	OFFSHORE CONSTRUCTION SPECIALISTS	
	PIPELINE FREE SPAN CORRECTION PRE-QUALIFICATION DOCUMENT	

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TABLE OF CONTENTS

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.

The company 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 technician work hand in hand to ensure all projects are properly engineered and operationally practical

OCS has invested considerably on a grouting delivery system for free span correction equipment. The grouting distribution systems provide a delivery and recovery of HP grout hoses in water depths to 1400m. This delivery system comprises of a hydraulically powered hose spooler incorporates a chiksan that allows grout to be pumped continuously while the hose are still on the reel.

OCS's cement silos' are in gauge 20ft standard ISO configuration, they are easily transported by conventional shipping container lines and well suited to intermodal transportation. The Silos are provided with TIR, CSC certification.

Our equipment is managed and operated by personnel who come from the same background as the main marine contractor. We help the major marine contractor plan the work such that the free span correction activity has the least impact on operations. We are proactive in highlighting potential issues and ensuring both parties win. OCS understands the importance of getting the job done safely and efficiently to minimise operational costs for all concerned.

1.1 FREE SPAN CORRECTION EXPERIENCE

OCS has undertaken eleven (11) major free span correction projects for different customers;

Year	Client	Project	Scope
2021	PTSC / Shelf Subsea	Sao Vang – Dai Nguyet (SVDN)	Free span correction for 26” spur line
2021	Timas Sapura Offshore JV (TSOJV)	ENI Merakes	Free span rectification (*) for i. 18inch x 13.347km pipeline for Shallow Water (WD 70m to 100m) and ii. 18 inch x 32.9km pipeline for Deep Water (WD 150m to 1500m)
2019	OPHIR Energy Plc (Madura Offshore)/PT Timas Suplindo	Meliwis	Free span correction for 10” pipeline x 11 km
2015	Shell / Technip	Malikai	Free span correction for 10” and 8” pipelines
2014	Petronas	Ketapang	Free span correction for 110 km x 12” pipeline
2013	Leighton Offshore	Balongan	12” Pipeline X-Ray field to Balongan pipeline
2013	Hess Carigali / Emas	Belida	FPSO Flexible Riser Supports
2013	Pertamina EP / Timas	Parigi	Pipeline Hot tap and Gas Diversion
2013	PTTEP / L&T	Zawtika Phase 1A	2 x 18” pipelines (10km each)
2012	Conoco Phillips/PT Timas Suplindo	Tembang	8” x 150m tie-in spool from Tembang Tee to T8 Well
2012	Conoco Phillips/PT Timas Suplindo	Bawal	14” pipeline x 40 km and tie-ins

(*) OCS prepared, test and mobilised the equipment to offshore, however, after pipelay there were no free span detected.

Our in-house equipment spread is described in detail in this document. OCS is equipped to handle the full range of free span correction activities utilizing grout bags to water depth up to 1400m and span heights to 3m. For spans height in excess of 3m in height, an alternative span correction method may need to be employed from the standard grout bag system as other technical challenges, eg, soil foundation stability; grout volume will need to be considered.

Our custom built spooler system is capable to handle, deploy and recover grout hoses to a water depth of 1400m.

OCS is equipped to handle large projects or discrete project elements depending on the specific needs of the customer. During the preparation for free span correction 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 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.

2.0 ORGANISATION CHART

KEY PERSONNEL CONTACTS

Keith Jackson	Managing and Technical Director	keith.jackson@offshore-ocs.com
Rakul Remanan	Engineering Director	rakulr@offshore-ocs.com
William Wijaya	Project Manager	william.wijaya@offshore-ocs.com
Loke Kah Poh	Project Manager	kploke@offshore-ocs.com
Fery Wijaya	Construction Manager	fery@offshore-ocs.com
Ivan Chai	Construction Manager	Ivan.chai@offshore-ocs.com
Henry Chuy	Subcontracts & Procurement Manager	chuy.chunfei@offshore-ocs.com

Refer to the next page for OCS Organisation Chart

OCS ORGANISATION CHART

OFFSHORE CONSTRUCTION SPECIALISTS

KEITH JACKSON
Managing & Technical Director

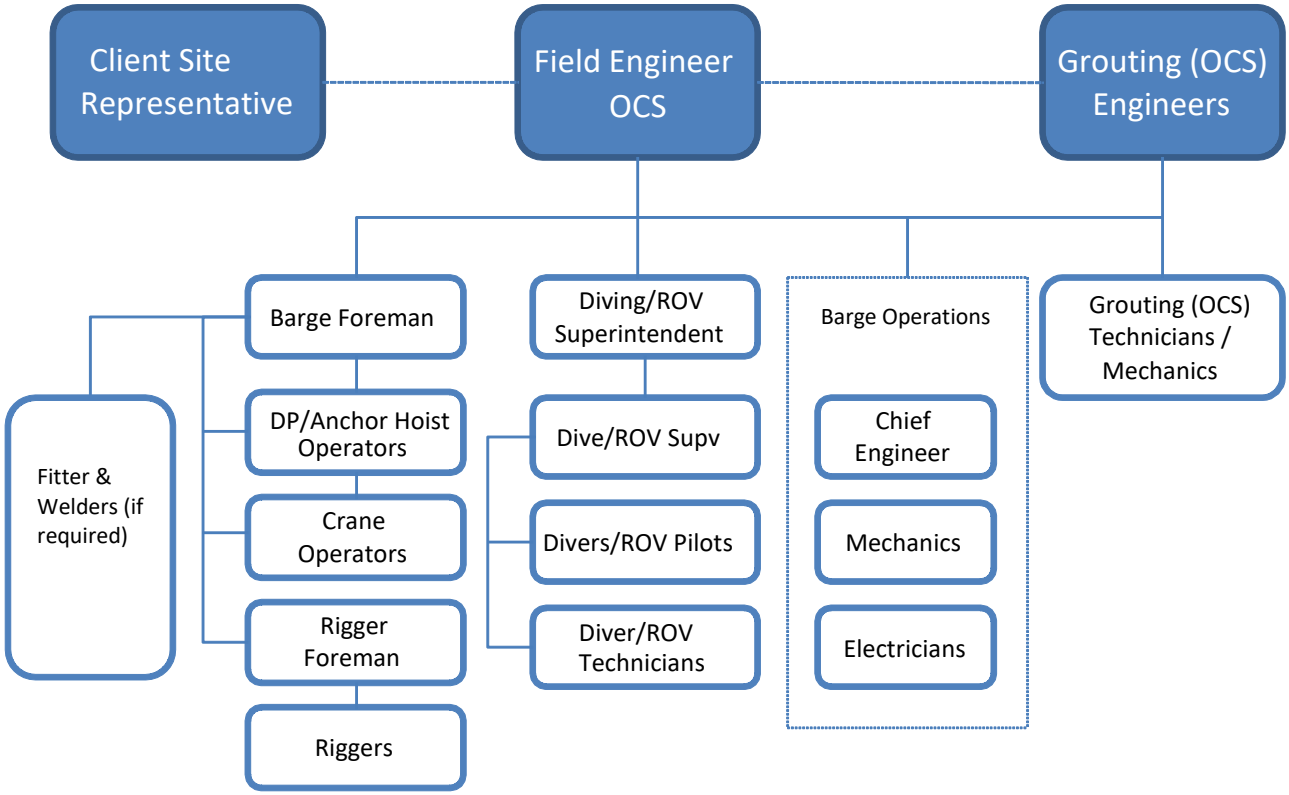
- **DLB-01 MANAGEMENT**
  - WILLIAM WIJAYA — Project Manager
    - VIVIANA CHANG, KEVIN KOH — Buyers
- **OPERATIONS / HSEQ**
  - JIM FORSYTH — Construction Manager
  - FERY WIJAYA — Construction Manager
  - NIKHIL MALIEKAL — HSSE Manager
    - FIELD CONSTRUCTION SUPEVISION TEAM
      - LIM KEAN SENG, CALVIN KENNEDY, JAMES ALLEN BONVILLIAN — Field Superintendent
      - UB01 / MULTICAT Vessel Team
        - FAISAL — Captain
        - GERAL EPAN — Chief Officer
        - HAIRUL ANWAR — Chief Engineer
        - ZAINAL HAFIZ — Electrician
    - STRATEGIC EQUIPMENT TEAM
      - SAYED DEDI M — Senior Pre-com Engineer
      - WAN — Equipment Engineer
      - RONI — Grouting Supervisor
      - CHINNA — Senior Machinist
      - ZAKARIA, BUDIMAN, KRISBEL, MOHD SLAMET — Technicians / Mechanics
    - OPERATIONS
      - IVAN CHAI, SETTHA Y — Construction Managers
      - ADI CAHYA — Operations Engineers
      - STEFANUS, ADITYA, ANTONIO, KITTIPAT, NATTAPAT — Field Engineers
      - MARCO CHRISTIAN, ADAM PUTRA — Junior Field Engineers
- **PROJECT & CONSTRUCTION MANAGEMENT**
  - KP LOKE — Project Manager
- **ENGINEERING**
  - RAKUL REMANAN — Engineering Director
    - PRAVIN THORAT — Engineering Manager
      - ENGINEERING
        - BAHARI — Senior Process Engineer
        - HERYANTHO — Lead Naval Architect
          - TAUFAN SAINUL — Senior Naval Architects
        - VINOD NAIR — Lead Structural Engineer
          - RADITYA ANDY — Lead Structural Engineer
            - AMANDA — Senior Structural Engineer
      - OCS DESIGN PVT LTD, INDIA
        - UDAYASARATHY — Lead Pipeline Engineer
          - SHANTA KUMARI — Senior Pipeline Engineer
        - VAMSHI — Senior Structural Engineer
          - ANANDA CHATTERJEE — Senior Draftsman
            - AMAL — Junior Draftsman
      - DRAFTING
        - CHAYUTRA — Senior Drafting Supervisor
          - ARYO PRAKOSO, LAWRENCE S.C, VINOTH KUMAR, KHAING ZAR AUNG — Senior Draftsmen / Draftsman
            - TIUR SUGANTHA — Piping Draftsman
- **OCS DESIGN PVT LTD INDIA**
- **OCS SAUDI**
- **PROCUREMENT & SUBCONTRACTS**
  - HENRY CHUY — Subcontract & Procurement Manager
    - IVAN TAN — Proposal Engineer
    - LOGAN NG — Buyer / Expeditor
    - FERLINDA LOW — Senior Buyer
- **PT OBOR CEMERLANG SAMUDERA BATAM, INDONESIA**
  - FERY WIJAYA — Construction Manager
    - META WARDANI — Office Administrator
- **ACCOUNTS & ADMINSTRATION**
  - NG BEE KIM — Accounts HR & Admin Lead
    - ADMINISTRATION
      - MELVIN TAN — IT Engineer
        - ESTRELLA BRIZUELA — Project Secretary & Document Controller
          - LIZA TAPERLA — HR Administrator
            - JINKEE MENDOZA — Admin Assistant & Receptionist
    - ACCOUNTS
      - ZHANG XIAN — Accountant
        - GILBERT GREJALDO — Account Executive
          - LEOW FEE PENG — Account Assistant
- **OCS USA**
  - LELAND TAYLOR — Country Manager

LEGEND

- Singapore Head Office
- Middle East
- India Office
- Indonesia Office
- USA Office

3.0 TYPICAL FREE SPAN ORGANISATION CHART

OCS FREE SPAN CORRECTION OFFSHORE TEAM



Personnel requirements for 24 hour operations specifically for operating the free span correction equipment spread are as follows:

- 1 x Field Engineer
- 1 X Grouting Engineer.
- 4 x Technicians/Mechanic (2 per shift)

Craneage, rigging and welding support along with key subcontract support including diving/ROV and survey services are usually provided by the vessel operator or main contractor. OCS can provide additional personnel as required.

Where specifically required, OCS can provide an option for provision of the entire support vessel. Customer requirements for this option can be discussed on a case by case basis.

4.0 PLANNING AND EXECUTION

OCS will cover the following scope areas during planning and execution of free span correction projects.

Pipeline free spans are areas where the pipeline (laid on seabed) are raised (due to natural pipe stiffness) and not supported on the seabed. Pipeline free spans can result from sand waves or undulated terrain/seabed or generally rough seabed conditions or from crossings over existing pipelines.

Different allowable free span lengths are assigned for “Unflooded”, “Hydrotest” and “Operating” conditions. This data is used to determine correction methodology.

Depending on the length of the free spans, where the spans exceeds the allowable length this will lead to overstressing of the pipeline during operation

Free span remediation can be achieved by

- Pre-sweeping to remove sand waves or obstructions (i.e prior to pipelay)
- Dredging of material from under the pipe using jetting or mass flow excavation.
- Installation of Fabric Formworks or “Grout Bags” to support the pipe in areas with excessive spans (post pipelay installation)

Pipeline free spans assigned for correction are defined as areas where the pipeline unsupported length on the seabed is excessive and will lead to overstressing.

4.1 Free Span Correction Scope

For a particular free span scope of work, OCS will review the scope of work taking particular note of the following:

- Pipeline outside diameter inclusive of all coating/s and anode locations
- As laid survey report (if available) to assess number and type of span correction requirement
- Seabed material properties, and seabed bathymetry/features
- Operating water depth and environmental conditions
- Supporting equipment requirement, eg Type of vessel to be used, deck peripheral equipment, a typical marine spread for a standard free span correction scope will require:-
  - A DP vessel of DP1 or DP2 (preferred) classification with accommodation for a crew and personnel of 20 to 25 pax.
  - For an option with ROV – a Work Class ROV with 6 crew for 24 hours operations (Grout bag installation by ROV) with deployment Lars.
  - For an option of Air Diving: Air Diving team of 11 pax for 24 hour Operations (Grout bag installation by Divers).
  - Survey and positioning system with DGPS.
  - Grouting Equipment spread.
- Preparation of project specific Free Span Correction Procedure

4.2 Equipment Assignment and Layout

Based on a review of the scope of work and the other critical parameters listed in 4.1 above OCS will assign the most appropriate grout bag requirement for the work.

Based on the assessment of equipment required OCS will also provided a layout the barge/vessel assigned by the client.

In certain cases OCS can provide the operating vessel on which to base the equipment depending on the specific needs of the client although it is our experience that it is most cost effective to use a vessel that is already engaged in other areas of the project.

4.3 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.

4.4 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.

4.5 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.

4.6 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.

4.7 Personnel

OCS will provide a team of qualified personnel to co-ordinate and operate the equipment on a 24 hour basis. The OCS proposed organization chart is in section 3.

4.8 Site Operations

A typical procedure for free span identification and rectification planning is as follows. OCS will work closely with the client to ensure all free span correction activities are closely coordinated with other activities on the project.

i) On completion of pipelay a as laid survey is conducted using side scan equipment
ii) Pipeline Free Spans are identified and compared with the allowable for the dry, hydrotest and operating conditions.
iii) In certain cases physical verification by ROV (divers) may be required.

iv) The type and number of grout bags required are identified based on the diameter of the pipeline and the height of the spans to be rectified.
v) Plans are developed to rectify the spans in the most timely and cost effective fashion that poses least risk to the pipeline.

FREE SPAN CORRECTION PROCEDURES : DIVING VS ROV

Factors that affect the selection of ROV or Divers

i) Generally for water depths over 35 metres saturation divers must be used which greatly increases cost. Unless saturation divers are already mobilised for other work ROV operations are more cost effective
ii) If spans are located in shallow water that is inaccessible by ROV, Air Divers must be utilised.
iii) The deployment turntable is essential for ROV operations and optional for divers although the turntable makes both operations far easier
iv) Any operation that eliminates divers involves less risk to personnel and in that respect ROV operations are safer.

FREE SPAN CORRECTION METHODOLOGY

Where free span correction operations are conducted the following basic steps are followed:

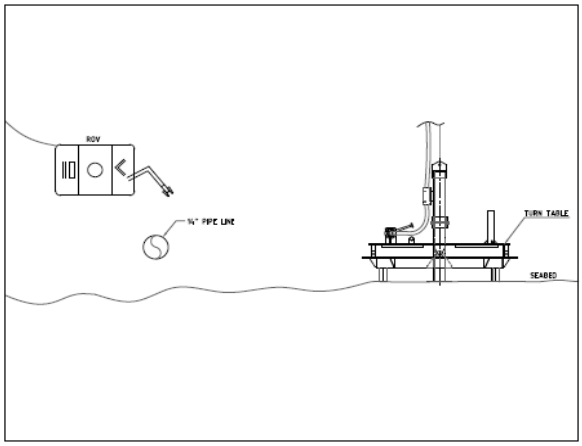
i) The vessel sets up at the span location
ii) ROV (or Diver) is deployed to confirm the span height and location and mark the position of the grout bag
iii) The appropriate grout bag is selected based on the height of the pipeline above the seabed at the support location.
iv) The selected grout bag is assembled on the turntable in the correct orientation and secured with quick release straps. A bridle with a deployment rod is attached to the leading edge of the grout bag
v) The grouting hose from the grout pump is attached to the turntable and the base (first compartment) grout bag hose is attached to the turntable grouting pipe work via a quick release connection system (QC Nozzle-hose / QC Box–TT)
vi) The turntable is lowered to the assigned position and located adjacent to the pipe. As the turntable is lowered the grout hose is paid out from the spooler and the hose is connected to the crane or A-frame downline via quick release hooks to ensure good control of the hose.
vii) With the turn table adjacent to the support location the ROV first rotates the turntable to the correct orientation then takes the grout bag bridle rod from the turntable and stabs it under the pipeline before relocating to the other side of the pipe to pull the bag into position under the pipe and locating the bag exactly using alignment indicators on the grout bag.
viii) The grout mix is prepared on the vessel and the grouting hose connected to the appropriate connection on the spooler.
ix) Grouting operations are carried out to fill the base first and then the pyramid section of the bag to a maximum height of 1.0 metre.
x) When the grouting operation is complete the ROV cuts the hose drapes it over the pipe and returns the quick connect assembly to a receptacle on the turntable
xi) For the larger bags with multiple compartments used for greater span heights the grouting must be completed in two or more stages allowing time for grout setting. In

these cases the ROV takes the next quick connect (QC) nozzle and stabs it into the QC box assembly on the turntable and engages the lock.

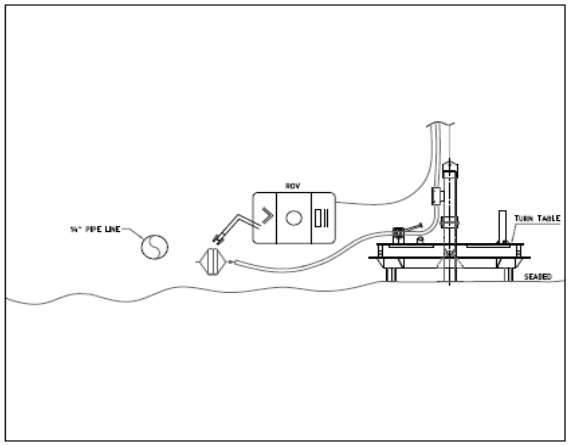
xii) Grouting operations proceed until the grout bag is supporting lower section of the pipeline.

xiii) The hose is cut as for the first stage and the turntable is recovered to the surface for the next grout bag.

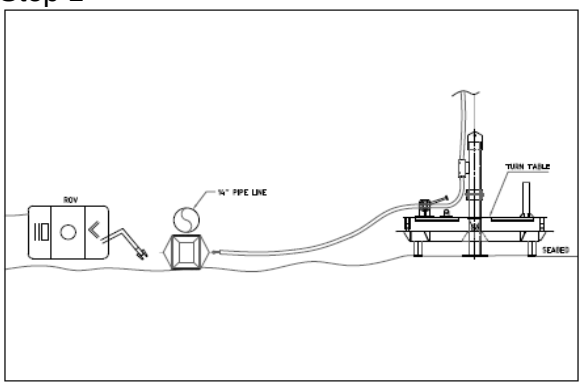
Illustrations:-



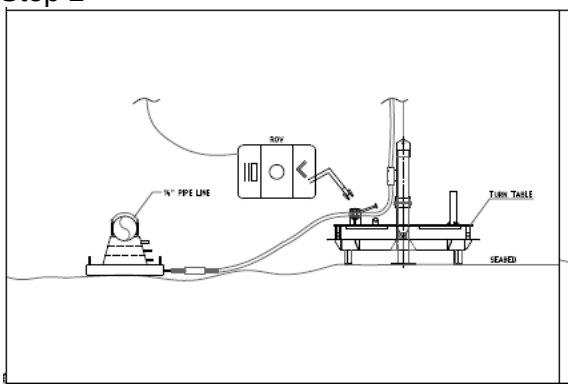
Step 1



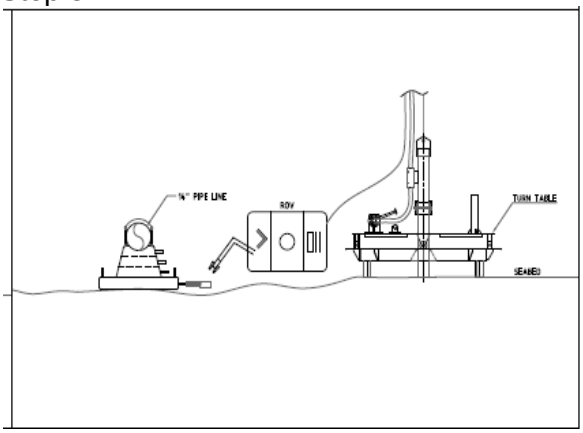
Step 2



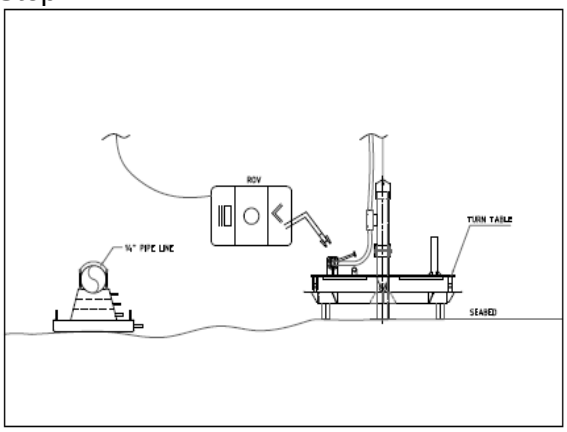
Step 3



Step 4



Step 5



Step 6

4.9 Surveys

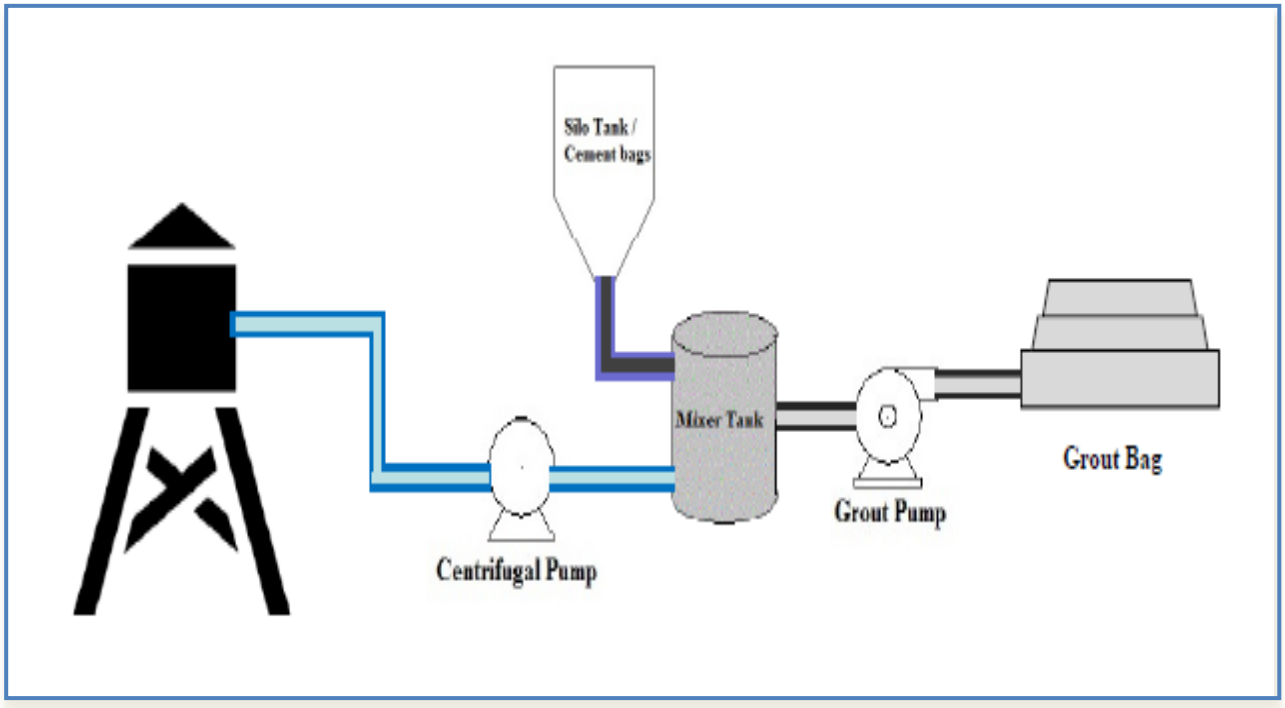
Typically a full complement of survey and positioning system set up on the grouting vessel will be required to track the ROV and to position the grout bag at the correct free span position. Prior to any deployment a visual survey will be performed to verify the span and the designated span to be corrected. Once confirmed the span rectification activity will proceed.

On completion of free span correction the corrected section of the pipeline will be surveyed using the ROV or Diver's hat video and the position will be plotted into the as built location database.

4.10 On Shore Preparation/Trial

Prior to any mobilization of the free span correction spread the grouting system are tested at OCS's onshore facilities. The purpose is to ensure the soundness of the equipment and check the quality of grout produced.

A typical schematic of the test:-



4.11 Load Testing

All OCS owned equipment's including Cement Storage Silos, Cement Mixing Tank, Grout Pump, Hose Spooler, Grout Bag Deployment Turntable, deployment chute have been designed for lifting in accordance with DNV lifting codes for offshore packages.

5.0 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 (M)
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	Sapura Acergy (Malaysia)
27	Sarku (Malaysia)
28	Sea Drill (Singapore)
29	Star Petroleum (Indonesia)
30	Sapura Offshore (Malaysia)
31	Vietsovpetro (VSP) (Vietnam)
32	PTSC (Vietnam)
33	Shelf Subsea (Singapore)

6.0 EQUIPMENT GENERAL DESCRIPTION

OCS operates a complete set of free span correction equipment. Each piece of equipment has its own equipment passport which is maintained from project to project. This helps to ensure that only appropriately maintained equipment is supplied to projects.

The key equipment components of our free span correction are as follows:

i) 28 tonne capacity cement silo tanks

OCS owned 2 cement silo tanks. These ISO Bulk Cement Silos are used for the transport and storage of powdered cement. They are manufactured to ASME-VIII-Div 1 rules for the construction of vessels and are classified as ISO Type 20B4 (20ft Dry Bulk Containers). They also fall under ISO TC-104. 2 units are generally mobilized.

ii) Grout Mixer and Pumping assembly

The grout pumping system is comprised of two major components:

a. Power pack/ pump skid
b. Mixing bowl skid

a. The pump skid contains a 4-71diesel engine coupled to a 5” x 6” centrifugal pump.

   The grout pumping system is normally used with bulk cement supply from silos or from vessel bulk tanks via a silo. It can also be used with bagged cement if for any reason the cement ISO tank storage units cannot be used.

b. The grout mixing bowl skid or Hopper (Capacity 1.6 m3) is comprised of the following:

   - Cement & water-jet mixing head.
   - Inlet & outlet pipes along with recirculation and overboard pump valves.

iii) Grouting Hose Spooler

A hydraulically powered hose spooler unit equipped with a chiksan swivel joint is used for hose deployment and grout flow control. Purpose built heavy duty spooler is capable to handle a full grout hose up to a water depth of 1400m.

iv) Hose Overboarding Chute

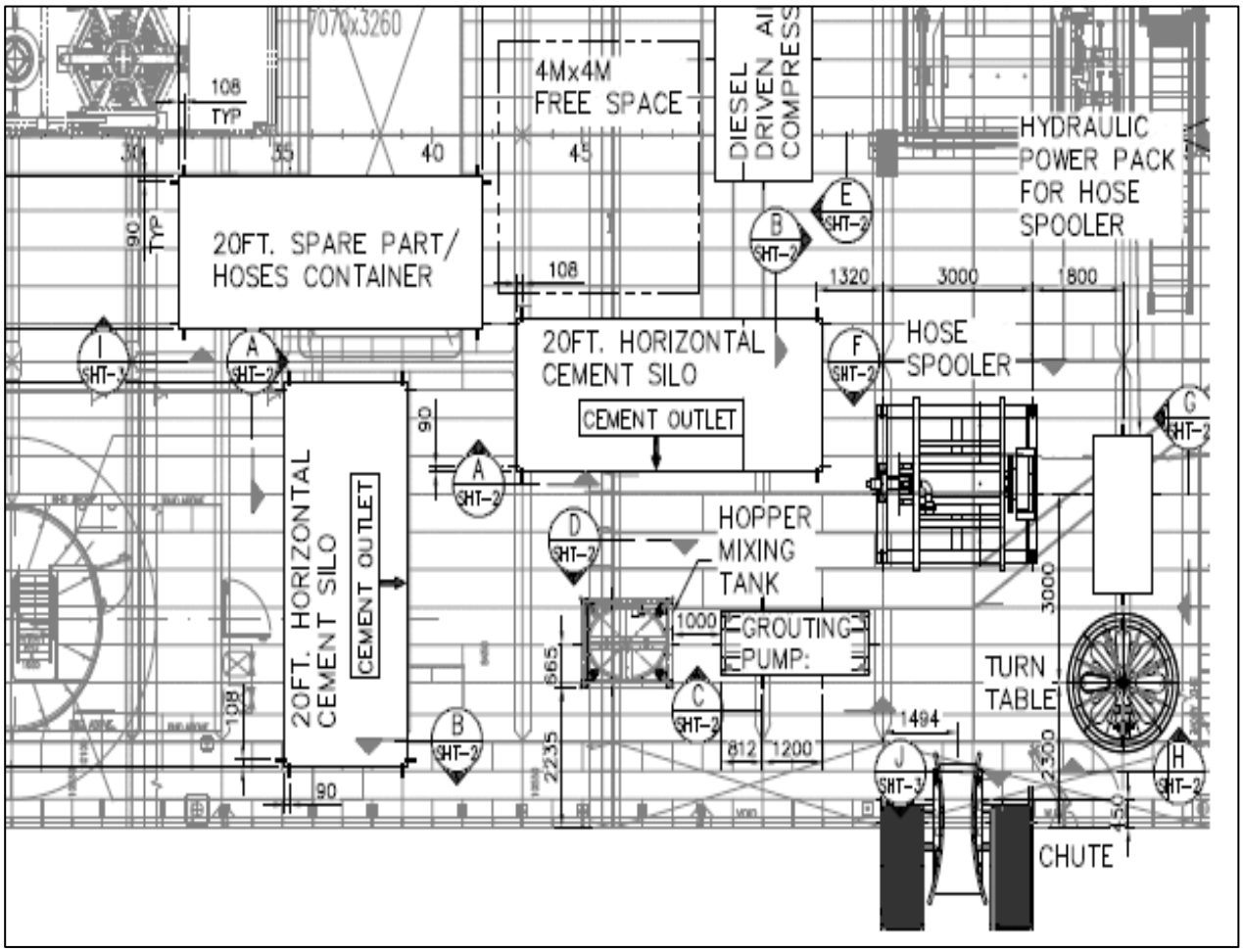
An overboarding chute allows for smooth deployment of grout hose over the side to prevent damage to grout hoses. The chute has an integrated personnel access.

v) Grout Bag Deployment Turntable

The Installation turn-table is utilised to deploy the Grout Bags used for pipe supports to the seabed on freespan rectification projects where Remotely Operated Vehicles (ROV’s) are utilised to position the bag accurately without the need for divers. It is equipped with grout pump hose connections and a quick connect (QC) box for remote connection of the QC nozzle from the grout bag.

6.1 Typical Layout of Equipment on vessel

A typical layout of free span correction equipment is shown below.



7.0 EQUIPMENT LIST

The following is a general description of the list of equipment supplied by OCS for a standard free span correction scope:

NO	DESCRIPTION	DIMENSION (m)	WEIGHT (mT)	QTY
1	20ft Horizontal Cement Silo with shackles and slings (OCSU0010029)	6.05 x 2.43 x 2.75	32	1 ea
2	20ft Horizontal Cement Silo with shackles (OCSU0010034)	6.05 x 2.43 x 2.75	32	1 ea
3	Grouting Pump : Diesel driven centrifugal pump, 320 m3/hr, 171 m head.	3 x 1.1 x 1.75	2.37	1 ea
4	Hopper mixing tank, 1.8 m3 tank cap., 4 m3/hr.	1.8 x 1.43 x 2.3	6.25	1 ea
5	Hose spooler, 1.5MT @ 12 m/min (bare drum) with Motor and reel configured to support water depths up to 1400m	3.532 x 2.75 x 3.109	5.0	1 ea
6	Turn Table	2.4 x 2.4 x 2 x 500	0.5	1 ea
7	Hose Deployment Chute	2.1 x 1.1 x 1.8	1	1 ea
8	98HP Hydraulic Power Pack	2.52 X 1.27 X 2.04	3.5	1 ea
9	Air Compressor 300cfm	3.81 x 1.8 x 1.78	1.825	1 ea
10	Spreader Bar of Hose Spooler	3 x 0.361 x 0.57	0.5	1 ea
11	20ft Container (OEGU151411) c/w pre-rig. For spares and miscellaneous parts	6.058 x 2.438 x 2.591	15	1 ea
12	Grout Bags (Variable sizes)	Dimension Varies	Varies	-

8.0 PRINCIPAL EQUIPMENT DATA SHEETS

8.1 Cement Silo

ISO Bulk Cement Silos are used for the transport and storage of powdered cement. They are manufactured to ASME-VIII-Div 1 rules for the construction of vessels and are classified as ISO Type 20B4 (20ft Dry Bulk Containers). They also fall under ISO TC-104. 2 units are generally mobilized.

The silos are in gauge 20ft standard ISO configuration, they are easily transported by conventional shipping container lines and well suited to intermodal transportation. The Silos are provided with TIR, CSC certification.

The silo specification is as follows:		
Length	-	20ft (6058m)
Width	-	8ft (2438m)
Height	-	8ft 6" (2591m)
MGW	-	32200 kg
Tare	-	4200 kg
Net	-	28000 kg
Volume	-	22m3
Air Supply	-	>8 m3/min
Design Pressure	-	0.22 Mpa
Test Pressure	-	0.33 Mpa

8.2 Grouting Pump System

The system dimensions are as follows (L x B x H x kg):

Power pack/ Pump Skid	3.0 x 1.0 x 1.8 x 2000
Mixing Bowl Skid	1.6 x 1.3 x 2.5 x 750

Grouting Pump

The grouting skid consists of Magnum 250, 6" X 5" X 14" centrifugal pump and 4 -71 diesel engine.

Clear Water Performance:

Sp, Gravity: 1.0
Max Performance:
Speed: 1800 RPM
Pressure: 102.8 psi
Total differential Head Feet: 237.5

8.3 Hopper Mixing Tank

The grout mixing bowl skid (Capacity 1.6 m3) is comprised of the following:
- Cement & water-jet mixing head.
- Inlet & outlet pipes along with recirculation and overboard pump valves.

8.4 Hose Spooler

OCS's hydraulically powered hose spoolers are an important critical part of the free span correction spread as it houses the 2" HP grout hose, configured in a chiksan such that the grout supply are continuous as the spooler reels out the hoses. The grout supply hose is of high strength anti-kink construction where it is durable and prevents kinking/collapse during operation.

The specification of the Hose spooler employed in OCS's grouting spread is as follows:

Spooler

Motor: Hagglunds

Model: 6185

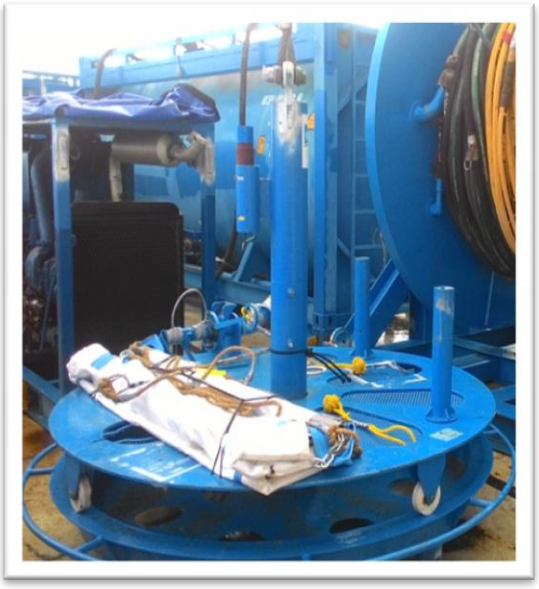
Max. Torque: 25 kN.m

General/Normal Configuration

Deep Water configuration

8.5 Turn Table

The Installation turn-table is utilised to deploy the Grout Bags used for pipe supports to the seabed on free span rectification projects where Remotely Operated Vehicles (ROV's) are utilised to position the bag accurately without the need for divers. It is equipped with grout pump hose connections and a quick connect (QC) box for remote connection of the QC nozzle from the grout bag.



The turn-table dimensions are as follows:

Outside diamter	-	2.4m
Height	-	2.0m
Weight	-	500 kg

The turn-table is launched and recovered via the work vessel deck crane or an A-frame system.

The ROV through interaction with the turn-table is able to access the Grout Bags packaged on the turn-table and then position them at the desired support location under the pipeline.

For accurate placements on the seabed a survey beacon can be positioned on the turn-table.

The unique Quick Connect Box on the turn-table facilitates the ROV to interchange grout supply hoses on the turn-table thereby enabling the filling of multi-staged/ multi-phased Grout Bags.

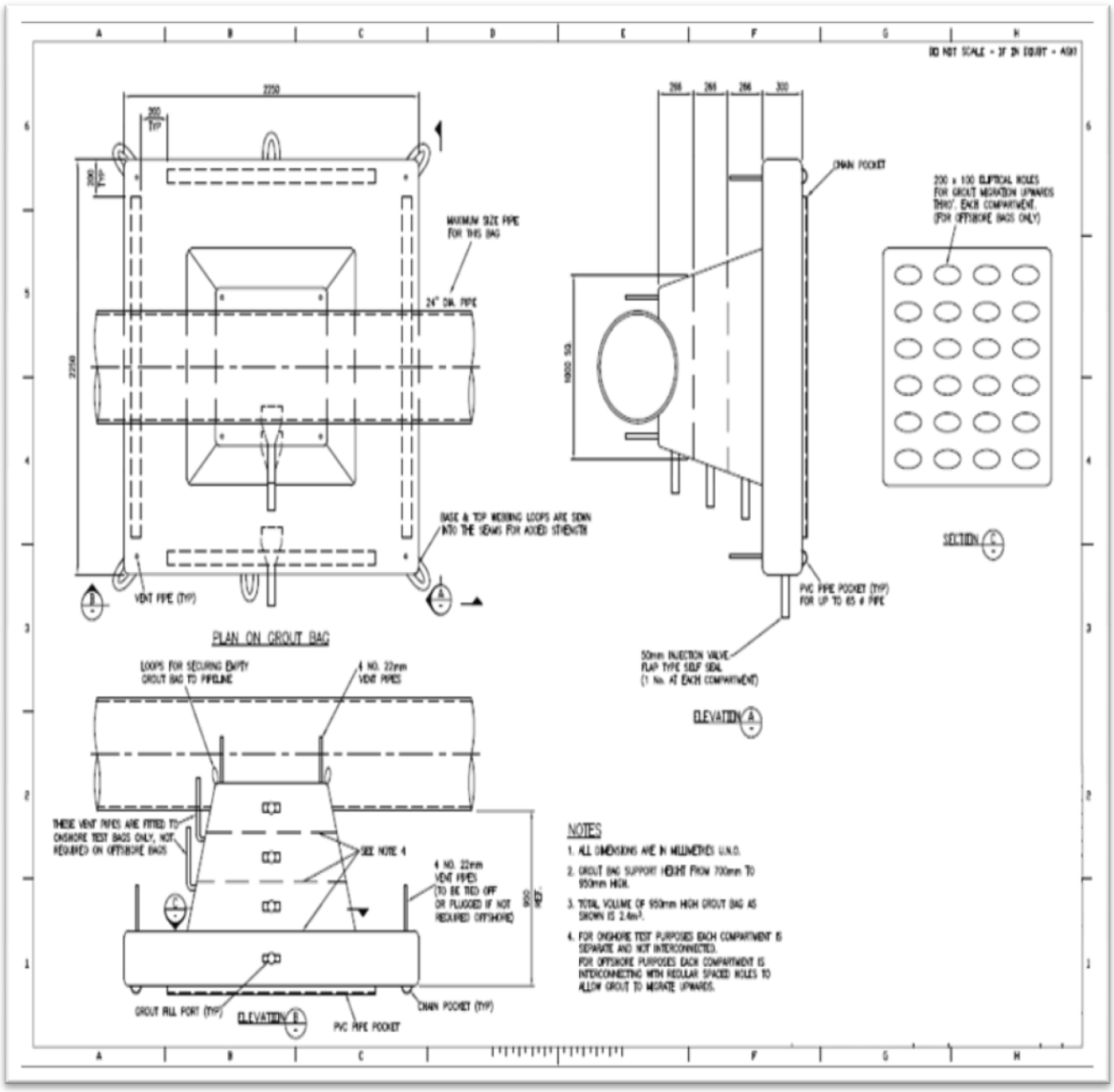
8.6 Hose Deployment Chute

Over-Boarding Chute with Access platform (SWL – 5 kN/m^2)

8.7 Hydraulic Power Pack

90 hp Power Pack Dimension:- Length:2520mm Width:1200mm Height:2040mm Weight: Approx. 3.0 ton (dry) Approx. 3.5 ton (filled)	

8.8 Grout Bags

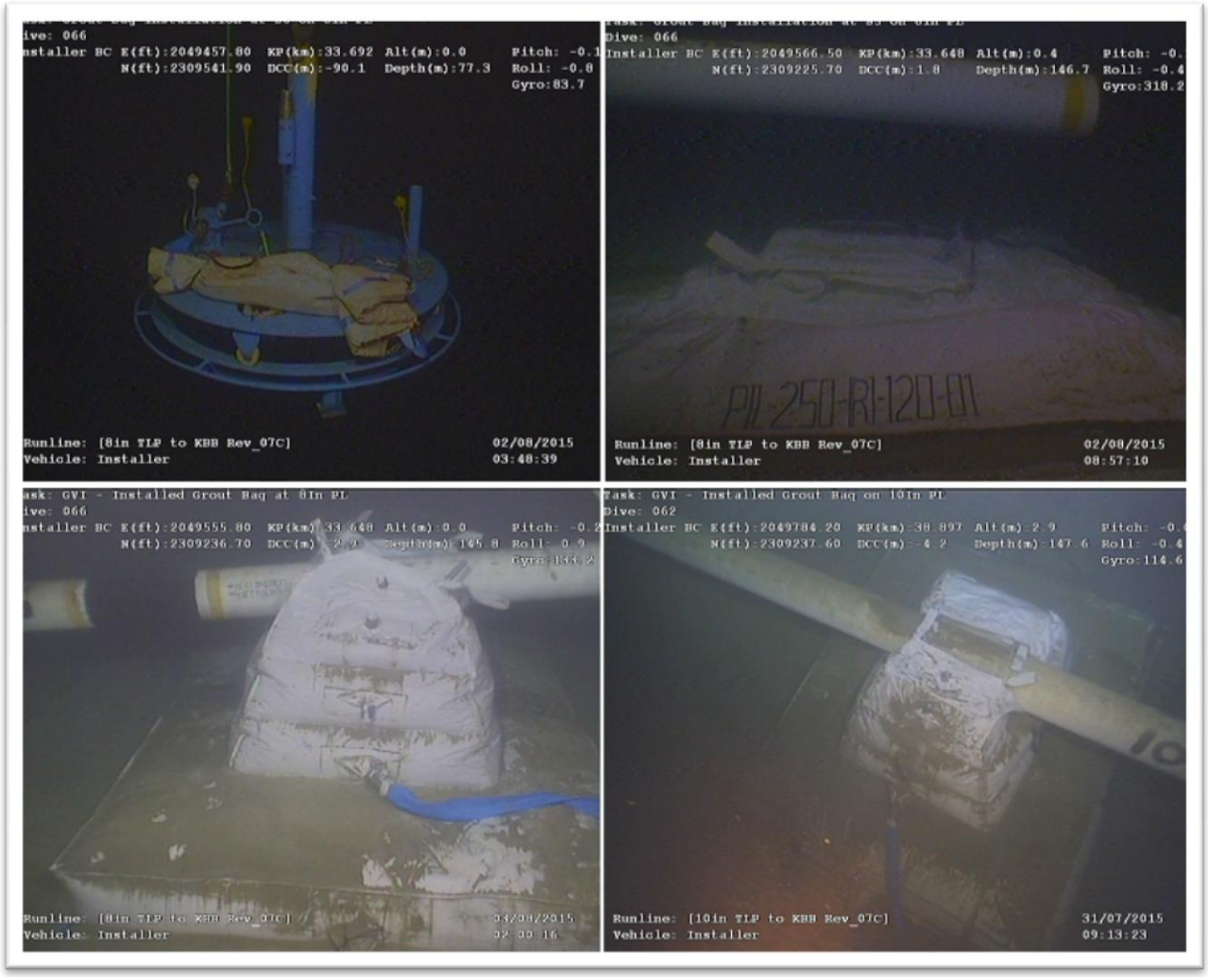


9.0 PICTURES – FREE SPAN CORRECTION PREPARATIONS

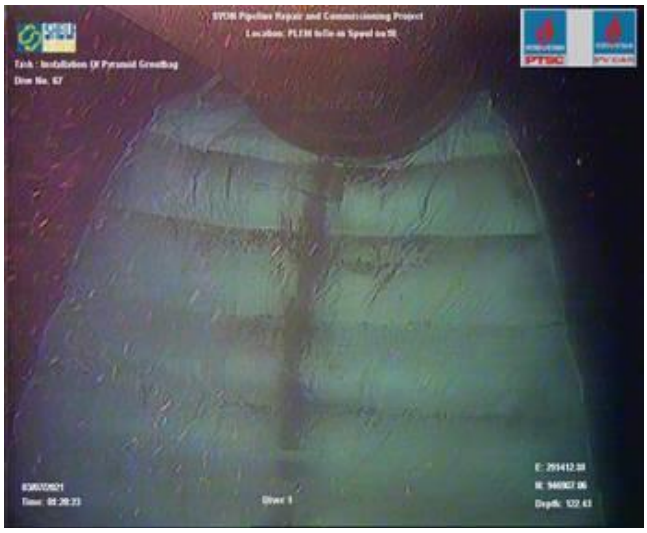
Grout Bag Deployment Preparation

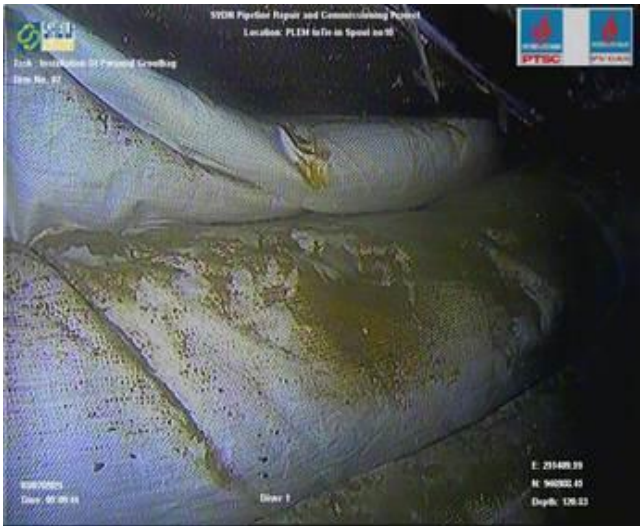
10.0 PICTURES – GROUT BAG DEPLOYMENT AND GROUTING OPERATION (ROV)

Grout bag deployment for Malikai Project



Grout bag deployment for Sao Vang – Dai Nguyet (SVDN) project





11.0 ISO CERTIFICATION

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:	Date of Issue: (Original)	Date of Issue:
41578/B/0001/SA/En	04 November 2016	04 November 2019
Issue No:	**Expiry Date:**	
2	03 November 2022	

Issued by: *On behalf of the Director*

Certificate of Registration

This certificate has been awarded to

Offshore Construction Specialists Pte Ltd

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

Certificate Number:	Date of Issue: (Original)	Date of Issue:
41578/C/0001/UK/En	06 November 2016	06 November 2019
Issue No:	**Expiry Date:**	
3	05 November 2022	

Issued by: *On behalf of the Schemes Manager*

12.0 NATA CERTIFICATION

NATA

NATA ACCREDITED LABORATORY

National Association of Testing Authorities, Australia

(ABN 59 004 379 748)

has accredited

Offshore Construction Specialists Pte Ltd
Singapore

following demonstration of its technical competence to operate in accordance with

ISO/IEC 17025

This facility is accredited in the field of

MECHANICAL TESTING

for the tests, calibrations and measurements shown on the *Scope of Accreditation* issued by NATA

Jennifer Evans
Chief Executive Officer

Date of issue: 25 August 2016
Date of accreditation: 15 July 2013
Accreditation number: 19122

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 Laboratory Accreditation Cooperation (APLAC).

APS-1-8 / Issue 3 / October 2015

13.0 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