290720891G

Workplace No. : _____

Owner of Lifting Equipment	Factory Occupier and Location of Lifting Equipment
OFFSHORE CONSTRUCTION SPECIALISTS PTE. LTD.	At various locations
36 KIAN TECK ROAD SINGAPORE 627875	

Particulars of Lifting Equipment	
Type and Description of Lifting Equipment 612 Mobile Crane - Crawler Mounted Fixed Boom Lifting Type	Classification Code : 612
Brand Name H. SUMITOMO SCX990-2	Distinctive No. ** SC990-7363
Country of Origin JAPAN	Date of Manufacture 2012
Source of Power Diesel Engine	First Registration Date 23/12/2021
Max. Safe Working Load : 35700 kg	Max. Boom Length/Span : 27.00 m
Owners' Reference/Vehicle Registration No.	Length of Fly Jib/Extension

Particulars of Last Load Test																									
Date of Load Test : 21/12/2021	Max Test Load : 44600 kg																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%;">(1)</th> <th style="width: 20%;">(2)</th> <th style="width: 20%;">(3)</th> <th style="width: 20%;">(4)</th> <th style="width: 20%;">(5)</th> <th style="width: 20%;">(6)</th> </tr> <tr> <td>Radius (m) :</td> <td>8.0</td> <td>22.0</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Test Load (kg) :</td> <td>44600</td> <td>10700</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Safe Working Load (kg) :</td> <td>35700</td> <td>8500</td> <td></td> <td></td> <td></td> </tr> </table>	(1)	(2)	(3)	(4)	(5)	(6)	Radius (m) :	8.0	22.0				Test Load (kg) :	44600	10700				Safe Working Load (kg) :	35700	8500				
(1)	(2)	(3)	(4)	(5)	(6)																				
Radius (m) :	8.0	22.0																							
Test Load (kg) :	44600	10700																							
Safe Working Load (kg) :	35700	8500																							

Comments/Observations
<p>1. Mobile Crane inspected off shore on: BARGE NAME: OCS UB01 "MISS PENNIE".</p> <p>2. Main 4 - part line Hook Block, SWL:35.7 ton @ 8 M RAD and 8.5 ton @ 22 M radius.</p> <p>3. Main 4 - part line Lifting Hook SWL: 11 ton @ 8 M RAD, Load Test 13.75 ton;</p> <p>4. 8.5 Tst @ 22 M. Load Test 10.5 ton.</p> <p>5. Datalogger WTALIA700 functioned with load radius limits checked.</p> <p>6. Stakeholders to ensure proper maintenance and safe use.</p> <p>(New Registration)</p>

I certify that on **21/12/2021** the lifting equipment described in this certificate was examined thoroughly by me, as far as its construction permits, and this is a true report of my examinations.

I further certify that the lifting equipment complies in all respects with the requirements pertaining to lifting equipment as stipulated in the Workplace Safety and Health (General Provisions) Regulations, and all other regulations made thereunder and is safe for use.

Expiry Date of Certificate 20/12/2022	Date of Print of Certificate 23/12/2021	Authorised Examiner's Name LEE SEE LOI	Signature of Authorised Examiner LEE SEE LOI
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* Lifting Equipment includes Lifting Gear, Lifting Appliances, Lifting Machine, Lift and Hoist as defined under the Workplace Safety and Health (General Provisions) Regulations.

** Distinctive No. is the Identification Number/Serial Number assigned to the equipment by the manufacturer.

Figure 8.4.2 SCX900-2 crane certificate issued by Singapore MOM

8.5 Trailing Arm

Another configuration for pre trenching in water depth up to 25m, where the CAT390 excavator long arm cannot reach, is the use of a Trailing Arm.

Trailing arm has articulated dredging pipes that extend to the seabed. At the end of the trailing arm, a dredge head is attached. The dredge head is the suction inlet of the trailing arm and consist of 2 electric submersible sand pumps.

The main functions of the trailing arms are to transport the dredged mixture to the surface, and transfer dredging forces from the dredge head to the barge. The trailing arm also ensures full control of the dredge head on the sea floor.

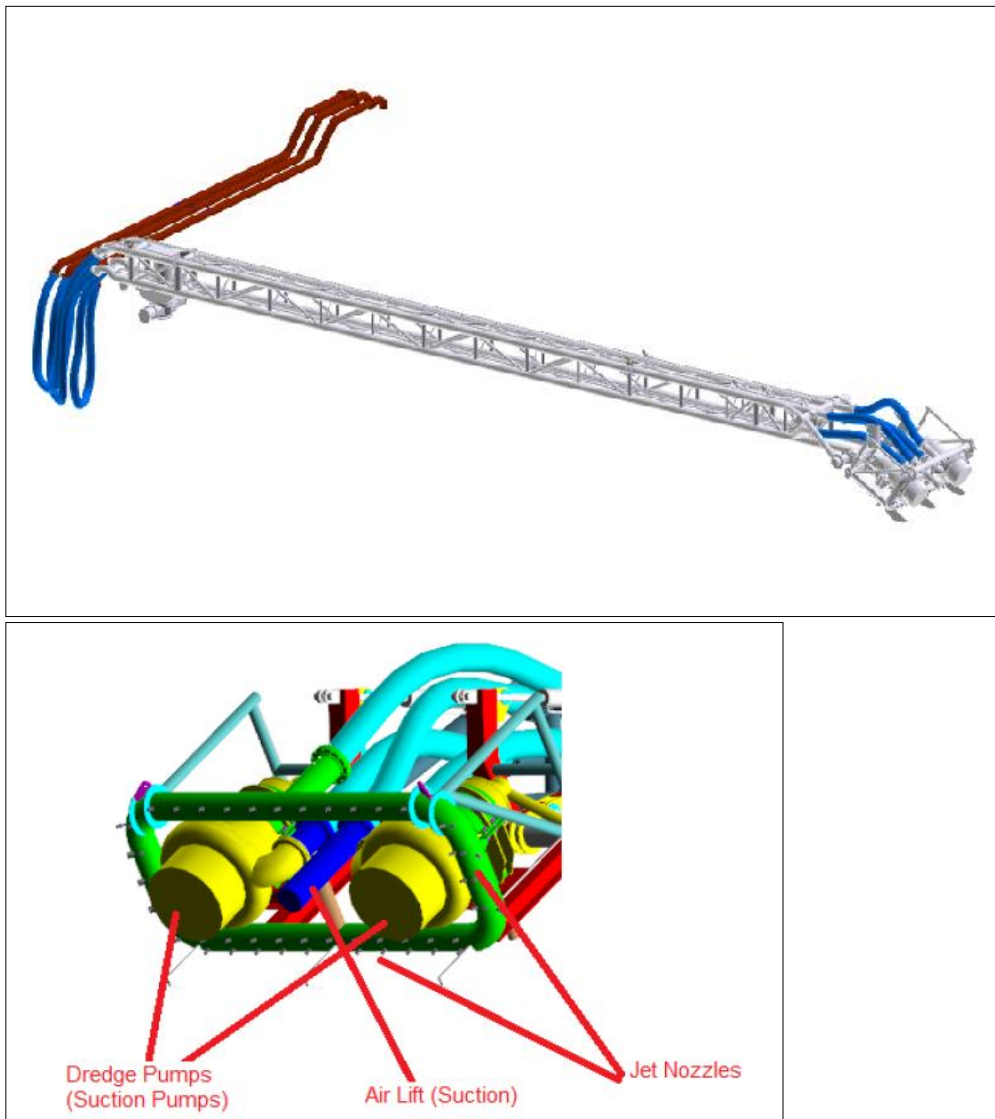


Figure 8.5.1 Trailing Arm and Dredge Head

OCS has already executed pre-trenching project using this trailing arm in Sriracha Refinery Project for Exxon Thailand.



Figure 8.5.2 Trailing Arm on UB01 Ms Pennie Illustration



Figure 8.5.3 Trailing Arm on UB01 Ms Pennie - Actual load out configuration for Sriracha Project

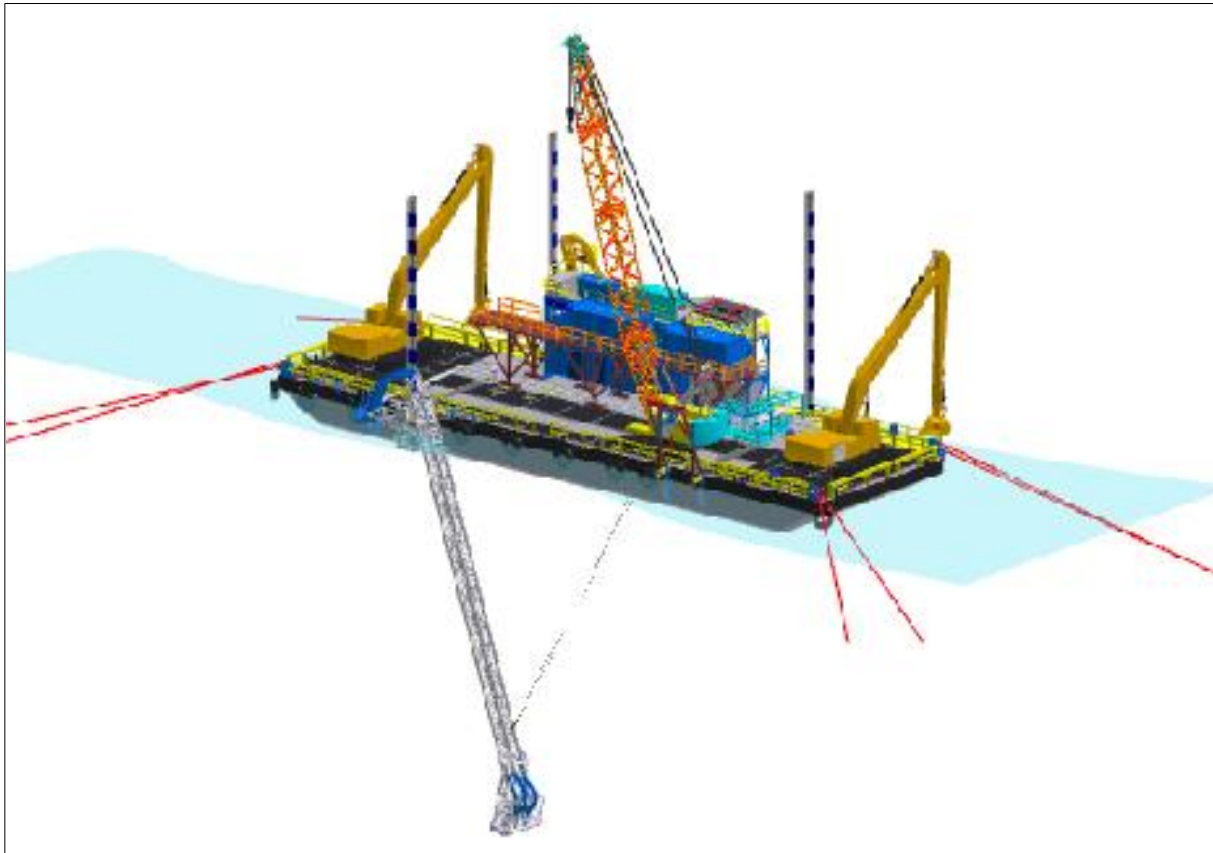


Figure 8.5.4 Trailing Arm working on UB01 Ms Pennie Illustration

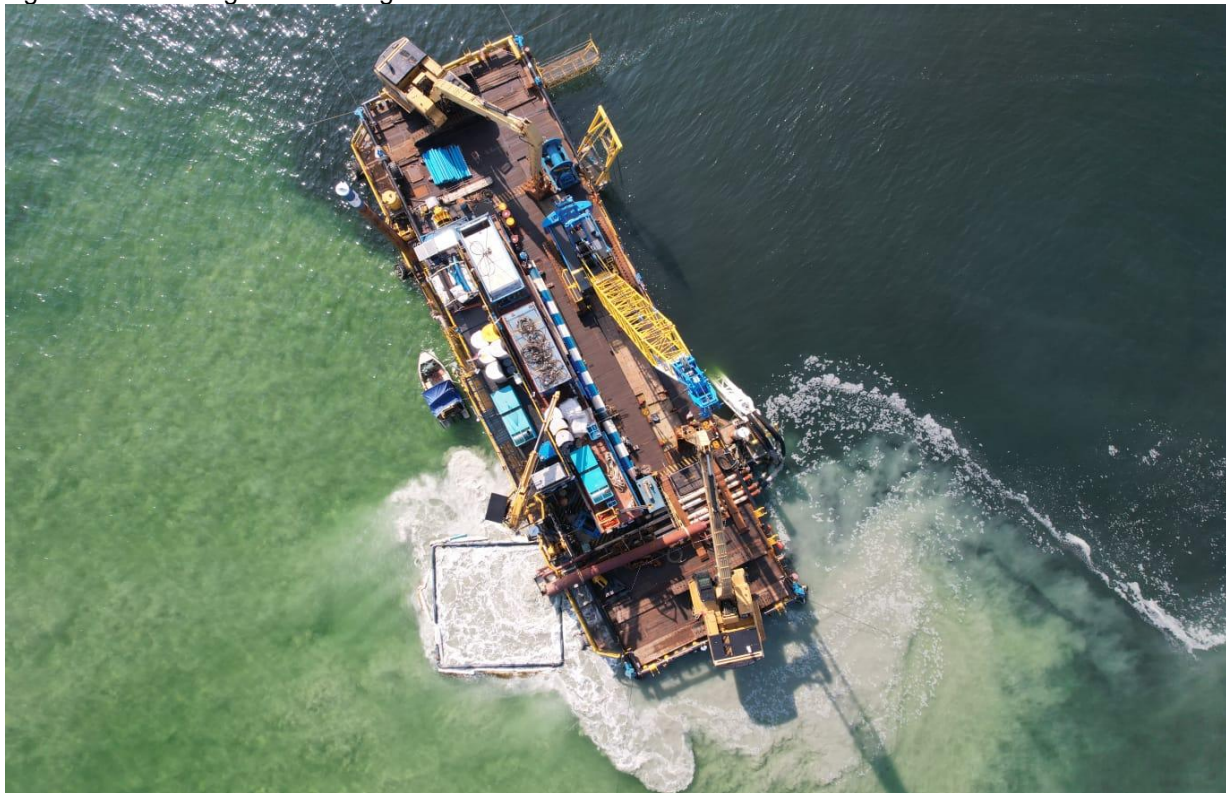


Figure 8.5.5 Pre-Trenching with Trailing Arm in Sriracha Project – Aerial view



Figure 8.5.6 Pre-Trenching with Trailing Arm in Sriracha Project

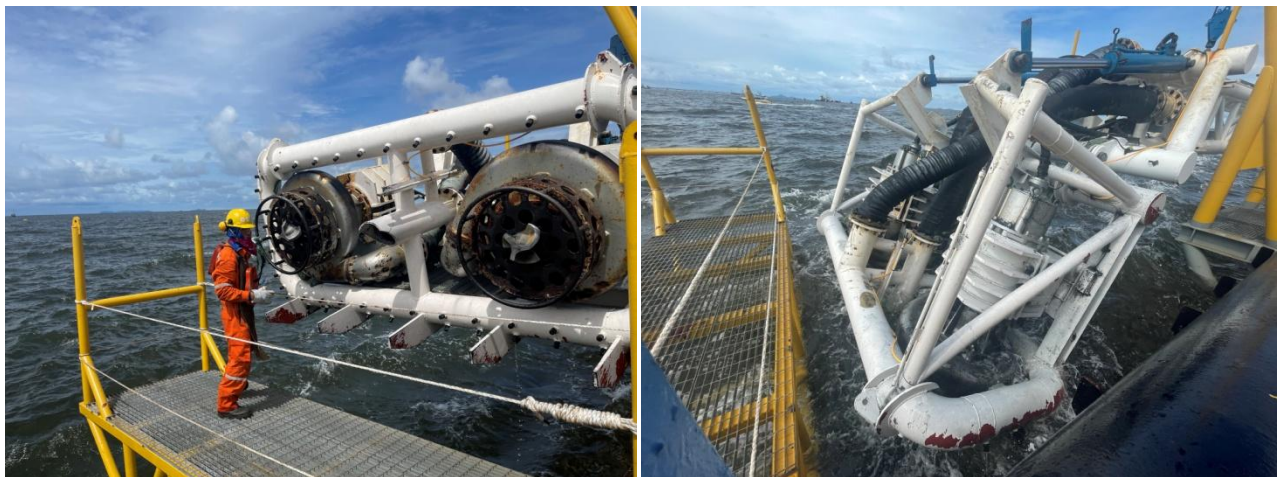


Figure 8.5.7 Pre-trenching Trailing Arm with Submersible Dredge Pump Components (Bottom section)



Figure 8.5.8 Trailing Arm Components (Arm and top support section)

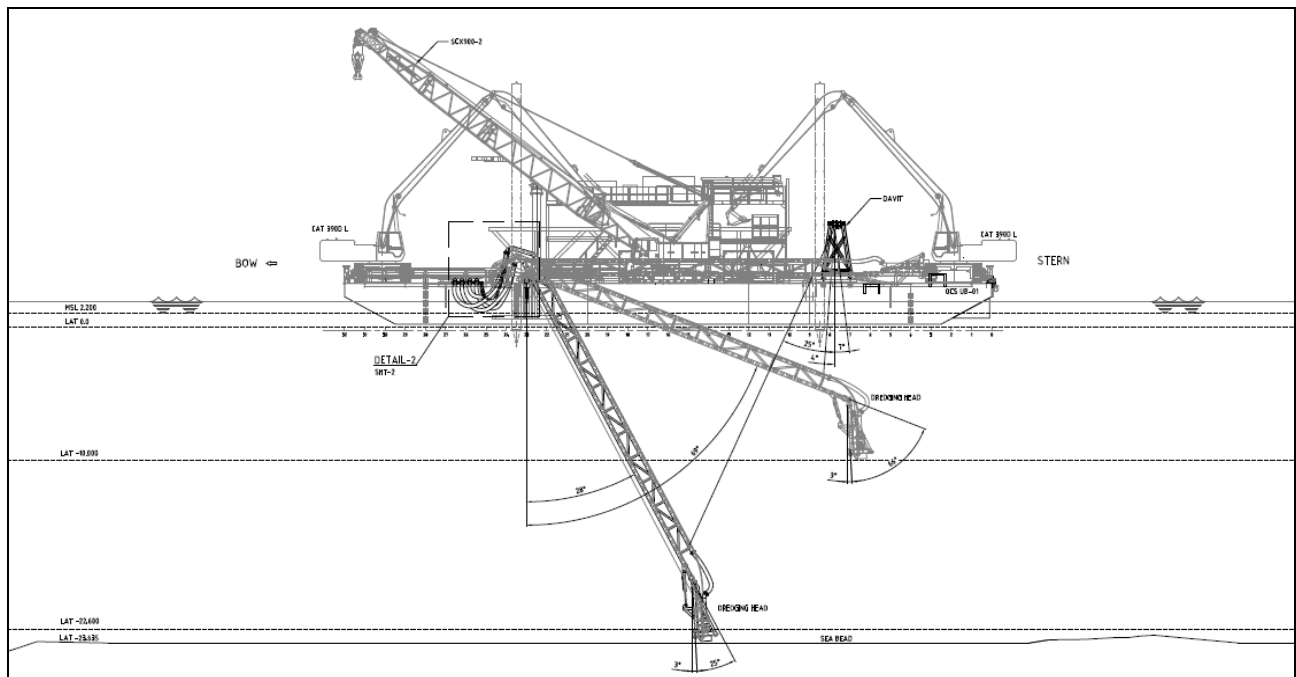


Figure 8.5.9 Trailing Arm depth control profile



Certificate of Registration

This certificate has been awarded to

Offshore Construction Specialists Pte Ltd

36 Kian Teck Road, Singapore 628781, Singapore

in recognition of the organization's Quality Management System which complies with

ISO 9001:2015

The scope of activities covered by this certificate is defined below

Provision of Project Management and Consultancy Services for Oil and Gas Construction Facilities

Certificate Number:

41578/C/0001/UK/En

Date of Issue: (Original)

06 November 2016

Date of Issue:

06 November 2019

Issue No:

3

Expiry Date:

05 November 2022

Issued by:





On behalf of the Schemes Manager



If there is any doubt as to the authenticity of this certificate, please do not hesitate to contact the Head Office of the United Register of Systems (URS) at 36 Kian Teck Road, Singapore 628781. URS is a member of United Register of Systems (Holdings) Ltd, United House, 4 Kallang Road, Singapore 341512. URS Company Registration no. 520460.



Page 1 of 1

	OFFSHORE CONSTRUCTION SPECIALISTS	
	PIPELINE PRE-TRENCHING PRE-QUALIFICATION DOCUMENT	

10.0 NATA CERTIFICATION




NATA is Australia's government-endorsed accreditor of laboratories, and a leader in accreditation internationally. NATA is a signatory to the international mutual recognition arrangements of the International Laboratory Accreditation Cooperation (ILAC) and the Asia Pacific Accreditation Cooperation (APAC).
APAC 1-9 / Issue 5 / May 2015

	OFFSHORE CONSTRUCTION SPECIALISTS	
	PIPELINE PRE-TRENCHING PRE-QUALIFICATION DOCUMENT	


11.0 BCA CERTIFICATION

Serial No : C2108038





Building and Construction Authority
CERTIFICATE OF LICENCE
 This is to certify that
**OFFSHORE CONSTRUCTION SPECIALISTS
PTE LTD**
 (Unique Entity Number / ACRA Registration Number : 200720801G)
 is licensed as a
 General Builder Class 1
 (24 Aug 2021 to 24 Aug 2024)

under Part VA of the Building Control Act and Building Control
 (Licensing of Builders) Regulations 2008



 Commissioner of Building Control
 Singapore

Date: 25 Aug 2021

	OFFSHORE CONSTRUCTION SPECIALISTS	
	PIPELINE PRE-TRENCHING PRE-QUALIFICATION DOCUMENT	

12.0 EXPERIENCE LIST /TRACK RECORD

The attached track records are also included in Pipeline Shore Approach Pre-Qualification Document and are extracted here for reference.

**PROJECT : ESSO SRIRACHA SUBSEA CRUDE PIPELINE CAPACITY
MAINTENANCE PROJECT AT SRIRACHA REFINERY CHONBURI**

Project Details:-

Esso Thailand Ltd (ETL) owns and operate the Sriracha Refinery in Chonburi, which has been processing imported crude since late 1960s. The existing subsea loading system includes a PLEM located in 22m water depth and is approximately 1.7km offshore from the refinery. In order to sustain a throughput capacity of 174kbd through to year 2050, a new 48" crude pipeline including a PLEM will replace the existing loading system.

The new replacement pipeline will be trenched and buried (backfill with the indigenous soil) along its full length including the new subsea PLEM at the new offshore MBM location. The new PLEM is located at 22m water depth below MSL and 25m north of the existing PLEM.

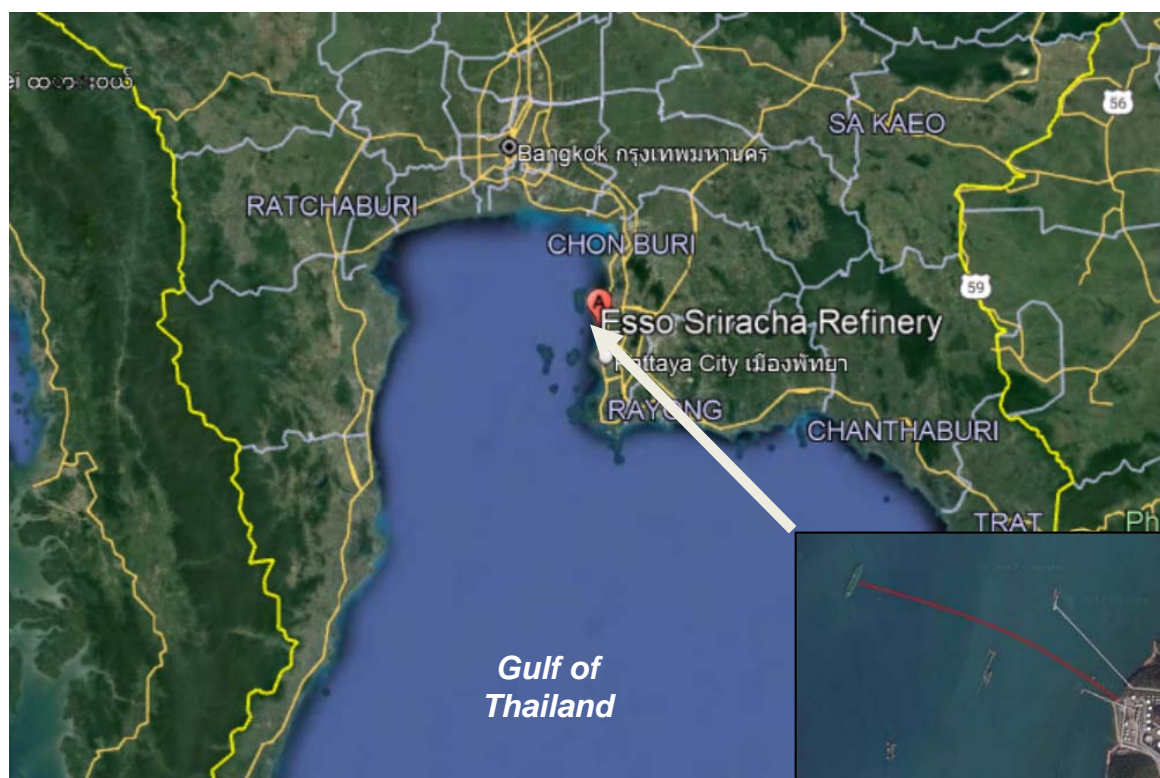
Pipeline/Trench Information:-

Pipeline Size:-	48" (1219mm)
Pipeline wt:	22.23mm
Pipeline Grade	API 5LX60
Concrete thk & density	100mm thk, 3040 kg/m3
Linear Winch	300 mT
Pipeline length	1.715km
Water Depth	22m @ PLEM
Beach Pull Length	0.875km
Pre-trench	1.7km

Project Scope:-

OCS scope for this project is to provide construction management, engineering services and suitable equipment and personnel to prepare, plan, manage and execute the 48" crude pipeline replacement shore approach with **1.7km pre-trenching**, beach pull hold back design and installation, 0.875km beach pull and backfilling. The new 48" pipeline was laid by PT Timas using the DLB01. OCS also provided the construction management for the pipelaying operation. Project was completed in October 2021

Pictures



General Site location



Pictures (continued)



Landfall location

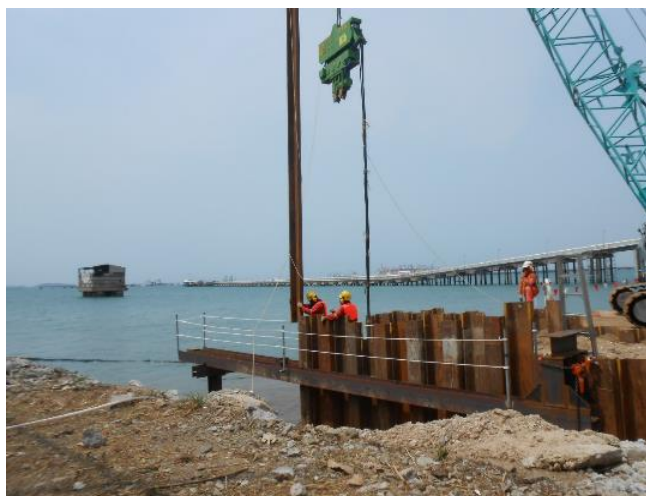


Landfall Before



Landfall after preparation

Pictures (continued)



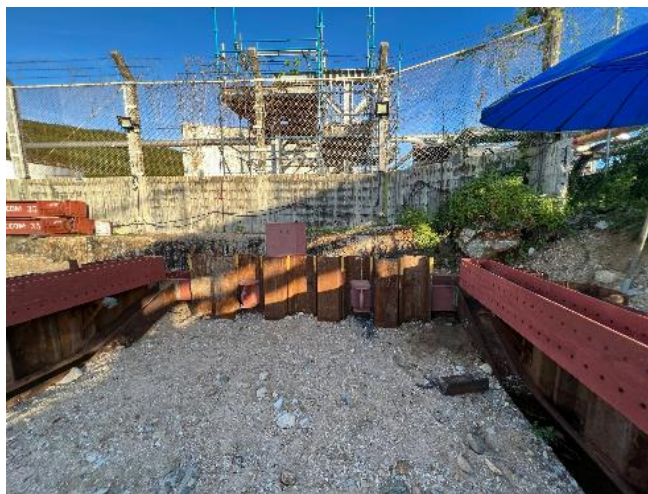
Cofferdam Installation

Pictures (continued)



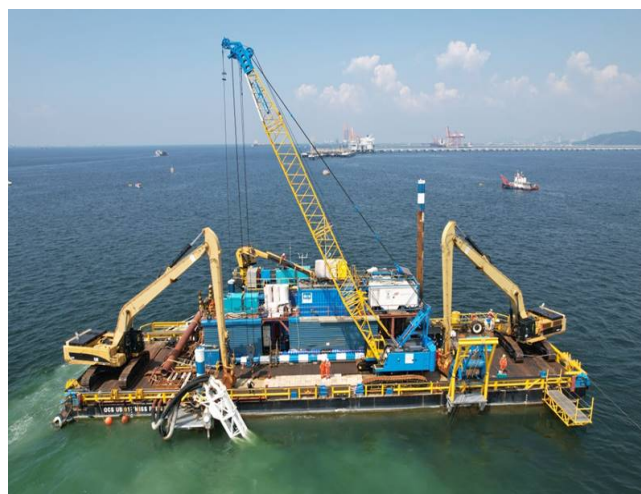
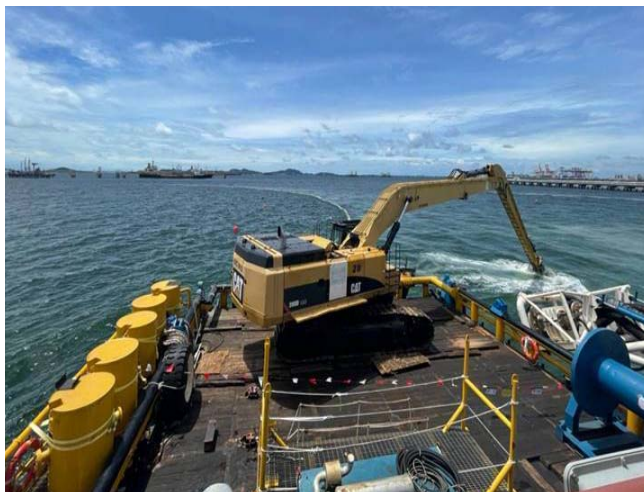
Cofferdam

Pictures (continued)



Lucker Winch Installation

Pictures (continued)



Pre Trenching using UB01 Ms Pennie including the use of the trailing arm dredge

Pictures (continued)



Beach pull / pipelay using DLB01

PROJECT : HCML BD PROJECT PRE TRENCH/SHORE APPROACH BEACH PULL/POST TRENCH

Project Details:-

Husky-CNOOC Madura Ltd. (HCML), plans to develop the Madura Strait Block BD gas reserves for sales gas to buyers in Java Island. This field is located offshore in the Madura Strait East Java, about 65 km east of Surabaya and about 16km south of Madura Island. The project includes development of a wellhead platform; an offshore spread moored Floating, Production, Storage and Offloading (FPSO) with gas processing facilities; Gas metering Station (GMS); flexible risers from wellhead platform to FPSO; and a 16" x 52.924km export gas pipeline from WHP to GMS

Pipeline/Trench Information:-

Pipeline Size:-	16"
Pipeline wt:	11.1mm
Pipeline Grade	API 5LX65
Concrete thk & density	90mmthk, 3044 kg/m3
Linear Winch	400 mT
Pipeline length	52.9km
Water Depth	60m @ Pltf
Beach Pull Length	4.8km
Pre-trench	4.8km
Post trench	1km
Cover	2m T.O.P

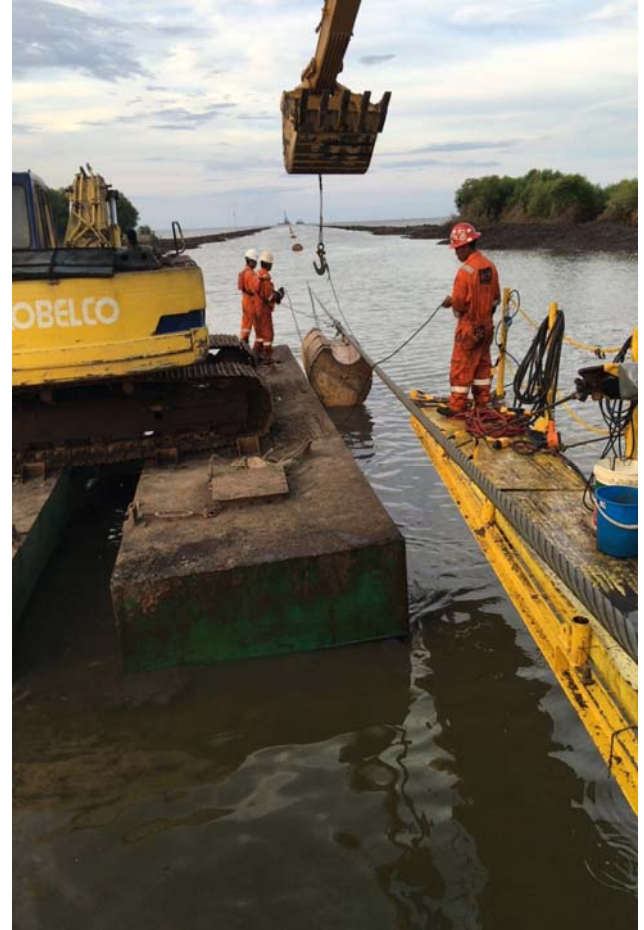
Project Scope:-

OCS scope for this project is to provide management, engineering services and suitable equipment and personnel to prepare, plan and manage and execute the 16" Gas Pipeline shore approach with **4.8km pre-trenching**, hold back design and installation, 4.8km beach pull and a 1km post trench section. Project was completed in August 2016

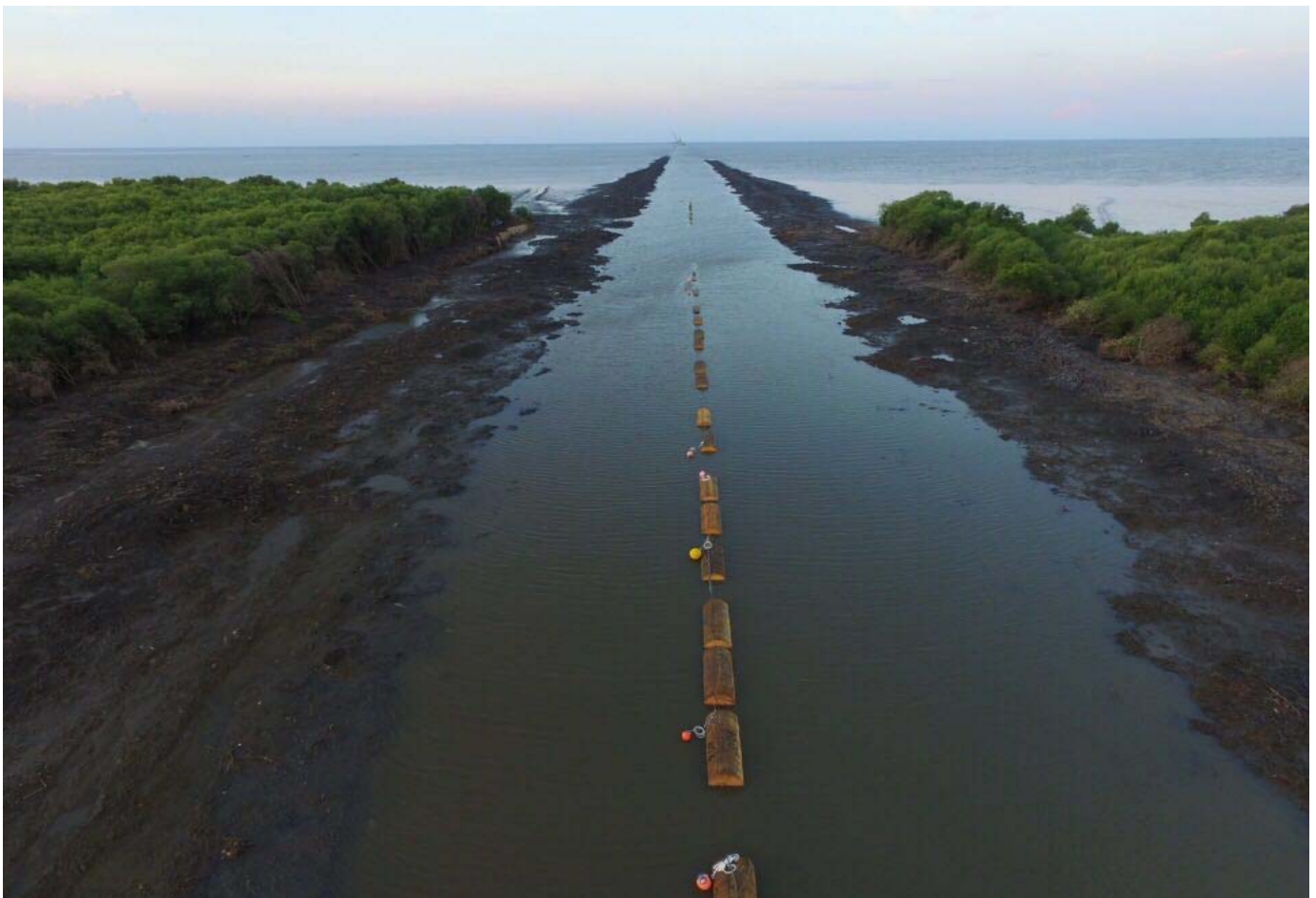




PRE TRENCH AND PULL BARGE



PIPELINE SHORE APPROACH
PRE-QUALIFICATION DOCUMENT



PROJECT : KETAPANG BUKIT TUA (PETRONAS) PRE TRENCH/SHORE APPROACH BEACH PULL

Project Details:-

PC Ketapang II Ltd (PCK2L) is developing the Bukit Tua Field, in Ketapang Block, East Java. Bukit Tua, is located 35 km north of Madura Island and 110 km northeast of Gresik at a water depth of approximately 57m.

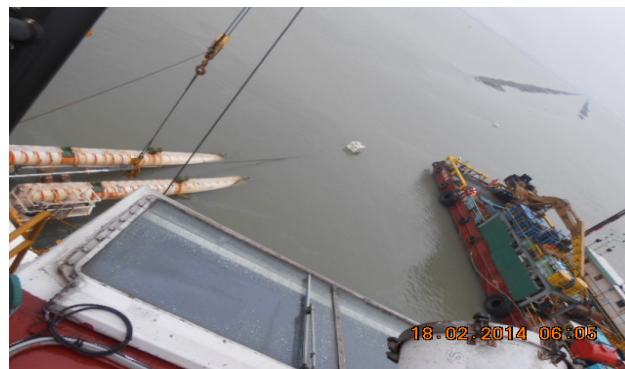
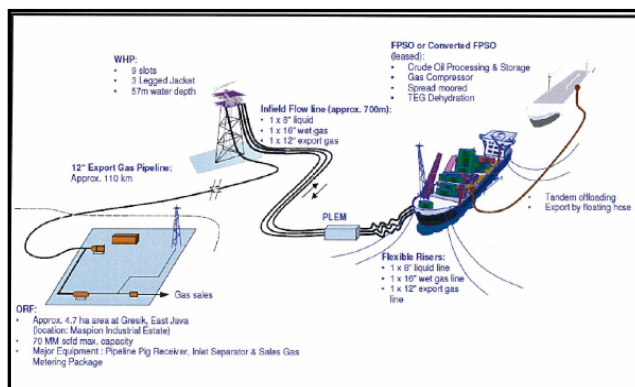
The development consist of unmanned Well Head Platform (WHP) which is tied back to a spread-moored Floating Production, Storage and Offloading (FPSO), anchored approximately 900 m from the WHP. The Full Well Stream (FWS) from the wells are separated into gas and liquid streams in the production separator on WHP. The gas and liquid are evacuated to the FPSO via two separator single phase 16" and 8" liquid infield flowlines. Associated gas is compressed and conditioned on the FPSO and exported via a 12" gas pipeline to WHP and there onwards via a 12" gas export pipeline to the Onshore Receiving Facilities (ORF) in Gresik.

Pipeline/Trench Information:-

Pipeline Size:-	12"
Pipeline wt:	varies
Pipeline Grade	API 5LX60
Concrete thk & density	70mm, 3044 Kg/m3
Linear Winch	450 mT
Pipeline length	110km
Water Depth	57m @ Pltf
Beach Pull Length	4km
Pre-trench	4km
Post trench	25km
Cover	2m T.O.P

Project Scope:-

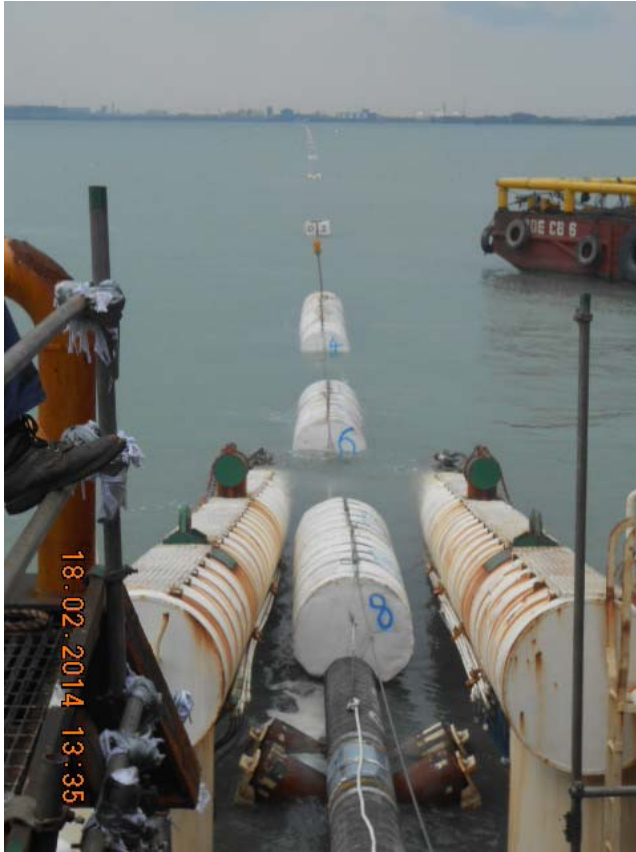
OCS scope for this project is to provide project management and engineering services to prepare, plan and manage the installation of the new facilities comprising WHP platform, 1x12"x110km pipeline and 3x in field pipelines (8", 12" and 16") including shore approach and preparation with **4km pre-trenching**, 4km beach pull, pipelay, post trenching and pre-commissioning. Project was completed in 2014



PRE-TRENCH, PULL WIRE DEPLOYMENT AND RECOVERY



BEACH PULL / PIPELAY FROM PIPELAY BARGE DLB01)



BEACHPULL OPERATION AND COFFERDAM



LPV HOLD BACK AND SPOILER



PROJECT : KAMBUNA (APD/SERICA) PRETRENCHING AND SHORE APPROACH & BEACH PULL

Project Details:-

Asia Petroleum Development (APD) Ltd developed the Glagah Kambuna Field located approximately 70km North East of Medan, North Sumatera. An offshore wellhead platform (WHS-A) will produce gas and condensate, which will transport to the Onshore Receiving Facilities (ORF) by a 14" Pipeline for further processing. The Pipeline is 42km long from the Kambuna platform in the straits of Malacca to the landfall site.

OCS was contracted by PT Timas Suplindo (Main contractor to APD) for the installation of the export pipeline from the wellhead platform to shore crossing at Pangkalan Brandan, North Sumatera.

Pipeline/Trench Information:-

Pipeline Size:-	14"
Pipeline wt:	11.5mm to 11.9mm
Pipeline Grade	API 5LX65
Pipeline length	42km
Water Depth	53m deepest
Beach Pull Length	5km pull
Pre-trench	5km to nearshore
Post trench	8km till 13m WD
Cover	2m T.O.P

Project Scope:-

OCS scope for this project is to provide management and engineering and technical services to prepare, plan and manage the installation of the 14" pipeline including shore approach, beach pull preparation, nearshore preparation, beach pull execution, pipelay, pre an dpost trenching and pre-commissioning. The project was completed in 2009

Pictures:-

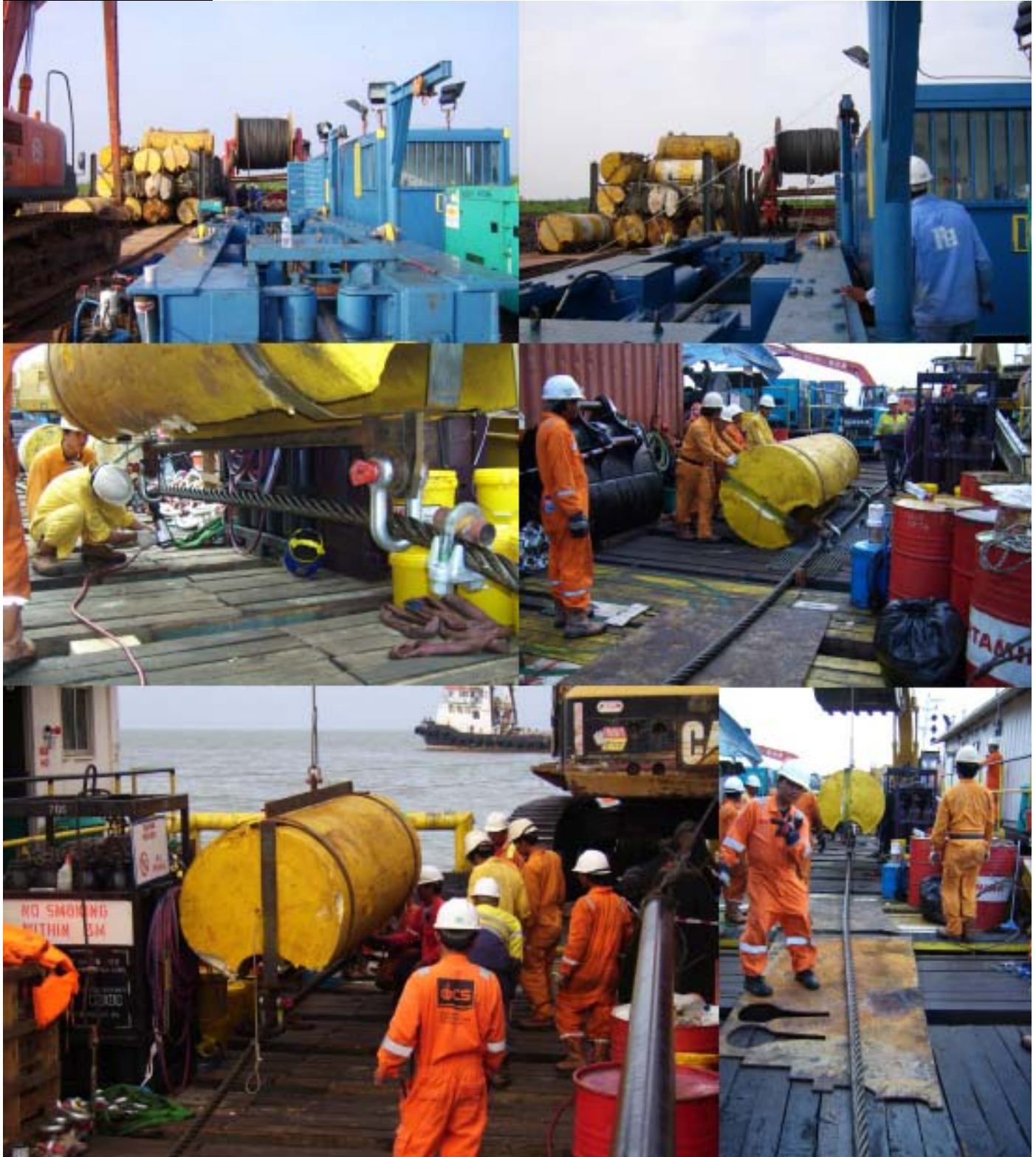


Pictures (continued)



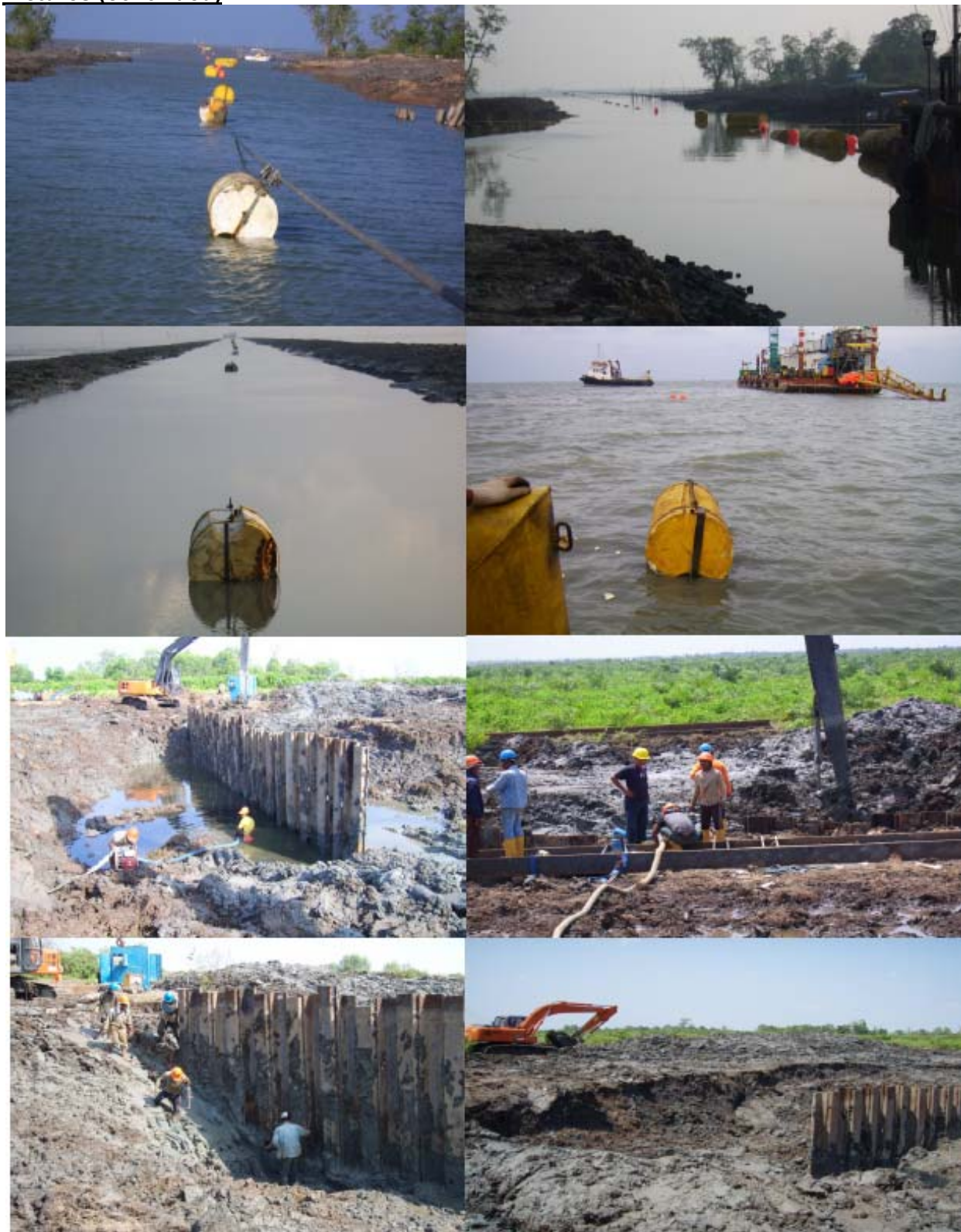
Pre Trench Barge 5km excavation to start of beach pull location, spoil bank on both side for back filling, and pull barge set/up with linear winch, spooler, HPU and Cable buoys

Pictures (continued)



Pull Barge and cable buoyancy deployment

Pictures (continued)



Cable buoys deployed and hold back sheet pile wall

Pictures (continued)



Pipelay barge and buoyancy attachment, pull barge with head arrival

PIPELINE SHORE APPROACH
PRE-QUALIFICATION DOCUMENT

Pictures (continued)



Pipeline pulling head at target location

PROJECT : CAMAU (PETRO VIETNAM) SHORE APPROACH & BEACH PULL

Project Details:-

The PM3 – CaMau Gas Pipeline Project is part of the Gas Power Fertilizer Coordination Project to supply natural gas to the Integrated Power and Fertilizer Plants in CaMau province of Vietnam. PetroVietnam – CaMau Gas Power Fertilizer Project management Board (CPMB) is the owner of the gas pipeline. The CaMau development consist of an 18" pipeline that stretches from the on shore tie in point at Trung Uong Dyke to PM3 BR-B platform approximately 297km away.

Pipeline/Trench Information:-

Pipeline Size:-	18"
Pipeline wt:	12.7mm (varies)
Pipeline Grade	API 5LX65
Concrete thk & density	45mm, 3040 kg/m3
Linear Winch	300 mT
Total Pipeline length	297 km
Water Depth	varies
Beach Pull Length	3km pull
Pre-trench	3.5km to nearshore
Post trench	7km from pre-trench

Project Scope:-

This scope were managed and completed by OCS personnel while their careers were still with McDermott, however the experience stays with the people with the significant relevance being a shore approach in very soft soil condition.

The scope of works involved beach and nearshore preparation (pre-trenching with excavator barge), beach pull execution (with pull barge), pipelay, pre-trenching and pre-commissioning. The project was completed in 2005





OFFSHORE CONSTRUCTION SPECIALISTS

PIPELINE SHORE APPROACH PRE-QUALIFICATION DOCUMENT



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PIPELINE SHORE APPROACH
PRE-QUALIFICATION DOCUMENT

