



# Offshore Construction Specialists

Experience At The Coalface of Marine Construction

## INTRODUCTION TO

# OFFSHORE CONSTRUCTION SPECIALISTS PTE LTD PILE-REFUSAL REMEDIAL SERVICES

Revision B : Mar 2023

Website “[www.offshore-ocs.com](http://www.offshore-ocs.com)”



# PILE-REFUSAL REMEDIAL SERVICES

## What is Pile-Refusal?

Pile-Refusal : Pile can not be driven further and pile penetration is not adequate.

## What is Pile Refusal Remedial Services?

- Jetting & Air Lift: to remove internal soil plug
- Drill and drive : when internal plug is harder or to drill ahead (“Relief Drilling”)
  - Reverse Circulation Drilling
  - Pile Top Rig, vs. drilling “off boom”
- Grouted piles

**OCS is equipped with the personnel and equipment to provide solution for Pile Refusal Remedial Services**

## How does an Air Lift Work ?

- Air bubbles injected in water column (inside a pipe)
- Bubbles within the water column decrease the “density” in the column decreasing the head at the base of the column
- Water flows into base of column

The jetting/airlifting string is static during remedial operations. The system relies on high pressure water through nozzles located in the jetting head to break up the formation and an airlift to remove formation materials.

# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread

### OCS Air-Lift Spreads: (all equipments can be containerised)

#### A. 40ft Air Lift String Rack consists of:

1. 10" Pipe Flanged strings (fitted with 2 x 2" Water Jet pipe & 1 x 2" Compressed air line)
  - ❖ 40ft LG x 10" dia Jetting Head Section (Type 4) 01 ea
  - ❖ 40ft LG x 10" dia Jetting Intermediate Section (Type 2) 03 ea
  - ❖ 40ft LG x 10" dia Jetting Intermediate Section (Type 3) 13 ea
  - ❖ 40ft LG x 10" dia Top Section (Type 1) 01 ea
  - ❖ Lifting Cap for jetting and airlift string 03 ea
  - ❖ Centralizers 04 ea
  
2. 2" dia x 500 psi Jetting Hose in 200 ft LG 04 ea



# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread



**40ft Air Lift String Rack**

# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread

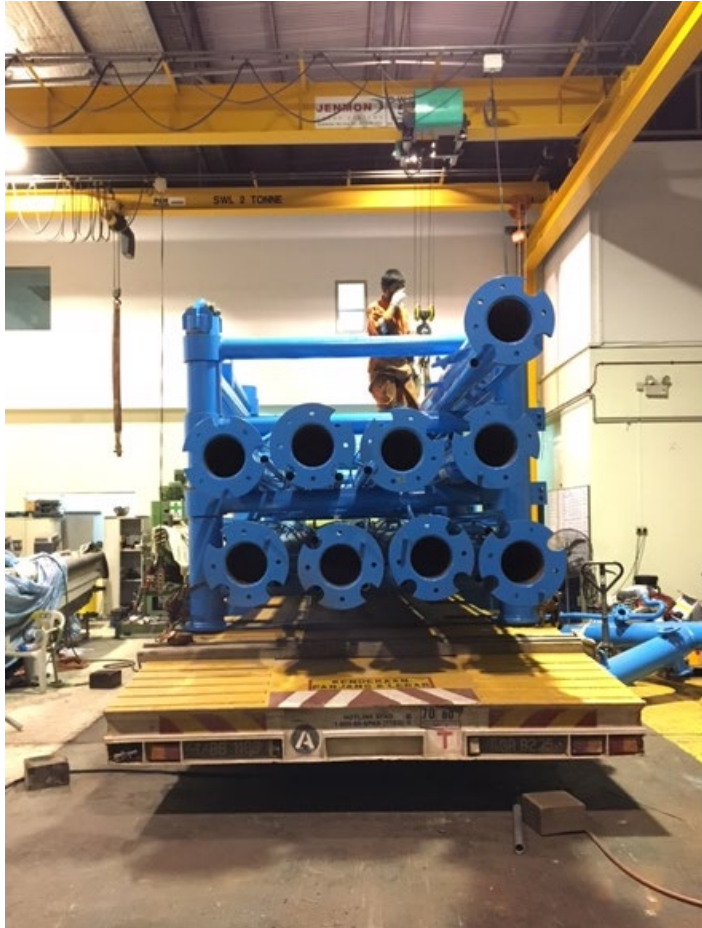


**OCS Air Lift String Arrangement on 40FT Lift String Rack**



# PILE-REFUSAL REMEDIAL SERVICES

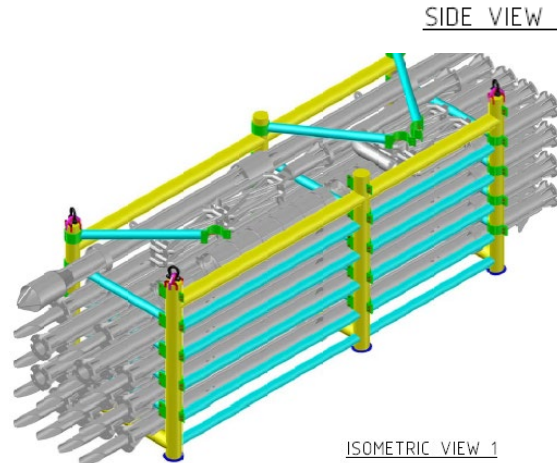
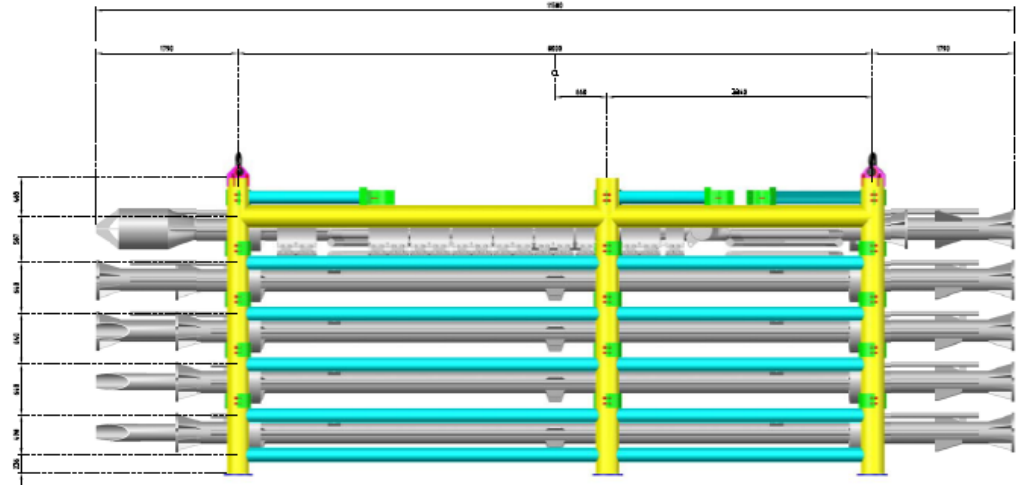
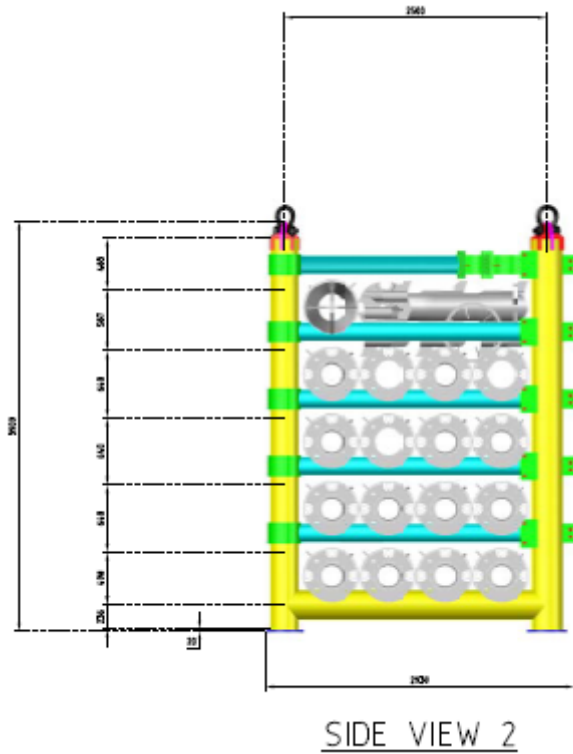
## Jet-Air Lift Spread



**OCS Air Lift String Arrangement on 40FT Air Lift String Rack**

# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread

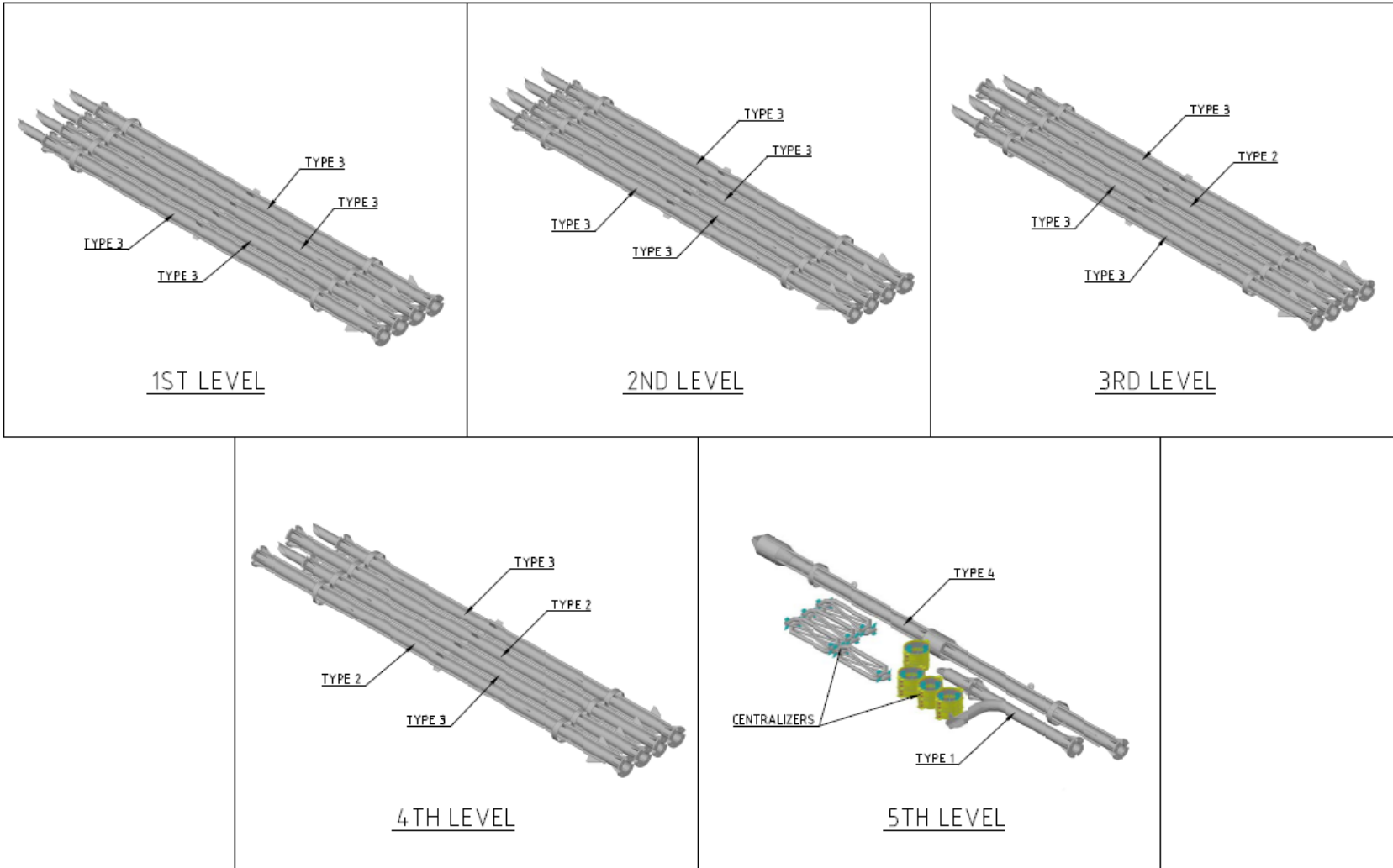


**OCS Air Lift String Arrangement on 40FT Air Lift String Rack**



# PILE-REFUSAL REMEDIAL SERVICES

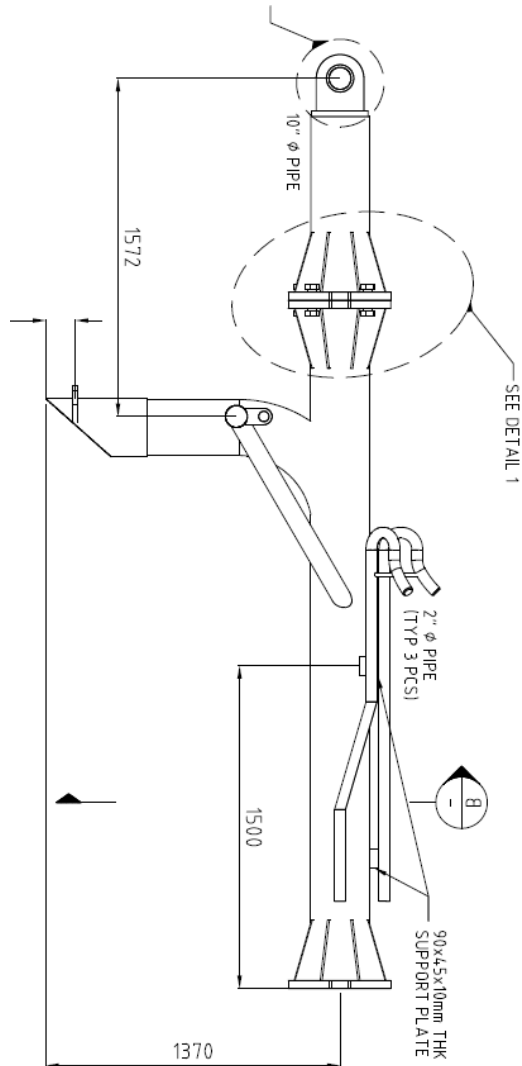
## Jet-Air Lift Spread



## OCS Air Lift String Arrangement on 40FT Air Lift String Rack

# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread



**40FT x 10" Top Section (Type 1)**

# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread



**40FT x 10" Jetting Head Section (Type 4)**



# PILE-REFUSAL REMEDIAL SERVICES

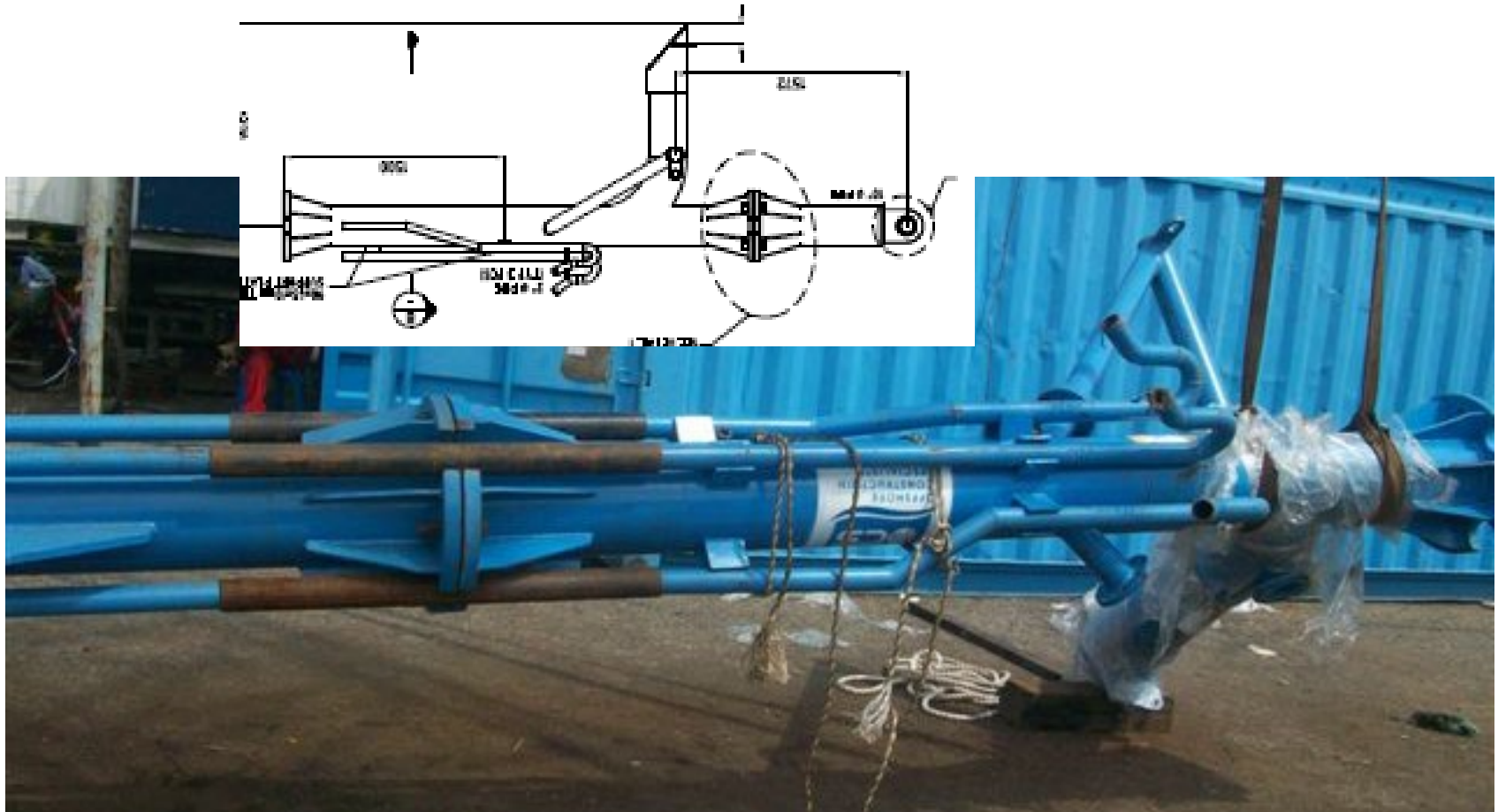
## Jet-Air Lift Spread



**40FT x 10" Jetting Intermediate Section (Type 2 & 3)**

# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread



**Air Lift Top Section (Type-1) and  
Intermediate Section (Type-2)**

# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread

### OCS Air-Lift Spreads (cont'd):

#### **B. 20ft High Cube Container TAHU6000086 consists of:**

- |   |         |
|---|---------|
| 1. 1200 gpm - 250 psi Jet Pump (OCS-SLD-001-0608) | 01 unit |
| 2. Centralizers                                   | 04 sets |
| 3. Neoprene Rubber, 5mm WT x 508mm OD x 280mm ID  | 50 ea   |
| 4. Pipe sleeve, 2-1/2" dia x 5mm WT x 1000mm LG   | 66 ea   |
| 5. 6" dia to 2" dia Water Distribution Manifold   | 01 unit |
| 6. 8" ANSI 150lb Foot Valve Cast Iron             | 01 pc   |
| 7. Misc Hose Assembly                             | 01 lot  |
| 8. Venture System Device                          | 01 ea   |
| 9. 8" dia to 6" dia reducer (#300 rating)         | 01 ea   |
| 10. 8" dia x 1ft LG pup piece                     | 01 ea   |
| 11. Water Filled Pressure Gauge ( 500 psi)        | 01 ea   |
| 12. 6" dia x 1ft LG pup piece                     | 02 pcs  |



# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread



**20ft High Cube Container No. TAHU6000086**

# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread



**20ft High Cube Container No. TAHU6000086**

# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread

### JET PUMP

Engine Make : Detroit Diesel 8V-92TA 450BHP

Pump Make : SLD 280-43 3 Stage

Capacity : 320 Cu.m / Hr

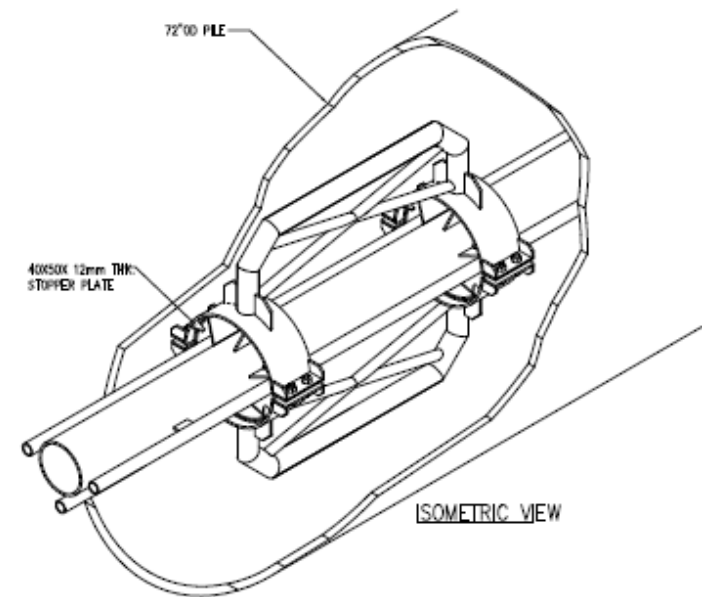
Maximum Head : 171 meters





# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread



### Centraliser

# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread



Pipe sleeve, 2-1/2" dia



Venture System Device

# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread

### DRILLING OFF THE BOOM:

This method uses a drilling power swivel and drill string connected to the vessel crane.

### How does it work?

- The rotating drill bit at the bottom of the drilling strings breaks up the soil plug
- The cuttings are airlifted to the surface.
- This string rotates and uses roller cutters on the drill bit to break up the formation.

# PILE-REFUSAL REMEDIAL SERVICES

## Jet-Air Lift Spread

### Equipment Spread:

- DOTB Assembly  
consist of Power Swivel, cross-over NW150 to 13-3/8 H490, drill pipes, cross-over 13-3/8 H490 to BHA, Bottom Hole Assembly, and drill bits
- Hydraulic Power Pack
- DOTB Tool Make Up System  
Consist of DOTB make up frame, hydraulic jacks, and HT100 tongs.
- Airlift System  
Consist of high pressure high airflow compressor, high pressure air receiver tank, and air hoses.

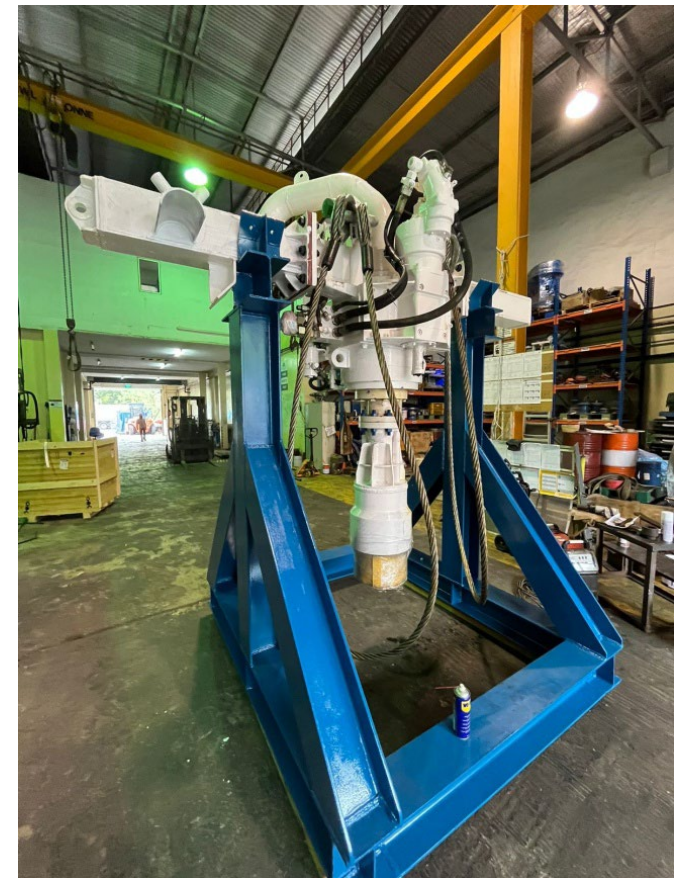


# PILE-REFUSAL REMEDIAL SERVICES

## Drilling of the Boom

- Power Swivel

Make	Wirth
Model	KDK 3-5 Reversed Circulation Airlift Powerswivel
Suitability	Soil Plug Removal and Pilot Hole Drilling in Hard Rock formation
Torque	66 kNm
Rotation	9.4 to 22.4 rpm
Hydraulic Power Requirement	Hydraulic Pressure: 200bar Hydraulic Flow: 375 l/min (HPU Engine Power approximately 170 kW)
Power Swivel Dimension	1000 x 700 x 1200 (mm)



# PILE-REFUSAL REMEDIAL SERVICES

## Drilling of the Boom

- 10MT Air Tugger Winch

Brake	Double air band brake
Working pressure – psi (bar)	102-131 (7-9)
Rated power – kW	30
Max air consumption – L/sec (m <sup>3</sup> /min) [USGPM]	400 (24) [6340]
Pulling force at 1 <sup>st</sup> layer – kN (ton)	100 (10)
Max rope storage – m	1000
Dimensions – mm	2500 x 1500 x 1300



# PILE-REFUSAL REMEDIAL SERVICES

## Drilling of the Boom

- Drill Pipes

Make	Hughes
Pipe detail	15ft 13-3/8" H490



- Bottom Hole Assembly

Top BHA Dimension (mm)	8300 x 1000 x 1000
Bottom BHA Dimension (mm)	6000 x 1000 x 1000





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## Drilling of the Boom

- Drill Bits / Roller Cutter





# PILE-REFUSAL REMEDIAL SERVICES

## Drilling of the Boom

- Hydraulic Power Pack

Engine	NISSAN Diesel RF8
Power & Speed	230kW @ 1500 rpm
Hydraulic Piston Pump	A11VO260LRDS/11R-NZD 12N00 (1 x 350L/min)
Pressure Setting	230 bar
Working Pressure	210 bar
Air Cooler	OK-ELD6H/3.1/24V/1/S
Hydraulic Oil Tank Capacity	1125 L
Diesel Oil Tank Capacity	400 L
Dimensions (mm)	3800 x 1800 x 2000 (mm)



# PILE-REFUSAL REMEDIAL SERVICES

## Drilling of the Boom

- DOTB Make up Frame

Make up frame to be designed following the project requirement



# PILE-REFUSAL REMEDIAL SERVICES

## Drilling of the Boom

- HT100 Tongs

Type	15-3/4"
Torque capacity	60,000 lb-ft (8,295 kg-m)
Moment arm	5 ft (1.53 m)



- Pipe elevator

Dimension	900 x 500 x 350 mm
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# PILE-REFUSAL REMEDIAL SERVICES

## Drilling of the Boom

- Jack (Pulling system)

Engine Model/Type	TECO Induction Motor Type AEEBKB040015FMLAX
Pump Maximum Pressure	320 bar
Dimension (L X W X H)	1500 x 1000 x 1550 mm





# PILE-REFUSAL REMEDIAL SERVICES

## Drilling of the Boom

- 1070CFM Air Compressor

Model	XHP1070W CAT-T1
Power train	CAT 3406TA 4 Stroke Diesel Engine 465 bhp / 347 kW
Engine speed idle / full	1200 / 1800 RPM
Fuel tank capacity	180 gal / 680 L
Fuel consumption rate (75%)	18.1 gph / 68.5 L/h
Fuel consumption rate (100%)	21.2 gph / 80.2 L/h
Air end	Rotary Screw Two Stage
Free air delivery	1070 CFM / 3.13 m <sup>3</sup> /min
Rated operating pressure	350 psi / 24.1 bar
Pressure range	150 – 375 psi / 10.3 – 25.9 bar

# PILE-REFUSAL REMEDIAL SERVICES

## Drilling of the Boom

- 1070CFM Air Compressor



# PILE-REFUSAL REMEDIAL SERVICES

## Drilling of the Boom

- 350 psi Air Receiver Tank

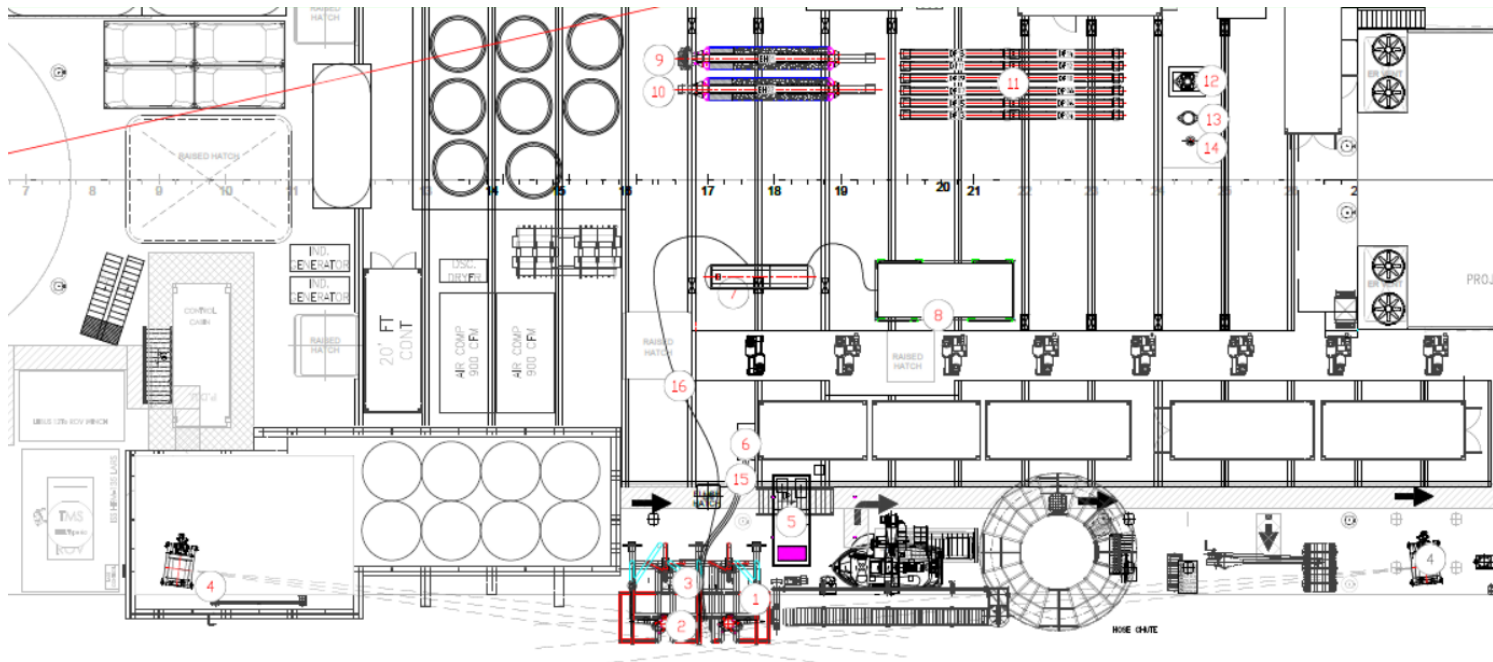
Volume	3 m <sup>3</sup>
Working Pressure	24 bar (350 psi)
Test Pressure	28.5 bar (455 psi)
Dimension	Length: 4000 mm ID: 950 mm Thk: 12.7 mm



# PILE-REFUSAL REMEDIAL SERVICES

## Drilling of the Boom

- Typical DOTB Spread Layout on the Vessel



ITEM No.	DESCRIPTION	DIMENSION (LxWxH) (mm)	QTY	ITEM UNIT WEIGHT (MT)	TOTAL ITEM WEIGHT (MT)
DOTB					
1	DOTB FRAME C/W HANG FRAME	6231x4200x4100	1	14	14.00
2	TONG	2000x900x1000	2	0.4	0.80
3	TONG'S HYDRAULIC JACK	700x250x1600	2	0.5	1.00
4	10T WINCH	2500x1500x1300	2	2.3	4.60
5	230 KW HPU	3845x1780x1975	1	5.5	5.50
6	EZ TONG HPU	2300x1000x1200	1	1.2	1.20
7	AIR RECEIVER TANK	4000x1600x1600	1	4.75	4.75
8	1070CFM COMPRESSOR	5090x2490x2780	1	5.65	5.65

ITEM No.	DESCRIPTION	DIMENSION (LxWxH) (mm)	QTY	ITEM UNIT WEIGHT (MT)	TOTAL ITEM WEIGHT (MT)
DOTB					
9	BHA 1	965x965x7400	1	11.4	11.40
10	BHA 2	965x965x8000	1	13.6	13.60
11	DRILL PIPE	400x400x4653	12	0.9	10.80
12	POWER SWIVEL AND CROSSOVER	1400x850x2860	1	4.5	4.50
13	PIPE ELEVATOR	900x500x350	1	0.2	0.20
14	LIFTING LUG	500x400x400	1	0.3	0.30
15	HYDRAULIC HOSE BUNDLE (3 LG)	-	1		
16	AIR HOSE	-	1		



# PILE-REFUSAL REMEDIAL SERVICES

## Drilling of the Boom



**Drilling Off the Boom Operation**



# PILE-REFUSAL REMEDIAL SERVICES

Thank You