IOEC (Iranian Offshore and Engineering Construction Company) is an Iranian leading general contractor in the oil and gas industry. In order to gain complete understanding of various oil and gas fields, IOEC is developing its capabilities in upstream industries, especially drilling and well appraisals and EPD projects. The company also acts as a rig provider and fabricator in the drilling market. In addition to signing contracts in drilling projects and development of fields, IOEC is rapidly expanding its activities in this sector.

At the moment, IOEC owns 5 Land Rigs in addition to the 4 Jack-up rigs. The main specification of the drilling Land rigs is noted as following:

**GENERAL DESCRIPTION**

**Drilling Depth**.......................... 20,000 ft [6,096 m]
**Rated Power of Drawworks** .......... 2000 HP
**Static Hook Load** ...................... 1,000,000 lbs

**Principal Characteristics**

**Static Hook Load** ...................... 1,000,000 lbs
**Traveling System** ..................... 6’7”
**Diameter of Drilling Line** .......... 1-1/2”
**Power Transfer Type** ................. AC-SCR-DC

**Height of Drilling Floor** ............ 34 ft
**Opening Diameter of Rotary Table** ... 31 1/2”

**Mast**

- **Model** .................................. JJ450/45-K
- **Width of top** ......................... 2.5/2/2 m
- **Height of top** ......................... 9 m
- **Height of racking platform** ........ 24.5, 25.5, 26.5 m

**Substructure**

- **Model** .................................. DZ450/105-S
- **Floor Height** ......................... 34 ft
- **Floor Area** .......................... 13.5m * 12 m
- **Available Height Below R/Table Beam** .......... 9.14 m

**Crown Block**

- **Model** .................................. TC-450
- **Max Load** .......................... 4000 KN
- **Number of Sheaves** ................. 6+1
- **Overall Dimension** ................. 3472*2222*2856 mm
- **Weight** ................................ 9735 Kg

**Rotary Table**

- **Model** .................................. ZP-375
- **Max Opening** ......................... 37 1/2” [952.5 mm]
- **Max Static Load** ................. 5850 KN
- **Max Output Torque** ................. 3282 N.m
- **Max Rotary Speed** ................. 300 rpm

**Power System**

- **Diesel Generator** ................. 4 Sets / CAT 3512B
- **Engine Rating** ..................... 1757 bhp
- **Generator Rating** ................. 1900kVA, 50KHz, 3 Phases
- **Auxiliary Generator** .......... 1 Set / CAT C15

**Air System**

- **Model** .................................. ZJ70D Type

**Air Supply System**

- **Screw Air Compressor** ............. 3 Sets / Ingersollrand
- **Cold Start Compressor** ............ LD 0.8/10
- **Air Dryer** .......................... Ingersollrand D2100
- **Air Storage Tank** ................. 1 Ingersollrand C-8.0

**Blowout Preventer**

- **SRP Annular Preventer** .......... 21-1/4” 2,000 psi
- **SRP Ram Preventer** ................. 21-1/4” 2,000 psi
- **BOP Annular Preventer** .......... 13-5/8” 5,000 psi
- **BOP Ram Preventer** ................. 13-5/8” 5,000 psi
- **Hydraulic Control Unit** .......... FKQ1280-8

**Safety Equipment**

- **Fixed Gas Detection** .............. 4 Sets / H2S & LEL
- **Emergency Shower Station** ........ 2 Sets
- **Eye Washer** .......................... 2 Sets
## Appendix 1: Technical Specification of ZJ70D Land Drilling Rig

### I. Technical Data Summary

1. **Rig rated depth:**
   
   20,000ft (6000m) 5” D.P.
   
   22,966ft (7000m) 4-1/2” DP

2. **Static hook load:**
   
   1,000,000Lb (4500KN)

3. **Height of mast:**
   
   149' (45.5m)

4. **Traveling system:**
   
   6×7

5. **Diameter of drilling line:**
   
   1 1/2" (φ38mm)

6. **Height of drilling floor:**
   
   34' (10.5 m)

7. **Opening diameter of rotary table:**
   
   φ37-1/2" (φ952.5mm)

8. **Steps of rotary table:**
   
   2+2R, step-less change

9. **Rated input power of draw works:**
   
   2000HP (1470kW)

10. **Steps of draw works:**
    
    4+4R, step-less change

11. **Top drive:**
    
    TDS-11SA (VARCO)

12. **Capacity of mud pump:**
    
    1176kw(1600HP)×3

13. **Power transfer type:**
    
    AC-SCR-DC

14. **Drive model:**
    
    one to two
II. Main Components Technical Description

A.1 Mast & accessories

A.1-1 Mast

Model: JJ450/45-K

- Certification
  
  A.P.I. 4F

General description:

- K- Style, consists of four sections, eight parts which are connected as a whole with pin rolls.
- Equipped with casing stabbing board, resting board and racking platform.
- Complete with climb safety device and derrick escape line.
- Two 0.5T air winches on racking platform for aiding the racking of the drill collars (up to 9-1/2")
- Counterbalance system for rotary tongs.
- Complete with anchor point to suspend upper logging sheave during stripping and anchor point to suspend block during stripping and cutting.
- Provide with chains on all fingers & safety grip walkway, belly belt rail C/W 2 eyes lines, racking board to be fitted with safety cage.
- Also provide with vapor tight, fluorescent lighting system.
- Complete with a tubing board between Rig floor and main racking platform.

Specifications:

- Mast height: 149' (45.5m)
- Static hook load capacity: 1,000,000 lbs
- Width of top (face/side): 2.5/2.2m
- Width of bottom: 9m
- Height of racking platform: 24.5, 25.5, 26.5m
- Anti-wind capacity
  
  ➢ No hook load, full of stands: 36m/s
  ➢ No hook load, no stand: 47.8m/s
  ➢ Lifting and lowering: 8.3m/s
- Weight: about 76880 kg

Mast stem

- One 148" X 30" beam leg mast stem with single pin connections.
- Complete with raising sheaves and shafts, sand line sheave brackets and air tugger sheave brackets.

A-Frame

- One A-frame assembly consisting of one pair of front and rear A-frame legs with raising sheaves and shafts, and A-leg spreader with floating fastline breakover sheave, grooved
for 1-1/2" wireline.

**Sling line**
- Two Piece proof tested slingline and slingline brackets.

**Sling line Equalizer**
- One slingline equalizer assembly complete, including brackets for hanging equalizer in the back of the mast.

**Ladder**
- Full height ladder complying with HSE standards. A safety climb rail and two (2) belts are included.

**Counterweights**
- Two (2) counterweights for tongs and spinning wrench, complete with buckets, guides, blocks and galvanized wireline and clamps.

**Mast Boom Kits**
- Dual 5000 pound capacity mast boom kits 20 feet long with upper and lower brackets coaxial and collinear to provide free swinging of the boom
- Complete with clamps for attaching to the mast rear legs on the driller’s and off-driller’s side.
- Complete with 8” sheaves grooved for 5/8” wireline.

**Air Tugger Sheaves**
- One (1) 14” air hoist snatch block complete with swivel shackle
- Grooved for 5/8” wireline with tapered roller bearings.

**Sand line Sheave**
- One (1) 20” diameter Sand line Sheave Assembly mounted on tapered roller bearings and grooved for 9/16” wire line.

**Deadline Anchor Support**
- Supports for leg mounted deadline anchor.
- Mounted to off-driller’s side leg above the drill floor.

**A.1-2 Crown block**

**Model:** TC-450
- Conforms to API 4F/ 8A.
- Consists of frame, guide shaft assembly, main pulley block and rail, match rope roll with sheave.
- Equipped with one lifting crane of 50kN, one sandline sheave, two sheaves for air winches with 50kN and one cantilever sheave for hydraulic tong with 50kN.
- Square hardwood bumper for crown block protection.
- One crown assembly rated for the specified gross and static hook loads. The sheaves are arranged such that the flat side of the traveling block faces the derrickman, an important safety consideration. Included are the following:
Crown frame fabricated from high strength steel shapes and plates.

Working cluster consisting of six (6) 60” sheaves, grooved for the 1 1/2” wireline. The working cluster is skewed to offset traveling block twist.

One offset 60” fastline sheave, grooved for 1 1/2” wireline.

All sheaves are mounted on heavy duty double row tapered roller bearings and feature our unique bearing retention system.

Shafts are drilled for individual bearing lubrication.

Line guards.

Crown safety platform with expanded metal flooring, square tubing handrails with toe boards. Complete with opening for ladder.

Deadline located on off-driller’s side.

Specifications:

- Max. Load: 4500kN
- No. of sheaves: 6+1
- Dia. of main sheave: 60” (φ1524mm)
- Dia. of drill wireline: φ38mm (1-1/2”)
- Dia. of sand line sheave: φ762mm
- Dia. of sand wireline: φ14.5mm (9/16”)
- Auxiliary pulley diameter: φ400mm
- Overall dimension: 3407×2722×2856mm
- Weight: 9735kg

A.1-3 Racking Board

One adjustable racking board with the following capacities:

- Racking platform capacity of 5” DP 214stds (28m per stand)
- Racking platform capacity of 9 1/2” DC 4stds (28m per stand)
- Racking platform capacity of 8” DC 6stds (28m per stand)

The racking board has the following features:

- Racking board will be adjustable from approximately the 80 ft. to 87 ft. elevation at 3.5 ft. increments.
- Platform will include access landing from ladder, walkway around three sides covered with expanded metal grating and 7 ft high steel wind wall.
- Fingers are fixed with safety chains and are covered with hinged flooring on the driller’s side. Collar fingers have individual stand locks.
- Supports for two (2) 0.5 ton air operated pull-back winch and lugs for safety belt tie-off are included.

Derrick air winch:
Model: JQH-5/48
- Air pressure: 0.8 MPa
- Rated load: 5kN
- Overall dimensions: 668×343×420mm
- Weight: 116kg

**A.1-4 Casing stabbing board**

Features:
- Entirety frame is made of channel steel
- Lifted by air motor capacity 1T, and a flexible tongue on the board
- Adjustable stroke: 6 m
- Board with safe stop and belly belt fixation point
- Total board can rotate 90 degree to the derrick when not used

**A.1-5 Dead line anchor**

Model: JZG41

Features:
- According to the standard API 8A
- Equipped at the bottom of derrick opposite to driller's position
- Completed with a tension type weight sensor
- Complete with a operating plate (1.5m height, handrails on three sides) for spooling dead line
- Complete with jumper bars to prevent wire from jumping off the anchor

Specifications:
- Suitable wire diameter: φ38 mm(1-1/2 ")
- Max load: 410 KN
A.2 Substructure & accessories

A.2-1 Substructure

Model: DZ450/10.5-S

- Certification
  - API 4F

General description

- Conforms to API 4F
- The substructure is slingshot type.
- Equipped 4 units buffer cylinders for substructure rig up and rig down and to hold subdues apart during erection.
- Escape slide (two sections), 2 back up tong piles,
- Three (3) sets of stairs to extend from the drill floor to ground level. Complete with grip strut serrated grating treads and pipe handrails, one is at off-driller side to mud tank, one is on rear substructure, the other is on fore head (as a whole body with ramp), the width of ladder is 800mm.
- There is a 40 tones capacity hydraulic operated handling and lifting equipment under the beam; a 4m³ storage tank hanged on back floor.
- Two 2m high ramp door protector uprights on ramp door, Which are fixed by drill pipe joint, connected with three protection chains.
- Drill floor is flush mounted (includes rotary table and setback).
- With 5” high kicking boards around drilling floor. Handrail adopts square steel plate; the entrances on ladders have safety chains.
- All hydraulic and air pipeline is mounted on dark with safety groove.
- Set back support is designed to support 500,000 Lbs of racked pipe simultaneously with an 100,000 Lbs. of casing load.
- Substructure is equipped with following additional equipment:
  - One set of stairway min. 30 ft. high from doghouse porch to ground. One set of stairway should be provided from drill floor to mud system walkways.
  - One combination ramp and stair 30 ft. high and 6’ (1.8m) wide ramp is 1/2” plate down to 3’-6” (1070mm) high cat walk elevation with frame ending and stair continuing to ground level. This should be supported with handrail on drillers side of ramp.
  - Handrails are provided on all working floors and stairs.
  - Mouse hole pipe with flip up cover and rat hole pipe are also provided.
  - Two numbers mounting pedestals for air winches furnished with sheet metal guard on rope drum for safety of operating personnel and wire line spooler bolted to the support in the substructure.
  - One horizontal air receiver of 4m³ capacity that is placed rear the substructure.

Specifications:
Floor height: 34ft (10.5m)
Available height below R/Table beam: 30ft (9m)
Floor area: 13.5m×12m
Max. load of R/Table beam: 1,000,000 lbs (4500kN)
Setback capacity (4-1/2" drilling pipe, 28m stand): 7000m
Setback load: 495,000 lbs (2200kN)
Weight: about 220965 kg

Rotary Beams
- One (1) set of rotary beams to support the rotary table.

Rotary/Setback Spreader
- One (1) rotary/setback spreader complete with framed mouse hole opening, and recess to accommodate 6 in. timber over 3/8" flat plate.
- Pin tabs are equipped with drop through stops. Timber installed.

Air Tugger Mounting
- Two mounting pedestals for air winches bolted to the support in the substructure.

Handrails
- One (1) set 3'-6" high square tube handrails with 5" toe board and intermediate stringer.

Doghouse Supports
- Two (2) sets of doghouse supports to accommodate a 9000×2800×2800mm (30 ft. long x 9 ft. wide x 9 ft. height) doghouse on three (3) supports.
- Support pins to driller’s and off-driller’s side floor elevator boxes.

V-Door Ramp
- One (1) 6' (1.8m) wide combination V-door ramp and stair consisting of a 1/2" plate on ramp extending to 3'-6" (1070mm) elevation with an integral stair tread guard between the ramp and stairs.
- Include grip strut serrated safety grating treads.

Stairs
- Three (3) sets of stairs extend from the drill floor to ground level.
- Complete with grip strut serrated grating treads and pipe handrails
- One is at off-driller side to mud tank, one is with wheel on rear substructure, the other is on fore head (as a whole body with ramp).

BOP Beams
- Set of two (2) 25 ton capacity each, BOP beams designed to pin to the underside of the substructure and support the BOP.
- BOP handling equipment are mounted under the substructure.

A.2-2 Raising Apparatus

Gin Poles
One set of self-elevating gin poles, which provide the leverage necessary to raise and lower the floor.

Sheave Assemblies
- Sheave assemblies mounted in the gin poles and the boxes, which provide the necessary mechanical advantage to raise and lower the floor.
- Each sheave is mounted on a heavy duty double row tapered roller bearing.

Sling line
- Two Piece proof tested slingline and slingline brackets.

A.2-3 Dog house
- Equipped on support frames (driller’s side), the walls are made of 2.5mm thickness corrugated steel sheets
- Consist of two cabins, one is for hydraulic power station, another for driller’s coffee break.

A.2-4 Tool house
- Equipped on support frames (off-driller’s side), the walls are made of 2.5mm thickness corrugated steel sheets
- Consist of two cabins, one is for drilling tools (subs), another for hand tools.

A.2-5 Cat walk
- One two sections catwalk.
- 3′-6” (1070mm) high, 6′ (1.8m) width, 60′ long ground level with steel plate top.
- Complete with a 4″ pipeline with hammer unions at two ends under the catwalk to transport water and other fluids for cementing or similar operations.

A.2-6 Pollution Package
Drip Pans
- One set of drip pans around the Drawworks, rotary and setback, with drains to a common outlet.

Gutters
- Floor gutters around the Drawworks, rotary and setback areas, draining into the drip pans.

One (1) Built-in Pin Storage Box in each lower side box.

A.2-7 BOP HANDLING SYSTEM
- The BOP Hoist Assembly consists of dual hydraulic operated 25 tons hoist (50 tons capacity total) complete with trolleys for operation on trolley beams.
- Complete with Control Panel and Control for BOP Handling System. Trolleys are hydraulic powered. And Hydraulic Power will be taken from HPU

Specifications:
- Lifting Capacity of Single hydraulic Lifter: 250kN
- Total Lifting Capacity: 500kN
- Lifting Speed: 0.23m/min
Lifting Height: 4m
Moving Speed: 12.6m/min
Moving Length: 6m

A.2-8 Hydraulic lifter
Qty: 1 set
Specifications:
- Model: TS-1.5E
- Rated power of motor: 11kW
- Rated speed of motor: 1460rpm
- Rated flow: 35.5L/min
- Work pressure: 20MPa
- Rated load: 15kN
- Lifting height: 10.5m
- Lifting speed: 0.2~0.38m/s
- Dia. of wireline: φ11mm
- Overall dimensions: 1360×1860×12000mm
- Weight: 2500kg
A.3 Drawworks and accessories

A.3-1 Disc brake drawworks

Model: JC70D

- Certification
  A.P.I. 7K

Features:

- The drawworks is combined by the means of input shaft driven by two DC motors, the power is transferred to the variable speed shaft through the gear clutch, then combined into 4 shifts through high and low speed clutch.
- It has two parts:
  - Fore part: Drawworks body consists of drum shaft assembly, bailer, variable speed shaft, driller’s console, main brake device, bailer brake device, pneumatic control system, panel type frame of drawworks.
  - Back part: power unit consists of two sets of DC motors, couplings, compound shaft, etc.
- Main brake is hydraulic disc brake unit, and auxiliary brake is water-cooling eddy current brake.
- The drum body is casting welded with Lebus groove to make the wire line (φ38mm) wound orderly.
- Pneumatic over roll anti-crush device.
- Pneumatic friction cathead and dead cathead with drums are on both sides of bailer drum. The pull of make-up cathead is 35kN, the break-out is 70kN.
- The driller’s console is installed in the driller’s house to control the high & low clutch of drum, shift of drawworks, Kelly spinner, electromagnetic current brake, main brake, catheads, bailer clutch, air brake, anti-crush over pulley. It is also equipped with air horn, display gauges of air pressure, machine oil, lock shift pressure.
- The control board is mounted on air control board, instrument console is also centralized in this house.
- Electric brake is explosion proof and with break down and alarm devices and crown block safety device.

Specifications:

- Rated input power: 1476KW (2000HP)
- Hoisting capacity: 1,000,000 lbs (4500kN) with 12 lines
- Dia. of drilling line: φ38mm (1-1/2”)
- Steps of speeds: 4+4R, Step-less speed change
- Main drum size (Dia.×Length): φ770×1246mm
- D.C Motor: 800kW
- No. of D.C. Motor: 2
Overall dimensions:
- Main body of drawworks: 7670×2520×3050mm
- Power device: 5448×1815×1700mm

Weight:
- Main body of drawworks: about 39500Kg
- Power device: about 3200Kg

Sand drum
- Dia. of wireline: Φ14.5mm
- Drum size (Dia.×Length): Φ400×1460mm
- Brake rim size (Dia.×Length): Φ1608×220mm

Drawworks brake Cooling system
- Include a 40 m³ rectangular steel tank with two no’s of centrifugal pumps, directly connected to two no’s of 15HP, 3P, 50 HZ, 400 V, 1500 RPM explosion proof electric motors
- Explosion proof push button control is located at driller’s panel with cable & all accessories.
- System supply the cooling water to Disc brake and Eddy current brake at the same time.

Crown-O-Matic
- A two-position-three-way push over valve is mounted above the main drum, and the position of valve bar is pre-set.
- When the traveling block is lifting too close to crown block, the drill line rolled on main drum will touch the bar of valve, then the valve working, will disengage the clutch, and make the hydraulic disc brake working to stop the drawworks.

Traveling Block Position Control
- The traveling block position will be monitored by PLC that get the data from sensor mounting in drum shaft.
- It will slow or stop drum speed when traveling block near or excess preset position.
- In the event the pre-set travel limits are exceeded, all disc brakes are set for an emergency stop.
- The driller should set the lower limit location from the driller’s controls. The lower limit will vary due to the frequent changes in tools for drilling and tripping.

A.3-2 Power unit - D.C. motor
- Series Wound, Land Application. Continuous rating of motor is 1085 HP and intermittent rating for Drawworks duty is 1320 HP. And Continuous rating is at 750 VDC, 1150 amperes, 970 rpm.
- Self excited series field
- Single shaft extension with hub
- Pressurized connection box mounted on left (or right) side of motor as viewed from commutator end with bolt-on armature cable connections and terminal strip for motor auxiliaries.
- Space heater, explosion proof, 220 volt, 185 watts
- Auxiliary lockout switch, explosion proof
- Blower assembly, 15 HP 380 volt, 50 Hz providing 2800 SCFM
- Pressure sensor, explosion-proof

Specifications:
- Rated power: 800KW
- Rated voltage: 750V
- Rated current: 1150A
- Rated speed: 970rpm
- Rated torque: 8033.7N.M
- Insulation class: H/H
- Cooling: forced air
- Protection class: plus pressure explosion proof
- Mass: 3200Kg
- Blower: 15Hp (include Air cleaner)
- Dimension: 1550×1270×1600mm
- Weight: 3200 kg

A.3-3 Hydraulic disc brake

Features:
- Consists of 6 working calipers and 2 safety calipers
- Working calipers are normally opened for controlling brake moments and adjusting bit feeding, weight on bit, and penetrate rate.
- Safety calipers are normally closed for emergency brake to realize crown block anti-crush and rotary table saving.
- As hydro is uncompressible, we can realize a remote and quick response control, so its control panel can be centralized in driller's house.

Specification:

Hydraulic control system
- Rated working pressure: 8 MPa
- Working fluid: hydraulic oil
- Rated output flow in single pump: 18L/min
- Oil tank volume: 80L
- AC motor power: 2.2kW
- Accumulator capacity: 4×6.3L
- Electro-heater power: 1kW
- Cooling water flow: 2m³/h
Dimension: 1160×960×1220 mm
Weight: 650 kg

Working caliper
- Single side max. positive pressure force: 75kN
- Piton effective working area: 12271.8mm²
- Dimension (Dia.×length): Φ165×390 mm
- Weight: 210 kg

Safety caliper
- Single side max. positive pressure force: 75kN
- Braking pad max. working clearance: 1mm
- Piton effective working area: 12644.9mm²
- Dimension (Dia.×length): Φ230×420 mm
- Weight: 235 kg

A.3-4 Auxiliary brake
Model: DSW70D
- Water -cooling electromagnetic eddy current brake
- System with electric control & accessories consisting of high water temp and flow loss alarm system for cooling water and cradle assembly for its mounting.
- Rated brake torque: 115KN·M
- NO. of coils: 4
- Isolation class: H
- Transport dimension: 1926×1346×1926
- Weight: 12500kg

A.3-5 Driller's house
- Hydraulic disc control handle, drill watch, air control panel, SCR control panel, foot throttle, etc are all centralized in this house and distribute reasonable.
- The driller can operate all the functions sit down on a swivel chair, and can have a good sight of rig floor, easy to monitor the monkey board and traveling block position.
- Complete with microphone, rain wiper on top and front, two cameras for monitoring.
- Complete with explosion proof air conditioner to make driller work comfortable.
- Overall dimension: 2700×2100×2600mm

A.3-6 Cooling Water tank
Features:
- Equipped with two sets of centrifugal pumps with 15HP motor.
- Ladder on outside and inside tank
- Top to have 24” square man hole.
- Temperature gauge
- Level gauge
One shell or tube heat exchangers, vents valves and piping for series flow through heat exchange and bypass piping, equipment to allow 100% pump stand by unitized on oil field type skid.

- Completed with explosion proof electric control box and lighting.
- Complete with brake cooling water monitor system to monitor eddy current brake cooling water flow and temperature and provide an alarm.

Specifications:

- Model: SG40
- Dimension: 12000×3000×2400mm
- Capacity: 40 m³
A.4 Traveling block and Hook assembly

A.4-1 Traveling block

Model: YC-450

- Certification: API 8A

Features:

- Grooved for 1-1/2” line.
- Complete with 6-60” sheaves and rated for 500 tons.
- Hydraulic snubbing action, articulated connection and hook safety positioner.
- Consists of upper beam, sheaves unit, left and right plate units, keyway and down hoisting hoop.

Specifications:

- Max. Load: (6 x 7 line): 4500kN
- No. of sheaves: 6
- Dia. of sheaves: 60” (φ1524mm)
- Dia. of wireline: φ38mm (1-1/2”)
- Overall dimensions: 3075×1600×800mm
- Weight: 8135kg

A.4-2 Hook

Model: DG-450

- Certification: API 8A

Features:

- Install inner and outer springs into the cylinder to make the standpipe ejected after break out.
- Match with location restricted unit at the top of cylinder, preventing hook from freely rotating when lift empty load.
- A rotation, lock unit is fixed for the hook, locking the hook at any direction of eight symmetric directions.

Specifications:

- Max. hook load: 1,000,000 lbs (4500kN)
- Spring travel length: 200mm
- Main hook open size: 220mm
- Auxiliary hook mouth Dia: 120mm
- Overall dimension: 2953×890×880mm
- Weight: 3496kg
A.4-3 Combination Swivel

Model: SL-450-5
- Certification: API 8A

Features:
- Consists of four parts: Standard bail, Double pin alloy steel sub with 6-5/8" API regular LH pin down, Washpipe packing assembly, 4" API Rotary hose connection
- Rotary part includes the center pipe and its joints.
- Fixed part includes body, upper and lower covers, gooseneck and hoist sub.
- Seal box consists of wash pipe assembly and upper and lower oil seals.
- Gooseneck with tapped and plugged hole in top for use with measuring line
- Integral link bumper support
- Load path components traceable
- Air Spinner includes air motor, gears and single direction air control friction clutch.
- Complete with access fitting for wire line entry on top of gooseneck

Specifications:
- Max. Static capacity: 4500kN
- Max. Speed: 300r/min
- Max. Working pressure: 35MPa (5000psi)
- ID of Center pipe bore hole: 75mm
- ID of Gooseneck and wash pipe: 75mm
- Connections
  - For center pipe: 6-5/8"REG-LH
  - For Kelly: 6-5/8"REG-LH
  - For gooseneck: 4" Union
- Overall dimension: 3037×1090×1085mm
- Weight (Including air spinner): 3060kg

Air spinner

Model: FMS-20
- Rated Speed: 2900r/min
- Power: 14.7kW (20HP)
- Rated pressure: 0.6~0.8Mpa
- Air consumption: 17 m³/min
- Air inlet: 1-1/2"
- Rated spinning speed: 90r/min
- Max. spinning torque: 3000N.m
A.5 Drilling line and Sand line

A.5-1 Drilling line

- Certification: API 9A

Model: 6 ×19S IWRC EIPS

- Diameter: $\varnothing 38 \text{ mm}(1-1/2 \text{ ")})$
- Length of drill line: 7500'
- Complete with support frame for drum/cover, and has drilling line drum power driver

A.5-2 Hydraulic reserving device

Model: YDS38

- Used for spooling, pulling out and storing drill line
- Rated work pressure: 16 MPa
- Flow: 2.5~80L/min
- Rated output torque: 10600N.m
- Range of speed: 0.5~15rpm
- Capacity: 8000kg
- Max. setback: $\varnothing 38 \text{ mm}(1-1/2\text{”})$ drill line 2200m
- Overall dimension: 2560×1800×2409mm
- Weight: about 1395kg

A.5-3 Sand line

- Dia. of wireline: $\Phi 14.5\text{ mm}$
- Length of sand line: 6000 m (20000')
A.6 Rotary table and Rotary table equipment

A.6-1 Rotary table

Model: ZP-375
- Certification: API 7K

Specifications:
- Max. Opening: 952.5mm (37-1/2")
- Max. Static load: 5850kN
- Max. Output torque: 32362N.m
- Max. Rotary speed: 300rpm
- Gear ratio: Dual speed & 3.56:1
- Overall dimension: 2468×1810×718mm
- Weight (exclude main bushing): about 7548kg

A.6-2 Rotary table independent drive unit

- Series Wound, Land Application. Continuous rating of motor is 1085 HP. And Continuous rating is at 750 VDC, 1150 amperes, 970 rpm.
- Self excited series field
- Single shaft extension with hub
- Pressurized connection box mounted on left (or right) side of motor as viewed from commutator end with bolt-on armature cable connections and terminal strip for motor auxiliaries.
- Space heater, explosion proof, 220 volt, 185 watts
- Auxiliary lockout switch, explosion proof
- Blower assembly, 15 HP 380 volt, 50 Hz providing 2800 SCFM
- Pressure sensor, explosion-proof

Specifications:
- Rated power: 800KW
- Rated voltage: 750V
- Rated current: 1150A
- Rated speed: 970rpm
- Rated torque: 8033.7N.M
- Insulation class: H/H
- Cooling: forced air
- Protection class: plus pressure explosion proof
- Mass: 3200Kg
- Blower: 15Hp (include Air cleaner)
- Dimension: 1550×1270×1600mm
- Weight: 3200 kg

A.6-3 Rotary table drive box

- The rotary table is coupled with independent 800kW electric motor drive transmission
and independent lubricating system:

- Transmission and accessories are mounted on a steel frame substructure. It has an emergency sprocket, Air-flux inertia brakes and flexible couplings.
- Reversing achieved by reversal of the DC drive motor complete with standard equipment.
- Consists of universal shaft, chain reducer.

A.6-4 **Bushings and accessories**

- MPCH master bushing 1ea
- Insert Bowl No.1 for 13-3/8” and 11-3/4” casing 1ea
- Insert Bowl No.2 for 10-3/4” and 9-5/8” casing 1ea
- Insert Bowl No.3 for 8-5/8” and 2-3/8” casing 1ea
- Casing bushing for 20” or 18-5/8” casing 1ea
- Drilling bushing 1ea
- Bit breaker adapter 1ea
- Lifting slings 1ea
A.7 Air hoist

A.7-2 Air hoist

Qty: 2 sets

Model: XJFH-5/35

Specifications:
- Air pressure: 0.5-0.9 MPa
- Air consumption: 12.7 m³/min
- Rated load: 50kN
- Rated speed: 35m/min
- Length of wire line: 120m
- Dia. of wire line: 5/8"
- Overall dimensions: 1335×675×1140mm
- Weight: 550kg

A.8 Hydraulic cathead

Qty: 1 pair

Specifications:
- Model: YM-16
- Rated working pressure: 16MPa
- Rated flow: 120L/min
- Rated pulling strength: 160kN
- Weight: 345kg
B. Mud Pumps

B.1 Mud pumps

Qty: 3 sets

Model: F-1600

- Certification: API 7K

Features:

- Each pump is driven independently by two 800kW DC-motors through belt transmission device. It is located on long oilfield skid. Two DC motors are located on the rear skid.
- Advanced structure, small volume, high reliability and easy for maintenance
- API 7# valves adopted, suction valves and discharge valves can be interchanged.
- The hydraulic cylinder is alloy steel forged.
- The 3 hydraulic cylinders of every pump can be interchanged.
- Cylinders are straight way type, namely a kind of valve-over-valve structural design, it has reduced the bulk volume of cylinders and has improved the internal volume efficiency.
- Pressure and splash lubrication.
- Complete with KB-75 Pulsation dampener.
- Complete with Suction strainer (stabilizer), Safety relief valve, and Pressure gauge (0~6000Psi.)

Technical specifications:

- Type: triplex single-acting piston type
- Maximum liner Dia. × stroke: 180×305mm
- Rated strokes: 120spm
- Max strokes: 130spm
- Nominal power ratings for one: 1180KW (1600hp)
- Gear type: herringbone gear
- Gear velocity ratio: 4.206:1
- Lubrication: pressure & splash
- Valve pots: valve over valve, API #7
- Valve cover: screw type
- Liner lock: Screw type, Metal to metal
- Liner available size: 6", 6-1/2", 7"
- Maximum working pressure: 35Mpa
- Maximum discharge capacity: 50.42 L/S
- ID of discharge: 130mm (5")
- ID of suction pipe: 305mm (12")
- Dimension: 4426×3262×2688mm.
- Weight: about 24791kg

B.2 Charging pump
Qty: 3 sets

Model: SB6"×8"-12-1/2"
- Suction line size: 8"
- Suction line size: 6"
- Impeller size: 12-1/2"
- Capacity: 200m³/h
- Lift: 35m
- Ac motor power: 75KW(100HP)

B.3 Rig Pump Driving Unit- DC motor
Qty: 6 sets
- Series Wound, Land Application. Continuous rating of motor is 1085 HP. And Continuous rating is at 750 VDC, 1150 amperes, 970 rpm.
- Self excited series field
- Single shaft extension with hub
- Pressurized connection box mounted on left (or right) side of motor as viewed from commutator end with bolt-on armature cable connections and terminal strip for motor auxiliaries.
- Space heater, explosion proof, 220 volt, 185 watts
- Auxiliary lockout switch, explosion proof
- Blower assembly, 15 HP 380 volt, 50 Hz providing 2800 SCFM
- Pressure sensor, explosion-proof

Specifications:
- Rated power: 800KW
- Rated voltage: 750V
- Rated current: 1150A
- Rated speed: 970rpm
- Rated torque: 8033.7N.M
- Insulation class: H/H
- Cooling: forced air
- Protection class: plus pressure explosion proof
- Mass: 3200Kg
- Blower: 15Hp (include Air cleaner)
- Dimension: 1550×1270×1600mm
- Weight: 3200 kg

B.4 Mud pump driving unit
Qty: 3 sets
- Each driving unit consists of belt transmission components for pumps, including skid, motor seat with terminal strand, combined narrow V belt, sheave and guards.
C. Rig Power System

Features:

- Consist of 4 sets of main generators, 1 set of auxiliary generator, SCR system and MCC.
- Diesel engines are CAT3512B and generators are SR4B
- Auxiliary generators are CAT3406 or C15 diesel engine generators
- Emergency shutdown switches for the complete power system are provided at both the driller's position and the power plant
- All engines’ exhaust pipes are sound proof and equipped with exhaust spark arresters, air inlet valve controlled at the power plant

C.1 Main generators

Qty: 4 sets

3512B DITA LAND GEN SET, 1200EKW, 600V, 50HZ

- Engine rating = 1757 bhp (1310 bkW) @ 1500 rpm w/o fan rating
- Generator rating = 1900kVA, 0.7PF, 50Hz, 600V, 3 phase Including following attachment:

GENERATOR

- SR4B GENERATOR, 826 FRAME, SE, 2 BEARING,
- 1900kVA, 50HZ, 600 VOLTS, 0.7PF, 3 phase
- 80 DEG C TEMPERATURE RISE, FORM WOUND, CLASS H INSULATION including
  - 1200 watt space heater,
- CABLE ACCESS BOX
- AIR FILTER - GENERATOR
  - (increases generator temperature rise to 90C)

AIR INLET SYSTEM

- Aftercooler core, corrosion resistant
- HEAVY DUTY AIR CLEANER, shipped loose

CONTROL SYSTEM

- Caterpillar ADEM A3 Electronic engine control, LH
- Requires 24V DC 10 Amp continuous, 20 AMP intermittent, clean electrical power.
- ENGINE GOVERNOR CONTROL CONVERSION

COOLING SYSTEM

- Thermostat and housing
- Jacket water pump gear driven
- Dual outlet
- Aftercooler fresh water cooling pump (SCAC), gear driven centrifugal SCAC pump circuit contains a thermostat to keep the aftercooler coolant from falling below 30 deg C (85 F).
- RADIATOR 46/CVD
  - including mounting group, fuel cooler, water connections, coolant level switch gauge, FAN DRIVE
- BLOWER FAN 72 IN
- FAN PULLEY
- COOLANT LEVEL SENSOR

EXHAUST SYSTEM
- Exhaust fitting, flexible, 203 mm (8 in).
- Exhaust expander 203.2 mm (8 in) to 305 mm (12 in), and weldable flange, 305 mm (12 in).
- Exhaust manifolds, dry
- ELBOW, 305 MM (12 IN).
- 12” SPARK ARRESTING MUFFLER.

FLYWHEELS & FLYWHEEL HOUSINGS
- Flywheel, SAE No. 00 Flywheel housing, SAE No. 00
- SAE standard rotation

FUEL SYSTEM
- Fuel filter
- Fuel transfer pump
- Fuel return line, hard, with flexible connection Fuel priming pump, LH
- Electronically controlled unit injectors

INSTRUMENTATION
- Electronic Instrument Panel, LH
- Analog gauges with digital display data for:
  - Engine oil pressure gauge
  - Engine water temperature gauge
  - Fuel pressure gauge
  - System DC voltage gauge
  - Air inlet restriction gauge
  - Exhaust temperature (prior to turbochargers) gauge
  - Fuel filter differential pressure gauge
  - Oil filter differential pressure gauge
  - Service meter (digital display only)
  - Tachometer (digital display only)
  - Instantaneous fuel consumption (digital display only)
  - Total fuel consumed (digital display only)
  - Engine start-stop (off, auto start, manual start, cooldown timer)

LUBE SYSTEM
- Crankcase breather
- Oil cooler
- Oil filter
- Shallow oil pan
- Oil drain extension, 2” NPT female connection. FUMES DISPOSAL

PROTECTION SYSTEM
- ADEM A3 monitoring system provides engine de-ration, alarm, or shutdown strategies to protect against adverse operating conditions. Selected parameters are customer
programmable. Status available on engine mounted instrument panel and can be broadcast through the optional customer communications module or programmable relay control modules(s). Initially set as follows:

- **Safety shutoff protection, electrical:**
  - Oil pressure, Water temperature, Overspeed, Crankcase pressure, Aftercooler temperature.
  - Includes air inlet shutoff, activated on overspeed or emergency stop.

**Alarms, electrical:**

- ECM voltage, oil pressure, water temperature (low and high), overspeed, crankcase pressure, aftercooler temperature, low water level (sensor is optional attachment), air inlet restriction, exhaust stack temperature, filter differential pressure (oil and fuel).

**Derate, electrical:**

- High water temperature, Crankcase pressure, Aftercooler temperature, Air inlet restriction, Altitude, Exhaust temperature.

**Emergency stop push button**

- Located on instrument panel
- Alarm switches (oil pressure and water temperature), for connection to customer supplied alarm panel. Unwired.

**STARTING SYSTEM**

- Air starting motor, RH, 620 to 1034 kPa (90 to 150 psi), LH control Air silencer
- **JACKET WATER HEATER - DUAL, 240~400V, total 12 kW**

**C-2. Auxiliary generator set**

Qty: 1 set, CAT C15

**400/230V 50 HZ PGS, 365KVA, 292 ekW prime with fan rating.**

- **AIR INLET SYSTEM**
  - AIR CLEANER - HEAVY DUTY
- **CONTROL PANELS**

  EMCP 3.1(for C15) or EMCP 2 (for 3406) control panel including:
  - Emergency stop push button
  - Voltage adjustment potentiometer
  - Speed adjustment potentiometer
  - Panel lights
  - Digital indication for: Digital AC metering - 3 phase, True RMS, Operating hours, Oil pressure, Coolant temperature DC volts, RPM

  **Safety shutdown protection with LED indicating lights for:**
  - Low oil pressure
  - High coolant temperature
  - Over-speed
- Emergency stop
- Failure to start (overcrank)
- Four programmable digital inputs (alarm or shutdown)
- Four programmable digital outputs

**COOLING SYSTEM**
- Radiator with guard (sized for 50 degrees C)
- Coolant drain line with valve; terminated on edge of base Fan and belt guards
- Caterpillar Extended Life Coolant
- Coolant level sight gauge

**EXHAUST SYSTEM**
- Stainless steel exhaust flex; ANSI style outlet flange, gasket, bolts, and mating weld flange; shipped loose INDUSTRIAL MUFFLER 10 DBA, shipped loose ELBOW KIT - 6" (152 MM), shipped loose

**FUEL SYSTEM**
- Primary and secondary fuel filters
- Fuel priming pump
- Fuel pressure gauge
- Flexible fuel lines (terminated on base)

**GENERATORS AND GENERATOR ATTACHMENTS**
- Self excited (2/3 pitch), random wound
- IP23 Protection
- Class H insulation
- R448 voltage regulator (single phase sensing) with Load Adjustment Module
- Circuit Breaker, IEC, 3-pole
- Segregated low voltage (AC/DC) wiring panel Power center contains control panel, wiring
- panel and power termination
- SPACE HEATER - 230V

**GOVERNING SYSTEM**
- Cat Electronic Governor (ADEM A4) for C15 or Hydra--mechanical governor for 3406

**LUBE SYSTEM**
- Lubricating oil
- Oil filter
- Oil drain line with valve piped to edge of base Fumes disposal piped to front of radiator

**STARTING/CHARGING SYSTEM**
- 45-amp charging alternator 24-volt starting motor
- Battery with rack & cables Safety shutoff protection

**JACKET WATER HEATER 3KW-240VAC**

**ETHER STARTING AID BATTERY DISC SWITCH**
C.3 Generator houses

Qty: 6 sets

Features:
- Include 4 main generator houses, one auxiliary generator house and one air house.
- Generator house with a center split door at cooling fan end, and push aside doors at both sides
- All side walls can remove away to form an entire house
- Complete with all binding posts and cables
- Complete with all oil and air lines for diesel engines
- 3 screw air compressors, dryer and one 8m$^3$ air storage tank share in the house of auxiliary generator set

Specifications:
- Dimension of single house: 10500×2900×3100mm
- Overall dimension: 10500×14500×3100mm
- Total weight: 120000 kg

C4 SCR system

Qty: 1 set

- For SCR
  - Output voltage is 0~750 V
  - Output current is 0~1900 amp
- For MCC
  - Output voltage is 400V
- For lighting
  - Output voltage is 220V.
- Overall dimension 13000×2900×3100mm
- Weight: 26ton

4 each - GENERATOR CONTROL UNIT

Each unit will contain the following:

A. Power Circuit Breaker – 2000AF/1800AT, 600Volt, 3 pole, 65 kA IC, UL/CSA Rated (Merlin Gerin Master pact)
- Long Time/Instantaneous Trip Unit
- Manually charged, electrically closed
- UV trip unit
- 2NO/2NC auxiliary contacts
- Fixed mount

B. Instrumentation and Controls
- 1-Ammeter, scaled at 0-2000AAC
- 1-Kilowatt Meter, scaled at 0-2000 kW
- 1-Kilovar Meter, scaled at 0-2000 kVAR
1-Generator Hour Meter
1-Engine Control Pushbutton, "Off-Idle-Run"
1-Generator “Run” Indicating lamp (white)
1-Generator “On Line” Indicating lamp (red)
1-Circuit Breaker “Push to Close” lighted pushbutton
1-Manual Engine “Speed Adjust” Potentiometer
1-Manual “Voltage Adjust” Potentiometer

C. Solid State Control Module
- PLC Compatible
- Voltage Regulator
- Working temperature range, –30 to +50 degrees C
- No load to full load regulation of +/- 1%
- Response time of one (1) second typical
- The load on any one (1) generator shall not differ more than +/- 10% of its rated kilowatt load from no load to full load
- Reactive Power is shared between Generators by reactive power droop compensation
- Exciter power supply, 12 amp maximum current (the exciter current limit is set to suit the individual exciter)
- Protective functions built into the regulator are:
  - Reverse Power Trip set at 7%
  - Under Frequency Trip set at –10%
  - Overvoltage Trip set at 15%
  - Overspeed Trip set at +10%
  - Frequency/Voltage Scheduled for Engine Operation at Idle Speed
- Electronic Governor
  - Speed regulation from no load to full load of +/- 1 Hz steady state
  - Response time on 0.8 seconds typical
  - Maximum load unbalance between engines (one hot, one cold) at all points, no load to full load, +/- 10% of its rated load

5 each SCR CONTROL UNIT
- Each unit will contain the following:
  A. 1600 AF Input Switch, Merlin-Gerin Masterpact
    - UV trip
    - Auxiliary Contacts
    - Fixed mount
  B. DC Ammeter, scaled at 0-2000 ADC
  C. DC Voltmeter, scaled 0-1000 VDC
  D. “SCR ON” indicating lamp, (green)
E. Bridge

- SCR type, six (6) elements, two (2) quadrant, rated at 1900 ADC continuous at 750 VDC.
- The bridge will be vertically configured and cooled by a single blower.
- It shall be protected using semiconductor type fuses.

F. DC Control Module

PLC Compatible

- 6 pulse thyristor firing circuits with “hard firing” outputs. The synchronizing signal originates directly from the AC line.
- High speed current regulators with twenty millisecond response.
- Automatic current limit load sharing for motors driving the same shaft and driven by separate armature supplies. No setup or adjustment required.
- Individual control of current limit for all drilling functions. The operator adjustable rotary torque limit potentiometer will be mounted in the driller’s console.
- Motor speed regulators for the mud pump and rotary table. Each regulator will be interlocked with its related assignment contactor.
- All controls are designed to be “foolproof”. No preset sequence of operation is required. The operator may push any button at any time and the system will either follow when it is safe or block the command if it is not consistent with the operation.
- Manual voltage control for maintenance operation.
- Thyristor gate suppression at approximately 150% of the bridge rating.
- “Zero Throttle Interlock”, the throttle on the drillers console must be returned to zero after an assignment change before the motor can be powered.
- Module Fault Finder includes a meter and a switch mounted on the front of the module for monitoring all critical internal voltages.
- Drawworks dynamic brake control circuit.

G. 1 Set of DC contactors to allow for multiple assignment of the bridges, Integrated assignment system to complete “one for two” drilling drive control mode.

H. Surge Suppression System

- Used to clamp any transient voltage spikes, which would be damaging to the SCR devices.
- Consist of a set of fused metal oxide varistors (MOVs) and will include a “Surge Suppressor ON” lamp (green).

1 each – 24VDC POWER SURPPLY FOR ENGINE

One (1) 24 volt charger.
One (1) 24 volt Battery.
Four (4) 24 VDC Power supply.

1 each – GENERATOR SYNCHRONIZING SYSTEM

- The Generator Synchronization (Sync) Circuit is required to connect additional generators to the Main AC bus, after one (1) or more generators are already connected to the Main AC Bus.
The Sync Circuit compares the frequency and voltage of the Main AC Bus with that of the generator being brought on line, so that they can be matched before the new generator’s circuit breaker is closed.

The Generator Synchronizing Circuit will include the following:

- 1 Synchroscope scaled at Fast-Slow
- 1 Voltmeter scaled at 0-750 VAC
- 1 Frequency Meter scaled at 45-55 Hertz
- 1 Sync Switch
- 2 Synchronizing Lamps
- 1 Verisync Relay

1 each – GROUND FAULT DETECTION SYSTEM

- The Ground Fault System is designed to detect both AC and DC ground faults via a set of wire connected grounding resistors.
- A Ground Test Pushbutton is included for determining if a Ground Fault indication is actually a burned out lamp.
- 1 DC Ground Ammeter scaled at 100-0-100%
- 1 AC Ground Ammeter scaled at 0-100%
- 3 Ground Fault Indication Lamps
- 1 Test Pushbutton

1 each – POWER LIMIT CIRCUIT

- The Power Limit System will monitor the kW engine loading and the kVA generator loading of each engine/generator set.
- If any of these parameters reach their limits, the Power Limit Circuit will reduce the power being delivered to the loads so that the load on each generator is held at its limit until the loads on the SCR drives are reduced (by other action) to a level below the generator limit.
- Percent Power Limit is indicated by a meter on the Drillers Console.
- Amber warning lamps are illuminated on the front of the Drillers Console at a load level just below the power limit.
- Another Amber Warning Lamps are installed in SCR units

1 each – HANDS-OFF-CRANKING CIRCUIT

- The Hands-Off-Cranking (HOC) Circuit allows starting of the first engine when no other power source is available.
- The circuit provides power to the AC Control Module’s “engine starting and pulse pickup” circuits via two (2) 12 Volt batteries.
- The Hands-Off-Cranking Circuit is connected to all Gen Control Cubicles via the Generator Interconnect Terminal Block located in each cabinet. In addition, there will be a small rectifier taking power from the auxiliary generator and supply the required DC power to start the engine in the black out condition.
3 each – MUD PUMP SPROCKET SLIP CIRCUIT (over speed protection)

- The Sprocket Slit Circuit provides over speed protection when two (2) motors are paralleled on a single Mud Pump and driven from the same SCR bridge.
- If either of the two (2) motors exceeds a preset limit, the Sprocket Slip Circuit will remove power from both motors by opening the DC assignment contactors.
- A lighted pushbutton is provided on the front door of the system.
- The lamp indicates an "over speed trip" and the pushbutton is used to reset the circuit after the over speed trip has been corrected.
- The Sprocket Slip Circuit compares the current drawn by each DC motor using a “Hall Effect Device” which is mounted between the DC contactor and the motor.
- The Sprocket Slip Circuit compares the current to the voltage output of the SCR bridge to determine if an over speed condition exists.

1 each – SYSTEM HOST PLC CUBICLE

- The System Host PLC is a high speed, versatile modular PLC.
- The PLC is used for serial communication with remote consoles and other rig devices. Additionally, the PLC incorporates the SCR bridge assignment logic.
- The PLC shall consist of the following.
  
  Siemens S7-300 Modular PLC
  
  32 Bit, Fixed & Floating Point CPU
  
  Up To 1024 Digital Inputs / 1024 Digital Outputs
  
  Up To 256 Analog Inputs / 256 Analog Outputs
  
  Complete Instruction Set With “Built-In” Functions
  
  Built-In Self Diagnostics
  
  Special Cable for Communication

1 each - DRAWWORKS DYNAMIC BRAKE

- The Drawworks Dynamic Brake will slow the drawworks motor from full speed to some preset speed within 10 to 15 seconds after the foot throttle is released.
- The power generated by the free wheeling DC motor is then fed into a stainless steel grid resistor bank.
- During normal operation of the drawworks, the dynamic brake is non-operative. If at any time, the motor speed is higher than the drawworks throttle setting and the foot throttle is not in use, the dynamic brake will operate.

1 each - DRILLERS CONSOLE

- The console will be constructed of 12 gauge 304 stainless steel.
- The throttle hand wheels will be of solid stainless steel and shall provide 100% back up of the throttle function.
- The console will be water tight with a gasket door.
- The console will be acceptable for use in a Class 1, Division II area, by means of a Z
Purge system in accordance with NFPA 496, when attached to an external dry air supply of 85 to 150 psi.

- Communication between PLC cabinet and the drillers console will be via special communication cables.
- Cables enter the bottom of the console via plugs and receptacles

A. 5 Hand Throttles
- Mud Pump 1
- Mud pump 2
- Mud pump 3
- Drawworks
- Rotary Table

B. 7 Switches
- SCR Assignment
- Mud Pump 1 “Off/On”
- Mud Pump 2 “Off/On”
- Mud Pump 3 “Off/On”
- Drawworks “Forward/Off/Reverse”
- Rotary Table “Forward/Off/Reverse”
- PLC Bypass

C. 2 Meters
- Rotary Table Ammeter
- Percent Power Limit

D. 17 Indicator Lamps
- Generator 1 On
- Generator 2 On
- Generator 3 On
- Generator 4 On
- SCR 1 On
- SCR 2 On
- SCR 3 On
- SCR 4 On
- SCR 5 On
- MP1 Blower On
- MP2 Blower On
- MP3 Blower On
- Drawworks Blower On
- Rotary Table Blower On
- Purge Loss
- Power Limit
E. 3 Pushbuttons
- DC Emergency Shutdown Pushbutton
- Alarm Acknowledge
- Lamp Test

F. 1 Potentiometer
- Rotary Table torque Limit

G. 1 Type Z Pressurization System with Alarm(s)

H. 1 Lot Plugs and Receptacles

1 each - FOOT THROTTLE
- The Foot Throttle is constructed of 12 gauge 304 stainless steel, built to withstand the environment normally encountered on the rig floor.
- It includes dual stainless steel return springs to provide a fail-safe return to the minimum position in the event of a single spring failure.
- Provisions for dry air connection are also included. The foot throttle connects directly to the drillers console through a three-wire connection.
- The foot throttle is designed for Explosion type for Zone one

2 each - 600 VOLT FEEDER CIRCUIT BREAKERS
- 1 MCC Transformer Feeder Breaker
  1600AF/1250AT, 600Volts, 3 Pole, 42kAIC
- 1 Top Drive Feeder Circuit Breaker
  1600AF/1250AT, 600Volts, 3 Pole, 42kAIC

1 each - 600: 400 V 230 VOLT TRANSFORMER
- 1 MCC Transformer
  Copper Wound, Dry Type
  1250kVA, 600/400 V AC,
  3 Ph, 50 Hz, Del: Wye
- The secondary side of the transformers will be connected to circuit breakers in Motor Control Center

1 each - 400 VOLT SECONDARY CIRCUIT BREAKER
- 1 Circuit Breaker
  2000AF/1800AT
  42kAIC
- Manually charged, Manually operated
- Fixed Mount
- 1 Voltmeter, scaled at 0-500 volts
- 1 Ammeter, scaled a 0-1500 amps
- 1 Lamp-Transformer ON LINE
  - These circuit breakers will be Interlocked with the Auxiliary Generator Incomer so that power cannot be “back feed” to the Main 600 volt AC bus.

1 each AUXILIARY GENERATOR INCOMER BREAKER
- 1 Circuit Breaker
  - 630AF/630AT
  - 42kAIC
  - Manually charged, Manually operated
  - Fixed Mount
- 1 Voltmeter, scaled at 0-500 volts
- 1 Ammeter, scaled a 0-750 amps
- 1 Lamp-Aux. generator ON LINE

1 each-400 MOTOR CONTROL CENTER
- The MCC will be wired 400 Volt, 50 Hz, with individual breakers. The horizontal bus will be tin plated copper and 2000 amps rated. The vertical bus will be tin plated copper and rated for 300 amps. A copper ground bus will run the full length of the MCC line up. Each starter will be complete with a 400:230 control power transformer fused on the primary and the secondary, a magnetic only breaker, a contactor and an electronic overload relay, Red run indicating light.
- 30 loops power starters and 26 breakers to supply enough AC power to all the rig electric equipments.

1 each_42 CIRCUIT 400/230 VOLT LIGHTING PANEL
- The circuit panel will be a 400/230 Volt, 3 phase, 4 wire.

1 set POWER CONTROL HOUSE
- The power control house will be not more than 13000 mm long, 3000 mm wide and 3100mm high. The house will be designed for transportation by an oilfield type trailer.
- The frame of the house will be constructed of structural steel and continuous welded. The siding of the walls and skins of the roof will be constructed of steel sheet. All corners shall be trimmed out by bending, and seam welding leaving no sheet edge exposed.
- The main beam will be 28B I steel beams, with integral cross members.
- Three of the walls will be insulated with thick polystyrene block insulation, but the floor and end wall with the receptacles will not be insulated.
- The inside surface of the walls behind the equipment will be covered with aluminum panels. The inside surface of the walls not covered by equipment will be finished with a laminated wall board of ¼” thick marine plywood.
- The front of the wall board is covered with pebble grain aluminum, and the back is covered with aluminum foil vapor barrier.
- A rubber neoprene mat will run the full length of the interior isle of the house.
- Two (2) doors with stainless hardware. The door will open to the outside by pushing down on a “panic bar”.
- Two (2) 7.5 ton air conditioners will be supplied. The units will be split system type with the condenser unit (compressor and coil) located on an elevated rack on the porch on one end of the house. The top of the condenser unit will be no higher than the top of the house roof.
- The interior of the house will be illuminated by four (4) flush mount fluorescent lighting fixtures. One (1) emergency lighting fixture with battery back up and self-charge capabilities will be provided.
- Incoming power from the generators will enter the house via lugs on copper stabs through a recessed “window” located at the top and on one (1) side of the house.
- DC power connections will be made using single pin connectors in the AC/DC plug panel at one (1) end of the house. DC control connections, the receptacles will be angled down at 45 degrees to relieve stress on the cables.
- The house will be sandblasted and finished with a two (2) coat process consisting of an epoxy primer and a polyurethane top coat, white in color.
D. Blowout preventer, control equipment and associated equipment

D.1 Ram Type Blowout Preventer

- According to the latest API 16A standard, NACE MR-01-75 and quality standard of ISO 9001
- Available to H₂S Trim

D.1-1 21 1/4”-2,000 PSI Single Ram BOP  QTY: 1set
- Model: FZ54-14
- Bore: 21 1/4 in.
- Working Pressure: 14/2,000 Mpa/psi
- Cylinder Open Chamber: 2×11.65L
- Cylinder Close Chamber: 2×13.65L
- Top Connection Type: 21 1/4”-2,000PSI 6B R73 studded
- Bottom Connection Type: 21 1/4”-2,000PSI 6B R73 Flanged
- Weight: 4725kg
- Dimensions: 3206(L)×1180(W)×705(H) mm

D.1-2 13 5/8”-5,000 PSI Single Ram Blowout Preventer  QTY: 1set
- Model: FZ35-35
- Bore: 13 5/8 in.
- Working Pressure: 35/5,000 Mpa/psi
- Cylinder Open Chamber: 2×8.25L
- Cylinder Close Chamber: 2×8.95L
- Top Connection Type: 13 5/8”-5,000PSI 6BX BX160 Studded
- Bottom Connection Type: 13 5/8”-5,000PSI 6BX BX160 Flanged
- Weight: 3570kg
- Dimensions: 2400 (L)×800 (W)×880 (H) mm

D.1-3 13 5/8”-5,000 PSI Double Ram Blowout Preventer  QTY: 1set
- Model: 2FZ35-35
- Bore: 13 5/8 in.
- Working Pressure: 35/5,000 Mpa/psi
- Cylinder Open Chamber: 4×8.25L
- Cylinder Close Chamber: 4×8.95L
- Top Connection Type: 13 5/8”-5,000PSI 6BX BX160 Studded
- Bottom Connection Type: 13 5/8”-5,000PSI 6BX BX160 Flanged
- Outlet: 0/1/2; 3 1/8”-5000psi
- Weight: 6150kg
- Dimensions: 2400 (L)×1170 (W)×1340 (H) mm

D.1-4 21 1/4”-2000 PSI Drilling Spool  QTY: 1set
- Model: FS54-14
- Bore: 21 1/4in
- Working Pressure: 14MPa/2,000psi
- Side Outlets: 2; 4 1/16”-5,000PSI 6B R39 Flanged
Top Connection Type:  21 1/4"-2,000 6B R73 Flanged
Bottom Connection Type:  21 1/4"-2,000 6B R73 Flanged
Weight:      950kg
Dimensions:     1060 (L)×800 (W)×600 (H) mm

D.1-5 13 5/8"-5,000PSI Drilling Spool  QTY: 2set
- Model:      FS35-35
- Bore:      13 5/8 in
- Working Pressure:  35MPa/5,000psi
- Side Outlets:     2;  4 1/16"-5,000PSI 6B R39 Flanged
- Top Connection Type:   13 5/8"-5,000 6BX BX160 Flanged
- Bottom Connection Type:  13 5/8"-5,000 6BX BX160 Flanged
- Weight:      800kg
- Dimensions:     950 (L)×680 (W)×650 (H) mm

D.2 Annular Blowout Preventer

D.2-1 21 1/4"-2000PSI Annular BOP (Diverter)  Qty: 1 set
- Model:      FH54-14
- Bore:      21 1/4in
- Working Pressure:  14MPa/2,000psi
- Closing Fluid volume:   94.5L
- Opening Fluid volume:  95.3L
- Top Connection Type:   21 1/4"-2,000 6B R73 Studded
- Bottom Connection Type:  21 1/4"-2,000 6B R73 Flanged
- Weight:      7660kg
- Dimensions:     1512 (L)×1512 (W)×1437 (H) mm

D.2-2 13 5/8"-5,000PSI Annular Blowout Preventer (Diverter)  Qty: 1 sets
- Model:      FH35-35
- Bore:      13 5/8in
- Working Pressure:  35MPa/5,000psi
- Closing Fluid volume:   94L
- Opening Fluid volume:  69L
- Top Connection Type:   13 5/8"-5,000 6BX BX160 Studded
- Bottom Connection Type:  13 5/8"-5,000 6BX BX160 Flanged
- Weight:      6415kg
- Dimensions:     1271 (L)×1271 (W)×1150 (H) mm

D.3 Pipe rams

D.3-1 Pipe rams for 21 1/4"-2000psi BOP
- 5"       2Set.
- 6 5/8"    2Set.
- 3 1/2"    2Set.
D.3-2 Pipe rams for 13 5/8"-5000psi BOP

- 5" 2Set.
- 6 5/8" 2Set.
- 3 1/2" 2Set.
- 7" 1Set.
- 9 5/8" 1Set.
- Blind 1Set.
- Shear 1Set.
- Variable 2 7/8" to 5" 2Set.

D.4 BOP Choke / Kill Lines

Specifications:

- Mounted on oil field skid
- Working Pressure: 5000psi
- Kill and choke manifolds are anti- H₂S
- The bore diameter of two side in choke manifold is 4-1/16"

Including:

- Top choke line:
  - One hydraulic actuated gate valve 4-1/16"-5000 psi.
  - One manual operated gate valve 4-1/16"-5000 psi.
- Bottom choke line:
  - One hydraulic actuated gate valve 4-1/16"-5000 psi.
  - One manual operated gate valve 4-1/16"-5000 psi.
- Bottom kill line:
  - One hydraulic actuated gate valve 2-1/16"-5000 psi.
  - One manual operated gate valve 2-1/16"-5000 psi.
- Bottom kill line:
  - One hydraulic actuated gate valve 2-1/16"-5000 psi.
  - One manual operated gate valve 2-1/16"-5000 psi.
- Remote kill line
  - One manual operated gate valve 2-1/16"-5000 psi.
  - One check valve
  - One nipple with 2" hammer union
- Choke manifold
  - Eleven gate valves
  - One hydraulic operated choke valve
  - One manual operated choke valve
  - One remote control panel

See the drawings as attached.
D.5 Coflexid hose for BOP/Choke manifold:

- Nominal 2-1/16” 5000psi fire proof, acid resistant, steel banded flexible or fire resistant hose connecting the BOP stack to the choke manifold.

D.6 Hydraulic Control Unit

Model: FKQ1280-8

- The BOP control unit will be a complete air/Hydraulic system designed for the control and the operation of surface mounted BOP stack
- According to API SPEC 16D, API RP 500
- Complete with remote control panel contained in a protect house, driller’s panel, one panel near tool pusher’s office (35m), 4 gauges at each panel, air cable, alarm device and hydraulic hoses
- Two (2) electric motor driven triplex plunger pump, c/w automatic pressure switch and relief valve. Pump flow rate 40 liter/min. (10.5GPM) at 21MPa (3000psi) output pressure. Explosion proof motor 25HP. 3phase 380V/50 Hz.
- Two (2) pneumatic pumps with capacity of 7 liter/min. (1.85 GPM) and 21MPa (3000 psi) output pressure with a 0.53MPa air supply. The ratio of liquid/air is 50:1.
- One (1) air supply manifold include air regulator, lubricator, filter/separator, shutoff valve, bypass valve and automatic pressure switch which allows full flow to the air pump up to desired shutoff pressures.
- One (1) control manifold consisting of the following major components:
  - Eight (7+1) 1” manual/remote operated 3-pos./4-way control valves for the controlling of:
    - Annular preventer (open/close)
    - Pipe ram preventer (open/close)
    - Blind preventer (open/close)
    - Pipe ram preventer (open/close)
    - Pipe ram preventer (open/close)
    - Valve to choke line (open/close)
    - Valve to Kill line (open/close)
    - Manifold by pass valve (open/close)
  - Three (3) 100 mm OD pressure gauge for the following pressure indication:
    - Accumulator pressure with 0~40MPa (0~5800 psi) range.
    - Manifold pressure with 0~40MPa (0~5800 psi) range.
    - Annular supply pressure with 0~25MPa (0~3570 psi) range.
  - One (1) 1” hydraulic regulator assembly for local and remote operation of the regulating of annular preventer function pressure including valve for the local/remote operation. Assembly to include the following major components:
    - One (1) 1” manual/air remote regulator
    - One (1) air pressure regulator
    - One (1) 2-position, 3-way distribution valve
  - One (1) 1” hydraulic regulator assembly for the regulating of the manifold function pressure. Assembly include the following major components:
One (1) 1” manual regulator

- One (1) 1” 2-position, 4-way manual/remote operated control valve for operation of the manifold pressure bypass function.

- Three (3) air transmitter for the remote indications of the following pressure reading:
  - Accumulator pressure with 0~40MPa (0~5800 psi) range.
  - Manifold pressure with 0~40MPa (0~5800 psi) range.
  - Annular supply pressure with 0~25MPa (0~3570 psi) range.

**DRILLERS PANEL**

- One (1) drillers control panel suitable for control of the BOP stack. The panel will consist of following main components:

- Eight (8) of 3-position, 4-way air operate valve, for the remote operation of the following functions:
  - Annular preventer (Open/Close)
  - Pipe ram preventer (Open/Close)
  - Blind preventer (Open/Close)
  - Pipe ram preventer (Open/Close)
  - Pipe ram preventer (Open/Close)
  - Choke valve (Open/Close)
  - Kill valve (Open/Close)
  - Manifold bypass valve (Open/Close)

- One (1) set of air pressure regulator, for the remote operation of the following function:
  - Annular air pressure (Increase /decrease)

- Four (4) 100mm OD pressure gauge for the indication of the following pressure readings:
  - Annular Pressure 0~25MPa (0~3570 psi)
  - Accumulator Pressure 0~40MPa (0~5800 psi)
  - Manifold Pressure 0~40MPa (0~5800 psi)
  - Air Supply Pressure 0~2.5MPa (0~357 psi)

**AUXILIARY PANEL**

- One (1) graphic auxiliary drillers control panel suitable for control of the BOP stack. The panel will consist of following main components (can’t indicate the position of open/close):

- Eight (8) of 3-position, 4-way air operate valve, for the remote operation of the following functions:

- Four (4) 100mm OD pressure gauge for the indication of the following pressure readings:
  - Annular Pressure 0~25MPa (0~3570 psi) range.
  - Accumulator Pressure 0~40MPa (0~6000 psi) range.
  - Manifold Pressure 0~40MPa (0~6000 psi) range.
  - Air Supply Pressure 0~2.5MPa

- Motor, lighting system, control panel explosion proof

- Pipe rack and hoses
  - Three (3) interconnecting pipe racks, 35MPa (5000 psi) WP, 5 meter long each, with 16x1” 35MPa (5000 psi) WP steel pipes with hammer unions at both end for connecting.
  - Thirty-two(32) of hydraulic hose, 1”, 35MPa (5000 psi) WP, 5 meter long,
interconnection of control system and pipe rack, fireshielded to API 16D.

- Sixteen (16) of hydraulic hose, 1”, 35MPa (5000psi) WP, 10 meter long, for interconnection of BOP stacks and pipe rack, fireshielded to API 16D.
- Complete with universal joints and hammer unions

**ALARM DEVICE**

- This device can be equipped with alarm device when following case occur, gives lamp and/or sound alarms, include a electric cable connecting the control system and driller’s panel, control system and auxiliary panel.
- Remote control system and driller’s panel, auxiliary panel are all equipped with 4 explosion-proof indication lamp for the following function:
  - Low accumulator pressure (yellow, with sound alarm)
  - Low air pressure (yellow, with sound alarm)
  - Low fluid level (yellow, with sound alarm)
  - Electric pump running (green)

**Specification:**

- Number of objects controlled: 8
- Total capacity of Accumulator set: 80L×16
- Effective volume of oil tank: 1600 L
- Flow ate of electric pump: 40 l/min
- Air/fluid ratio of air operated pump: 50:1
- Number of air operated pumps: 2
- Motor power: 18.5 KW

**D.7 Box-end wrench for BOP**

- Size: 3-1/4”, 2-1/2”, 2”, 1-3/4”, 1-7/8”, 1-5/8”, 1/2”, 1-1/4”, 1-3/8”, 1-1/8”, 1”, 7/8”, 3/4” and 5/8”, four for each size

**D.8 Poor boy degasser**

Qty: 1set

- Model: YQF-1200/1.5
- Max. Working pressure: 1.5MPa
- ID: 1200mm
- Max. Mud capacity: 400m3/h
- Max. Gas capacity: 10000m3/h
- Fluid inlet pipe ID: 100mm
E. Mud engineer house and laboratory

- Divided into two parts, one is as mud engineer’s bed room, with air conditioner, smoke alarm, single bed, wallboard and other accessories, another is as laboratory, complete with air conditioner and working desk, mud test equipment.
- Mud lab fitted with sink and water connection, electrical outlet and drainage.

**Stainless cabinet includes following:**

- Four scale Mud balance 2Nos.
- Marsh funnel viscometer & enamel cups 2 Nos.
- Measuring cups 1000CC 2 Nos.
- Stop watch 10 Nos.
- API filter press 2Nos.
- HPHT filter press 2No
- Retort kit 50mL 2Nos.
- Air hose adapter & hose 2 pack
- Sand content kit 2 No
- Brush, large with wooden handle 2 No
- Brush, test tube, small 2 No
- Graduated cylinder 25 mL 2 no
- Graduated cylinder 10 mL 4 no
- Graduated cylinder 25 mL 4 no
- Titration dish, polyethylene, 140ML 2 no
- Pressure source (100 PSI & 500 PSI) 2Nos.
- V.G. meter 6 speed 2Nos.
- Beach mixer (one shaft & one blade) 2Nos.
- Metal Thermo meter (50-350°F) 4Nos.
- Heating cup of VG meter 2Nos.
- Magnetic plate for titration 2Nos.
- Stability tester 2Nos.
- Filter paper for API and filter press and HP 4 boxes.
- Regulator for HPHT 2 Nos
- Laboratory analytical balance (0 to 500 GR, precision of 0.01 GR) 1 No
- Total PH meter (electrical) 2Nos.
- Test kit 1 No
- Filter glass, 250ML 2 No
- Filter glass, 500ML 2 No
- Measuring glass, 500ML 2 No
F. Safety equipment

F.1 Gas detection fixed system
   - 4 H2S detect sensors
   - 4 LEL (lowest explosion limit) sensors
   - Multi-point control unit
   - Cables and accessories
   - Complete with 1 bottle of standard H2S and 1 bottle of standard LEL gas, 4 liter per bottle

F.2 Emergency shower station on mud tanks
   Qty 2 sets

F.3 Eye Washer
   Qty: 2 Sets
G. Double standpipe, mud manifold, rotary hose

G.1 Double standpipe

Features:
- 4"ID Double standpipes with goosenecks connected to rotary hoses at upper ends and the lower ends connected to an H-type mud manifold.
- All connections are quick couple Union type.

Technical specifications:
- Working pressure: 35Mpa
- OD/ID: 5 1/2"/4"
- Working medium: water, mud, mixture of fluid
- Height from the drilling floor to the union of gooseneck: 17.5m, 21.5m (for top drive)

G.2 Mud manifold

Features:
- It consists of floor manifold, pressure gauges, ground high pressure pipelines and valves.
- Pre-install interfaces and gates on the drilling floor for drilling instruments, logging instruments, kill manifold, fill-up lines, etc, and all to be vertically up mounted to meet the requirements of drilling, cementing, killing and other operations.
- Floor manifold forms H-type, completed with pressure gauges and sensors for instrumentation.
- Equipped double ground pipelines with valves from mud pump to floor manifold
- With fill up outlet and two 2" outlets having fig.1502 connections
- All connections are quick couple Union type.

Technical specifications:
- Working pressure: 35Mpa (5000psi.)
- Test Pressure: 52.5MPa
- OD/ID: 5 1/2"/4"
- Working medium: water, mud, mixture of fluid
- Ambient temperature: -29°C~ 80°C

G.3 2 sets Rotary hose

Technical specifications:
- Working pressure: 35MPa (5000psi.)
- Test Pressure: 52.5MPa
- ID: 4"
- Pipe connection: 4" union
- Length: one is 19m, the other is 23m

G.4 3 sets 15’ Short hose

Technical specifications:
<table>
<thead>
<tr>
<th><strong>Working pressure:</strong></th>
<th>35MPa (5000psi.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Test Pressure:</strong></td>
<td>52.5MPa</td>
</tr>
<tr>
<td><strong>ID:</strong></td>
<td>4&quot;</td>
</tr>
<tr>
<td><strong>Pipe connection:</strong></td>
<td>4&quot; union</td>
</tr>
<tr>
<td><strong>Length:</strong></td>
<td>15'</td>
</tr>
</tbody>
</table>
H. Mud Tanks

Features:

- The system consists of six main mud tanks (straight type layout) and one pill tank (2.2 m³), complete with 5 classes mud cleaner equipment (shale shakes, degasser, mud cleaner, centrifuge).
- Each tank base is equipped on oil field type skid and with oil field type skid ends.
- Tank Side, end walls and partition plate V type crimp design.
- Tank walls rimed with mud gun pipeline, water pipeline, grout pipeline and chemicals pipeline.
- Tanks connection is hammer seal pit union type.
- Overall dimension for all tanks are as annex drawings to ensure the safety transmission by railway or road.
- All AC motors are explosion proof type.
- Coating: Fully sand blast first, expoxy zinc rich prime, thickness 75µ, expoxy medium twice, thickness 250µ, polyarethene finish paint twice, thickness 70µ

Specifications:

- Total effective capacity: 345 m³,
- Overall dimension of each tank: 12600×3000×2400mm
- Weight of each tank: about 18800kg

H.1 Shale shaker tank

Features:

- Equip three Mongoose shale shakers, one divider.
- The bottom of the tank lefts the output pipeline for wellhead pipeline and mud. The surface of tank should lefts sidewalk for people.
- The body of tank consists of two compartments: metering compartment (trip tank) and setting sand compartment, with sand removal door, water clean outlet in each compartment.
- Capacity of metering compartment (trip tank) is 16 m³, with a metering pump at the right end (look from drill hole).
- A 7.5KW (10HP) agitator is fixed on its top. The top of the tank is closed.
- A liquid measure meter is fixed on one side of the tank (the dial have two units m³ and bbl). The tank is equipped an alarm for mud level.

H.2 Intermediate tank

Features:

- The tank is separated into three parts, consisting of degasser compartment, desanding compartment and desilting compartment with one 20HP(15kW) agitator, one mud gun, sand removal door, water clean outlet in each compartment.
- A degasser and a mud cleaner are fixed on the top of the tank.
- Two 75KW (100HP) supply pump are fixed at the right (look from drill hole) of the tank.
They are used to supply drilling mud for mud cleaner (desander and desilter).

- The tank includes one pill tank (capacity 2.2 m³) on the top of the tank. The pill tank completes with agitator (power 15HP/11kW).

**H.3 Res. Tank #1**

- The tank is separated into three parts, with one 20HP(15kW) agitator, one mud gun, sand removal door, water clean outlet in each compartment.
- A middle-speed centrifuge and a high speed centrifuge are fixed on the tank complete with feeding pump.

**H.4 Res. Tank #2**

**Features:**

- The tank consists of storage compartment and shearing compartment.
- The volume of shearing tank is 15m³.
- A sand discharge gate, a mud gun and a clean water outlet are fixed on each compartment.
- One shearing pump is fixed on one end of the tank.
- One mixing hopper is fixed on the skid of the tank.
- A 20HP(15kW) agitator is fixed on the storage compartment and a 7.5KW(10HP) agitator is fixed on the shearing compartment.

**H.5 Suction tank**

**Features:**

- Two mud pump absorbing inlets (12") are fixed on the tank side.
- The tank consists of two compartments.
- Two sand discharge gates, two 20HP(15kW) agitators, two mud guns and two clean water outlet are fixed on this tank.
- A super-charging cell is fixed before the tank. Two super charging pumps are installed in it (include filters of two pumps).

**H.6 Mix tank**

**Features:**

- The tank is separate two parts. Each part has two 20HP(15kW) agitators, two gates for sand discharge, two mud guns and two water clean outlet.
- Along side of mixing tank place a skid mounted mud mixing and weighting system include two sand pump and two hoppers.
I. Solid control system equipment

I.1 Shale shaker

Qty: 3 sets

Mongoose Dual-Motion Shaker Specifications:

- Dimensions
  - Length 95 in (2,413 mm)
  - Width 65 in. (1,651 mm)
  - Weir height 31 in. (787 mm)
  - Height 49 in. (1,245 mm)
  - Operating Weight 4000 lb (1,814 kg)

- Screen date and Screens
  - Screen Area: 25 ft²
  - Deck Angle: Adjustable from -4° to +3°
  - Screen Type: Pre-tensioned 4 ft x 2 ft

Motor Specifications

- Two (2) 2 hp vibrator motors
- One (1) 0.6 hp vibrator motor
- 380V/50HZ/1,500 rpm
- Explosion proof
- Class I, Group C and D
- UL, CSA

FEATURES

- Dual Motion, linear and balanced elliptical, can be changed with the flip of a switch, linear 7gs, BEM 5gs.
- Control box allows for changing the motion with the “flick of a switch”.
- The balanced basked is designed to provide perfect motion both for linear and Balanced Elliptical Motion whether dry, lightly loaded, or heavily loaded.
- The reinforced basket has cross-braced structural steel frame that has been stress relieved.
- The distribution box replaces the typical flow-line trap (or possum belly) and includes the quarter pipe.
- The bed angle adjustment is a conveniently located at the front of the shaker.

I.2 Vacuum degasser

Model: ZCQ1/4

Features:

- Water ring vacuum pump is always working at constant temperatures, suitable to swab flammable and explosive gases, safe and reliable.
- Belt transmission is adopted, which simplifies the speed-reducing mechanism.
- Gas/water separator is used, which will make water and gas discharged separately, and
the gas exhaust pipe is always kept unobstructed.

Major technical parameters:

- Treatment capacity: 4 m$^3$/min.
- Vacuity: 0.3-0.4
- Power of main motor: 15KW
- Power of vacuum pump/speed: 3KW, 876rpm
- Dimensions: 1800×800×1400mm
- Weight: about 789 kg

I.3 **Centrifuge**

**Model: MI Swaco 518 FVS**

Qty: 2 sets

- The 518 FVS fully variable-speed centrifuge is controlled and constantly monitored by PLC for optimum performance.
- The 518FVS centrifuge ensures less frequent solids pack–off, cleaner effluents, reduced personnel interaction and automatic adjustment to accommodate a full range of operating conditions.

**SPECIFICATION**

- Length – 3617.5 mm (142.4 in)
- Width – 2000 mm (78.7 in)
- Height – 1805 mm (71 in) with the electrical control panel bracket; 810 mm (31.9 in) without
- Weight - 3600 kg (7937 lbs)
- Power Required – 380 VAC 50 Hz 3 Phase; 50Kw
- 380 VAC 50 Hz 3 Phase
- Motors:  Electrical motor - 30 kw, 4 poles, 380 Volts, 50 HZ, Explosion Proof(Euro)
  - Main drive hydraulic variator – 3000rpm maximum continuous speed.
  - Back drive hydraulic variator – fixed-displacement axial piston.
- Bowl:  Dimensions - 14" Diameter by 56" long (356 mm by 1422 mm)
  - Material – Stainless steel
- Conveyor:  Pitch – 4.33” (110mm)
  - Material – Stainless Steel
- Gear Box:  Type – Planetary
  - Ratio – 57:1
  - Max Torque – 350 KPM (Kilopoundal meters)
- Bowl Speed:
  - High speed – 3600 rpm
  - Standard Speed – 2500 rpm
  - High Volume – 1900rpm
- Recommended Feed Rate:
  - High Speed – 100 GPM
Standard Speed – 150 GPM
High Volume – 250 GPM

I. 4 Mud cleaner package (Combination of Desander & Desilter)

Qty. 1 EA

2-12 D-Sander
- The 1,000 gpm Model 2-12 D-Sander includes two 12” diameter polyurethane hydroclone that is either vertically or slant mounted on a heavy duty skid.

Physical Data
- Length 78 in (1981mm)
- Width 47.5 in. (1207mm)
- Height 35.2 in. (894mm)
- Shipping Weight 1030 lb. (467.2 kg)

Operating Data
- No. of Clones per Unit 2
- Diameter 12 inches (304.8 mm)
- Feed Volume 1,000 gpm
- Feed Manifold Diameter 8 inches
- Overflow Manifold Diameter 10 inches (254 mm)
- Processing Rate 1,000 gpm at 75 feet of head
- Apex Valve Size: Fixed at 1-1/2 inches standard, 1 inch optional
- Desander Clone Median Separation: D-50 separation at 40 microns, D-90 separation at 74 microns

Features:
- Efficient: The 2-12 D-Sander hydroclone removes 95 percent of the drilled solids to 74 microns and up to 50 percent to 40 microns
- High Processing Rate – Processing capacities of 1,000 gpm with the 12-inch double clone.
- Configured to customer needs – The 2-12 D-Sander is available in space saving vertical mount skids and slant-mount skids.
- Field Proven Clone Design - Field proven in years of oilfield operation, each hydroclone assembly includes four replaceable wear resistant polyurethane sections joined together with quick-release stainless steel clamps. Worn sections can be replaced quickly and easily.

8T4 D-Silter
- The 1,200 gpm Model 8T4 D-Silter includes sixteen 4” diameter polyurethane hydroclones.

Physical Data
- Length 80.3 in (2040mm)
- Width 30 in. (762mm)
- Height 56.1 in. (1425mm)
Weight: 925 lb. (420 kg)

Operating Data:
- No. of Clones per Unit: 16
- Diameter: 4 inches (101.6 mm)
- Feed Volume: 1,200 gpm
- Feed Manifold Diameter: 6 inches (152.4 mm)
- Overflow Manifold Diameter: 8 inches (203.2 mm)
- Processing Rate: 1,200 gpm at 91 feet of head
- Desilter Clone Median Separation: D-50 separation at 25 microns, D-90 separation at 40 microns

Features:
- Cost Efficient: Field comparisons show that Swaco D-Silter provide more efficient removal of silt particles larger than 20 microns, and some as small as 15 microns.
- High Processing Rate – Processing capacities of 1,200 gpm
- Innovative Design – The exclusive Twin-Cone design of Swaco D-Silters consists of two 4 inch (101.6 mm) sturdy polyurethane cyclones mounted as a single unit. This feature results in a 40-50 percent greater capacity than other comparable 4-inch cyclones. The design also features a unique 20 degree taper angle compared to the typical 15 degree taper of most other units resulting in a much lower percentage of mud lost to underflow.

Shale shaker:
- Same as above.

I.5 Agitator
I.5-1 Agitator ZJW-15
- Quantity: 16
- Capacity: 20HP

I.5-3 Agitator ZJW-7.5
- Quantity: 3
- Capacity: 10HP

I.6 Mixing system - Hopper
- Quantity: 2
- Capacity: 100
- Total Capacity: 200

I.7 4 sets Sand pump Model: SB6”×8”-12-1/2”
- Capacity: 200m³/h
- Lift: 35m
- Ac motor power: 75KW (100HP)
- 2 for desander and desilter supplying and 2 for mixing pump.

I.8 1 set Shearing pump Model: WJQ5”×6”-10”

Features:
- Reliable compound seal is adopted to ensure no leakage.
Stainless steel turbines are installed inside, having long working life.

The belt transmission system of the motor is installed on the same skid with the pump, small in volume and easy to set up.

Major technical specifications:

- Pump inlet diameter: 6”
- Pump outlet diameter: 5”
- Flow rate: 155 m$^3$/h
- Lift distance: 26m
- Rotating speed: 2050rpm
- Matching power: 55KW

I.9 1 set Metering pump Model: 2NP

- Capacity: 40 m$^3$/h
- Ac motor power: 11KW
J. Drilling Instrumentation

Functions

- It monitors and alarms the parameters of hook load, weight of bit, rotary table RPM, rotary torque, tong torque, pump SPM1, 2, pump pressure, mud return flow, depth, ROP., mud pit/trip tank volume.
- The sensors are installed at the corresponding places of the rig, The Data Acquisition Unit (DAQ) requires Device Net CAN bus (port for top drive RPM/torque is preserved), all sensors connect to the CAN bus and can be added as user needs.
- The monitor installed in driller controlling cabin require PC104 computer with TFT LCD and touching screen(-40-60°C), it can acquires and stores data independently, Data recording and storing system installs in the engineer’s office.
- It displays curve, data and meter in pages. And it records, stores and printouts the real-time data changing in digital and curves. It also can recall and print the historical data and curve.
- The display is marked in Chinese/English. The meters utilize SI Metric/ANSI unit.
- The derived parameters of penetrate rate, accumulated SPM, total SPM and kN.m are displayed on computer.

Specifications

- Power Supply: 220V AC +20%, 50Hz +10%
- Operating Environment: -40°C to 60°C (equipment in open area)
- Hook Load: 0-5000KN, 10/12 line strung
- Rotary Table RPM: 0-300RPM
- Rotary Torque: 0-1000AMPS
- Tong Torque: 0-100kN·M
- Pump SPM: 0-200SPM
- Pump Pressure: 0-40MPa
- Mud Return Flow: 0-100%
- Depth of Hole: 0-9999.99m
- Level of Mud Pit: 0-5m
- System Accuracy: display=±2.5%, record=±1%

I.2 Equipment Supply

I.2-1 Sensors:

- 1*Weight load sensor
- 1* depth sensor
- 2*Pump SPM sensor
- 1*Rotary table RPM sensor
- 1*Pump pressure sensor
- 1*Mud return flow sensor
I.2-2 Display System
- TFT LCD with touching screen (PC104) to display electronics as follows:
  - Hook load
  - Weight on bit
  - Rotary table & top drive RPM
  - Rotary table & top drive torque
  - Tong torque
  - Casing tong torque
  - Pump SPM1, 2
  - Pump pressure
  - Mud return flow
  - Well depth
  - Ton. Mile of drilling line
  - ROP. (rate of penetrate)
  - Mud pit/trip tank volume (gain/loss)
- Mechanical meters on driller’s console:
  - 1×Weight indicator
  - 1×stand pipe pressure gauge
  - 1×Tong torque meter
  - 1×Rotary torque meter

I.2-3 Data Acquisition System
- Device Net CAN BUS with CAN card

I.2-4 Recording System
- 1*Industrial PC (VIP work station)
  - Pentium IV 2.4GHz, 256M RAM, integrated video card and network card,
  - 17” LCD display,
  - 80G hardware, sound card, 2 serial ports, 1parallel port, 2 USB ports, at least 2 PCI slots,
  - 52×CDRW, 3.5" FD , keyboard , mouse,
  - PCI bus adapter card.
- 1* EPSON 1520K color inkjet printer
- 1* software
- 1*Online UPS

I.2-5 Mounting Accessories
- 2*Mounting parts of pump SPM sensor
- 1*Mounting parts of pump RPM sensor
- Mounting parts of mud return flow sensor
- Mounting parts of pump pressure sensor
- 10*Mounting parts of ultra-sonic probe
- 1* Mounting parts of Weight load sensor
- 1* Mounting parts of depth sensor
- 1* Mounting parts of Rotary torque sensor (Electrical)
- 1* Mounting parts of Tong torque sensor
- Each sensor complete with a junction box for quick change.

I.2-6 Hydraulic Hose, Cables and Fittings
- Weight indicator hose, 15m
- Pump pressure hose, 15m
- Tong torque hose, 15m
- 2*cable from pump SPM sensor1, 2 to signal barrier box, 15m each
- 1*cable, from signal barrier box to CAN BUS, 10m
- Cable, rotary torque sensor to CAN BUS, 10m
- Cable, depth sensor to CAN BUS, 15m
- 10*cable, ultra-sonic probe to CAN BUS, 15m
- 1*Cable, DAQ to LCD screen, 30m
- Co-axial cable, DAQ to recording unit, 150m
- Cable, rig site power supply control case to system power supply, 100m
- All cables will be screened.
K. Top drive- Varco

Model: TDS-11SA (VARCO)

The system package consists of:

- 1 TDS-11SA Drilling Unit - 500 Ton Rated (p/n )
- 1 Counterbalance Attachment Kit
- 1 Lubrication Kit
- 1 PH-75 Tool Kit
- 1 Control House Assembly
- 1 Driller Console, UL, Purgeable (p/n )
- 1 Purge Kit for Driller Consol, Z-Purge
- 1 Service Loop Kit, 777MCM
- 1 Derrick Leg Cable Kit, 777MCM
- 1 VDC Cable
- 1 Derrick Termination Kit, Portable Installation
- 1 Grounding Rod, Electrical
- 1 Guide Beam Kit (p/n )
- 1 Lower Tieback Kit (p/n )
- 1 Intermediate Guide Beam Tieback Kit (p/n )
- 1 Owner's Manuals (p/n )

TDS-11SA Drilling Unit - 500 Ton Rated

- The drilling unit comes complete with the following equipment pre-assembled: motor housing, onboard hydraulic power unit, roller-style carriage, bail, pipe handler (PH-75), integral swivel with gooseneck and 7500 psi "S-Pipe" assembly, and the shipping/storage skid.
- The unit comes equipped with a 7500 psi S-Pipe. This allows the end user to configure the unit to the well needs by selecting either a 5000 psi or 7500 psi Wash Pipe option.
- The TDS-11SA drilling unit features two forced air cooled 400HP AC drilling motors (800 HP Total), a 10.5:1 double reduction helical quiet gear drive, hydraulic disc brakes, rotating head, bail, and counterbalance with stand jump.

<table>
<thead>
<tr>
<th>TDS-11SA Output Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque, ft-lbf</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>55,000</td>
</tr>
<tr>
<td>37,500</td>
</tr>
<tr>
<td>18,250</td>
</tr>
</tbody>
</table>

- The on-board pipe handler (PH-75) is complete with 500 ton rated link adapter assembly,
remote operated dual crank upper IBOP safety valve, manual operated lower IBOP safety valve, lower gripping jaw, link tilt assembly. The pipe handler will be dressed for tool joint size specified by Customer.

- The PH-75 offers mechanized break-out of lower and upper IBOP valves, heavy-duty rotating head motor for more consistent operation, accommodation for tool joints up to 8-1/2 inch OD.

Counterbalance Attachment Kit

- Provides required hardware for attaching the counterbalance cylinders to rig traveling equipment.

Lubrication Kit

- Includes TDS gear box lubrication fluid and hand pump.

PH-75 Tool Kit

- Includes an IBOP wrench, an additional saver sub and a cross-over sub for use during well-control processes.

Control House Assembly

- Walk-in steel enclosure with integrated PLC, variable frequency drive (VFD) and other control components.
- All system hardware and software are specifically designed to control the TDS-11SA Top Drive drilling motors and auxiliary systems.
- It is equipped with climate control, insulation, and quick disconnect couplings. For use in non-hazardous area.
- Incoming power requirement is 575VAC ± 15% 3-phase at frequency 46-64 Hz.
- Note: The auxiliary motors on the TDS, however, are rated at 50 Hz. Systems configured for different input frequencies by default also include a small conversion VFD for this purpose.

Driller Console, UL, Purgeable

- Features operating switches, RPM & torque meters, indicator lights, throttle, etc. and housed in a purgeable stainless steel enclosure. Stand-jump control is standard.
- The VDC offers two 4-20 mA signal outputs which may be processed by external devices.

Purge Kit for Driller Consol, Z-Purge

- Included for site implementation of optional Z-Purge for the driller console. For UL systems only.

Service Loop Kit, 777MCM

- Kit includes: 1 power loop (3 x 777MCM + 444MCM ground), 1 auxiliary power loop, and 1 composite control loop.
- The power loops run between the Top Drive and the mid-derrick junction.
- The composite control loop runs from the Top Drive to the control house, straddling over a saddle at mid-derrick.
Derrick Leg Cable Kit, 777MCM

- Includes TDS cables designed to run from the derrick termination (mid derrick) to the control house.
- If the TDS control house is located further way from the derrick, a jumper cable kit may be required for reach.
- If required the jumper cable kit may be purchased as a separate accessory.

VDC Cable

- Provides communication between the VDC and the TDS control house.
- Unless otherwise specified, the VDC cable is equipped with QD connectors. Extension cables may be purchased separately if required.

Derrick Termination Kit, Portable Installation

- Includes mounting brackets for supporting the power loop at mid derrick, allowing for quick disconnect.
- Also includes support saddle for composite control loop, plus mounting hardware.

Grounding Rod, Electrical

- For earth grounding of control system chassis.

Guide Beam Kit

- The guide beam provides guided traveling of the Top Drive and torque reaction.
- Torque is transmitted to the derrick/mast structure via the lower tieback.
- The lower tieback is designed to interface with a horizontal spreader beam mounted at approximately 10 ft above the drill floor.
- The guide beam consists of several segments, allowing easy rig-up / rig-down. See option summary for as quoted guide beam configuration.

Lower Tieback Kit

- Includes hardware to tie the lower end of the guide beam to spreader beam for lateral and torsional support.

Intermediate Guide Beam Tieback Kit

- Brackets and hardware for tying guide beam to derrick or mast structure at intermediate point.
L. Air Supply System

Features:

- Equipped in a separator house, consisting of 3 screw air compressors, 1 dryer, 1 set of 8 m³ air storage tank and air lines on skid.
- Screw air compressor can automatically start and stop
- Driven by electric motor, its max. continuous power is 75KW.
- Air supply system flow sheet:
  - Air compressors--dryer--air tank—lines
  - Total volume: described as follows
  - Total weight: described as follows

L.1 Screw air compressor

Qty: 3 sets

- Type: Oil Lubricated Screw Air Compressor
- Model: MH75
- Manufacturer: Ingersoll Rand
- Capacity: 11 cu. m/min
- Discharge Pressure: 10 Bar
- Motor Power: 75 KW
- Noise Level: 76 dB (A)
- Power Requirement: 380/50/3 V/Hz/Ph
- Cooling Method: air cooling
- Connection: NPT2.0
- Outline Dimension (L x W x H): 1605x1689x1696 mm
- Weight: 1315 kg

L.2 Cold start air compressor

Qty: 1 set

Model: LD-0.8/10

- Air discharge pressure: 1.0MPa
- Free air delivery: 0.8m³/min
- Rated rotating speed: 1000rpm
- Cooling Method: Air
- Driven by 7HP diesel engine which is started by manual.

Diesel engine

- Model: R180
- Type: single cylinder, horizontal, pre combustion
- Rated power: 7HP
- Rated rotating speed: 2600 rpm

L.3 Air Dryer

- Manufacturer: Ingersoll-Rand
- Model: D2100INR-A
- Capacity 35 cu. m/min
- Pressure Rating 10 Bar
- Output Pressure Due Point 3 Deg C
- Noise Level <70 dB (A)
- Power Requirement 380/50/3 V/Hz/Ph
- Piping Connection 4" Flange
- Outline Dimension (L x W x H) 1650x980x1900 mm
- Weight 600 kg

L.4 Air storage tank
- Manufacturer Ingersoll-Rand
- Model C-8.0/1.0
- Capacity 8.0m3
- Maximum Pressure Rating 1.1 Bar
- Diameter 1800 mm
- Height 3806 mm
- Weight 1534 kg
- Piping Connection DN150

L.5 Main air lines

Specifications:
- Diameter: 2"
- Work pressure: 1.2 Mpa
M. Electricity Circuit System

Standard for design and manufacture

- API  RP 500B “The recommend way for the classify of the place of electrical installations for petroleum installations”;
- GB 3836.8—87 “electrical installations for circumstance of explosive gas” no spark “n”
- GB 50058—92 “design specifications for the electrical installation of explode and fire”,
- ”District for explode place of oil and gas field”;
- SY / T 5957 - 94 “Specification of electrical installation in well site”,
- SY 5225 - 94 “safety regulation of fireproof and explosion proof for drilling, exploit, preservation and transportation of oil and gas”,
- SY/T6276 - 1997 eqv ISO/CD 14690 “oil and gas industry, management system for health, safety and environment”.

Standard well site electrical circuit covering all area from MCC output to electrical equipments, including power circuit, lighting circuit, and protecting circuit (earthing system).

- Rated voltage: 380V/220V (3 phase four – wire system)
- Rated frequency: 50Hz
- Explosion proof: According to API Standard (RP 500B)
- Ambient temperature: -18°C to 50°C and in a windy and dusty atmospheres
- Relative humidity: up to 90% at 20°C.
- All Cables are Flexible Rubber type & oil resistance

Enough lighting will be supplied covering all the rig site, including flood lights, Ex-proof fluorescent lamps, Ex-proof emergency fluorescent lamps and aviation lights.
N. Spare parts
   - Recommended Spare parts list for two years operate, as the spare parts may be consumed different at different condition, what we recommend is just for reference.

O. Training
   - Seller offers 9 persons training course for 21 days for each rig including training for operating, maintenance and rigging up of all rig equipment, at manufacturer factory or country

P. Specialist service
   - Group of Specialist for rigging up & operating all rig equipment in well site for 4 weeks period

Q. Rig equipment operating manual and maintenance Catalog
Appendix-1 Technical Specification of Optional Equipment

R.1 Accommodation

R.1.1 Rig Site Accommodation: 11 Units

<table>
<thead>
<tr>
<th>Items</th>
<th>Descriptions</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tool pusher office + bedroom + bath room</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Company man office + bedroom + bath room</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Geologist man office (Laboratory) + (2 beds) room + bath room</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Mud engineer man office (Laboratory) + (2 beds) room + bath room</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Supervisor office + (2 beds) room + bath room</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Senior mechanic (2 beds) room + senior electrician (2 beds) room + bath room</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Senior mess room + prayer room</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Junior mess room</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Clinic + QHSE officer room + bath room</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>4 bed room + bath room (for guest)</td>
<td>2</td>
</tr>
</tbody>
</table>

R.1.2 Camp Accommodation: 11 Units

<table>
<thead>
<tr>
<th>Items</th>
<th>Descriptions</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Laundry and dryer + service</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Mess room (senior and junior)</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Kitchen room</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>4 beds + 4 beds + 4 beds</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>4 beds + 4 beds + camp boss</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Night pusher (2 beds) room + driller (2 beds) room</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>2 beds + 2 beds + 2 beds + 2 beds</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>TV room and prayer room + Dry food store</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Refrigerator + freezer</td>
<td>1</td>
</tr>
</tbody>
</table>

R.1.3 Camp Site Generators

R.1.3.1 Generator house (with switchover cabinet): Qty. 1 set

R.1.3.2 Generators: Qty: 2 sets of CAT C15

400/230V 50 HZ PGS, 365KVA, 292 ekW prime with fan rating.
• AIR INLET SYSTEM
  ➢ AIR CLEANER — HEAVY DUTY

• CONTROL PANELS
  EMCP 3.1(for C15) or EMCP 2 (for 3406) control panel including:
  ➢ Emergency stop push button
  ➢ Voltage adjustment potentiometer
  ➢ Speed adjustment potentiometer
  ➢ Panel lights
  ➢ Digital indication for: Digital AC metering — 3 phase, True RMS, Operating hours, Oil pressure, Coolant temperature DC volts, RPM

Safety shutdown protection with LED indicating lights for:
  ➢ Low oil pressure
  ➢ High coolant temperature
  ➢ Over-speed
  ➢ Emergency stop
  ➢ Failure to start (overcrank)
  ➢ Four programmable digital inputs (alarm or shutdown)
  ➢ Four programmable digital outputs

• COOLING SYSTEM
  ➢ Radiator with guard (sized for 50 degrees C)
  ➢ Coolant drain line with valve; terminated on edge of base Fan and belt guards
  ➢ Caterpillar Extended Life Coolant
  ➢ Coolant level sight gauge

• EXHAUST SYSTEM
  ➢ Stainless steel exhaust flex; ANSI style outlet flange, gasket, bolts, and mating weld flange; shipped loose INDUSTRIAL MUFFLER 10 DBA.
  ➢ shipped loose ELBOW KIT — 6" (152 MM), shipped loose

• FUEL SYSTEM
  ➢ Primary and secondary fuel filters Fuel priming pump
  ➢ Fuel pressure gauge
  ➢ Flexible fuel lines (terminated on base)

• GENERATORS AND GENERATOR ATTACHMENTS
  ➢ Self excited (2/3 pitch), random wound
  ➢ IP23 Protection
  ➢ Class H insulation
  ➢ R448 voltage regulator (single phase sensing) with Load Adjustment Module
  ➢ Circuit Breaker, IEC, 3-pole
  ➢ Segregated low voltage (AC/DC) wiring panel Power center contains control
panel, wiring
  ➢ panel and power termination
  ➢ SPACE HEATER — 230V

• GOVERNING SYSTEM
  ➢ Cat Electronic Governor (ADEM A4) for C15 or Hydra—mechanical governor for 3406

• LUBE SYSTEM
  ➢ Lubricating oil
  ➢ Oil filter
  ➢ Oil drain line with valve piped to edge of base Fumes disposal piped to front of radiator

• STARTING/CHARGING SYSTEM
  ➢ 45-amp charging alternator 24-volt starting motor
  ➢ Battery with rack & cables Safety shutoff protection

• JACKET WATER HEATER 3KW-240VAC
• ETHER STARTING AID BATTERY DISC SWITCH

R.2 Fuel and Water Tanks

R.2.1 60m³ Fuel Tanks
  ➢ Two (2) rectangular fuel tanks, each having a capacity of 60 cubic meters, each tank saddle mounted on a four runner skid with oilfield type skid ends for tail boarding.
  ➢ One (1) 20" OD manway on top of tank.
  ➢ Ladder rungs inside and out.
  ➢ One (1) 2" vent.
  ➢ One (1) 4" fill connection.
  ➢ One (1) 4" drain.
  ➢ One (1) sight level gauge.
  ➢ Suction and discharge piping with fuel transfer meter.

One of the fuel tank skids to be have a skid extension deck with 6(mm) checkered plate to accommodate two (2) fuel transfer pump with 15hp, 380v, 3 phase, 50hz electric motor and one (1) fuel filter.

R.2.2 Water tanks
  ➢ Three (3) rectangular water tanks each with capacity of 500(bbls) mounted on a four runner oilfield skid, complete with loading rolls. Tanks will be fabricated primarily with 8(mm) plate V-crimp material for tank walls and 10(mm) plate material for tank floor. Water tanks measure 9000(mm) long x 3000(mm) wide x 3000(mm) high.
  ➢ Ladder rungs inside and out.
  ➢ Suction and discharge piping.
  ➢ Two (2) transfer centrifugal pumps 2 x 3" mounted on one water tank skid extension with electric explosion proof motor 20hp, 380v, 3 phase, 1800(rpm), 50hz.
➢ Skid inline mounted pump and motor.
➢ Guard around drive.
➢ Mechanical seals and hard iron material.
➢ Two (2) pumps to be manifolded to supply water from any of the four water tanks to the water line on the mud tank system. Delivery system is a combination of hard piping and hose (if required).

R.3 Drilling Tools and Fishing Tools

R 3.1 Detailed List of Fishing Tools

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Description</th>
<th>Specification</th>
<th>Qty.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>For 28&quot; hole</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-1</td>
<td>Overshot, Series 150 FS</td>
<td>12 3/4&quot;</td>
<td>1</td>
<td>SET</td>
</tr>
<tr>
<td>1-1-2</td>
<td>Extension</td>
<td>12 3/4&quot;×42&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td>1-1-4</td>
<td>Oversize guide</td>
<td>12 3/4&quot;×15 1/2&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td>1-1-5</td>
<td>Oversize guide</td>
<td>12 3/4&quot;×21&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td>1-1-6</td>
<td>Standard wall hook</td>
<td>12 3/4&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td>1-1-7</td>
<td>Wall hook</td>
<td>12 3/4&quot;×15 1/2&quot;×48&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td>1-1-8</td>
<td>Spiral Grapple</td>
<td>10 7/8&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td></td>
<td>Spiral Grapple</td>
<td>10 3/4&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td></td>
<td>Spiral Grapple</td>
<td>10 5/8&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td>1-1-9</td>
<td>Basket Grapple</td>
<td>9 3/4&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td></td>
<td>Basket Grapple</td>
<td>9 1/2&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td></td>
<td>Basket Grapple</td>
<td>9 1/4&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td></td>
<td>Basket Grapple</td>
<td>9&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td></td>
<td>Basket Grapple</td>
<td>8 3/4&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td></td>
<td>Basket Grapple</td>
<td>8 1/2&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td></td>
<td>Basket Grapple</td>
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<td>7 1/2&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
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<td>Basket Grapple</td>
<td>6 1/2&quot;</td>
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<td>PCS</td>
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<tr>
<td>1-1-10</td>
<td>Spiral Grapple Control Packer</td>
<td>3 PCS</td>
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<tr>
<td></td>
<td>Mill Control Packer</td>
<td>11 PCS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>For 17 1/2&quot; Hole</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-1</td>
<td>Overshot, Series 150 FS</td>
<td>11 3/4&quot;</td>
<td>1</td>
<td>SET</td>
</tr>
<tr>
<td>2-1-2</td>
<td>Extension</td>
<td>11 3/4&quot;×42&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td>2-1-4</td>
<td>Oversize guide</td>
<td>11 3/4&quot;×15 1/2&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td>2-1-5</td>
<td>Standard guide</td>
<td>11 3/4&quot;×48&quot;</td>
<td>1</td>
<td>PCS</td>
</tr>
<tr>
<td>2-1-6</td>
<td>Standard wall hook</td>
<td>11 3/4&quot;×48&quot;</td>
<td>1</td>
<td>PCS</td>
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Technical Specification of Optional Equipment
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<td>4 1/8&quot;</td>
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</tr>
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<td>Jars</td>
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<td>5-6</td>
<td>Bowen Circulating Junk Basket with insert magnet</td>
<td>For 6 1/8&quot;-6 1/2&quot; hole</td>
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## Item Description Specification Qty. Unit

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<th>Unit</th>
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<td>Bowen Junk Sub</td>
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<td>Impression Block with port for circulation</td>
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<td>For 4 1/8&quot; Hole</td>
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<td>Bowen ITCO Junk Basket</td>
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<td>Bowen ITCO Junk Basket</td>
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### R 3.2 Detailed List of Drilling Tools

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<td>Jar Accelerators 8&quot;</td>
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<td>DCS-L 8&quot; -9.1/2&quot;</td>
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<td>Safety clamp for (4-3/4&quot; -9-1/2&quot;)</td>
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<td>Casing Spider 350Ton, Complete with slips</td>
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<td>7.7</td>
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<td>2 7/8&quot; seamless D.P, 10.4 PPF,E-75, ID:2.151 in, IU, PAC Conn, Tool.J, OD: 3.125 in, T,j ID: 1.5 in, T.J.Drift Dia:1.375 in, pin tong 9&quot;, Box tong: 11&quot;, Tk34 INTERNAL PLASTIC COATING, COMPLETE WITH THREAD PROTECTORS, Length :R2</td>
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<td>10</td>
<td>11” OD x 3” ID by 30 ft long , 299 PPF, spiral type Drill collar, with 8 5/8” reg. conn, connection threads to be cold worked with gall-resistant coating in accordance with API spec 7,with 1.2 m length of fish neck</td>
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<tr>
<td>11</td>
<td>9 1/2” OD x 3” ID by 30 ft long , 216 PPF, spiral type Drill collar, with 6 5/8” reg. conn, connection threads to be cold worked with gall-resistant coating in accordance with API spec 7,with 1.2 m length of fish neck</td>
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<tr>
<td>12</td>
<td>8 1/2&quot; OD x 3&quot; ID by 30 ft long, 169 PPF, spiral type Drill collar, with NC61 conn (6 5/8&quot; reg. conn), connection threads to be cold worked with gall-resistant coating in accordance with API spec 7, with 1.2 m length of fish neck</td>
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<td>6 1/2&quot; OD x 3&quot; ID by 30 ft long, 89 PPF, spiral type Drill collar, with NC50 conn (4 1/2&quot; IF conn), connection threads to be cold worked with gall-resistant coating in accordance with API spec 7, with 1.2 m length of fish neck</td>
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<td>14</td>
<td>4 3/4&quot; OD x 2 1/4&quot; ID by 30 ft long, 47 PPF, spiral type Drill collar, with NC35 conn (3 1/2&quot; IF conn), connection threads to be cold worked with gall-resistant coating in accordance with API spec 7, with 1.2 m length of fish neck</td>
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<tr>
<td>15</td>
<td>3 1/8&quot; OD x 1 1/4&quot; ID by 30 ft long, 22 PPF, spiral type Drill collar, with 2 3/8&quot; reg. conn, connection threads to be cold worked with gall-resistant coating in accordance with API spec 7, with 1.2 m length of fish neck</td>
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