Technical Specification of ZJ40DB
Walking Drilling Rig

PALITAL  2011.5.20
Technical Specification
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Design References and Technical Standards

- API Spec Q1 Specifications for Quality Programs for the Petroleum and Natural Gas Industry
- SY/T5609-1999 Types and Basic Specifications for Drilling Rig
- API Spec 4F Specification for Mast and base of Drilling and Work-over Rig
- API Spec 8A 8C Drilling and Production Hoisting Equipment
- API Spec 7 Specification for Rotary Equipment
- API Spec 7K Drilling Equipment
- API Spec D10 General procedures for the selection of drilling equipment
- API Spec 7F Drive roller chain of petroleum drilling rig
- API Spec 9A Wire Ropes
- API RP 500 Recommended Area Classification for Oil Electrical Devices
- IEC General Technical Condition for Explosive Gas and Electrical Equipment
- IEEE Electricity and Electrical Engineers Association Specification
- JB/T7845-1995 Electrical Equipment with Electrical Components for Land Drilling Rig
- API Spec 9A Wire Ropes
- API spec 16C Specification for Choke and Kill Devices
- API 510 PRESSURE VESSELS
- ASME SERIE B31 STAND PIPE LINES

1. Main parameters

1. Rig rated depth: 4000m 4-1/2" D.P.
2. Available height of derrick: 45 m
3. Traveling system: 5×6
4. Diameter of drilling line: 1 1/4" (φ32mm)
5. Height of drilling floor: 27’ (9 m)
6. Opening diameter of rotary table: φ27-1/2” (φ699mm)
7. Steps of rotary table: 1+1R, step-less change
8. Rated input power of draw works: 1000HP (1100kW)
9. Steps of draw works: 1+1R, step-less change
10. Capacity of mud pump: 970kw(1300HP)×2
11. Power transfer type: AC,VFD
12. Drive model: one to one
13. Walking system multi-direction

2. Power Supply System

Features:
Consist of 3 sets of main generators, 1 set of auxiliary generator, VFD system and MCC.

Diesel engines are CAT3512B and generators are SR4B

Auxiliary generator is C15 diesel engine generator

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

2-1. Main generators

QTY: 3 sets

Model: CAT3512B

3512B LAND ELECTRIC SCR POWER MODULE

- Engine rating = 1476 bhp (1101 bkW) @ 1200 rpm w/o fan rating
- Generator rating = 1750kVA, 1225kW 0.7PF, 60Hz, 600V, 3 phase Including following attachment:

AIR INLET SYSTEM

- After-cooler core, corrosion resistant
- HEAVY DUTY AIR CLEANER, shipped loose

CONTROL SYSTEM

- Caterpillar ADEM II Electronic engine control, LH
- Requires 24V DC 10 Amp continuous, 20 AMP intermittent, clean electrical power.
- ENGINE GOVERNOR CONTROL CONVERSION
- (for use with 0~200mA External Speed and Load Sharing Control)

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)

2-2. Auxiliary generator set

QTY: 1 set

Model: C15
Features:
- CATERPILLAR C15
- Rated power 480V, 320Ekw /FAN,
- Rated speed 1800RPM,
- Control panel
- EMCP3.. control panel including::
- Mounted inside rear facing power centre.
- Emergency stop pushbutton
- Voltage adjustment potentiometer, digital speed adjustment Via EMCP3 display

2-3. Generator houses
QTY: 4 sets
Features:
- Include 3 main generator houses and an auxiliary generator house
- Shield style, for easy ventilating.
- Lifting pad strength is enough, for hoisting.
- Complete with all binding posts and cables
- Complete with all oil and air lines for diesel engines
- 2 screw air compressors, dryer and air storage tank share in the house of auxiliary generator set

Specifications:
- Dimension of single house: 10600×2900×3100mm

3. VFD System
QTY: 1 set
Digital Generator Control Unit
QTY: 3 sets
Each unit will contain the following:
- The system adopts digital control model, close loop adjusting, system protection.
- The system adopts WOODWARD 2301D digital speed regulator to ensure the power distribution among generators.
- The excitation system adopts PI regulator to ensure the stable voltage.

GENERATOR DIGITAL SYNCHRONIZING SYSTEM
- The Generator Synchroization (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 system adopts digital control .through apply WOODWARD 2301 and BASLER products to complete this function.
The Synchronous Circuit compares the frequency, phase 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 are included in each generator control unit.

GROUND FAULT DETECTION SYSTEM

The Ground Fault System is designed to detect both AC ground faults via a set of wire connected grounding resisters.

A Ground Test Pushbutton is included for determining if a Ground Fault indication is actually a burned out lamp.

1 AC Ground Ammeter scaled at 0-100%

480 VAC Ground Fault Indication Lamps

600V VAC Ground Fault Indication Lamps

1 Test Pushbutton

POWER LIMIT SYSTEM

The Power Limit System is made up of PM134 digital powermeters and PLC, the PM134 will monitor the kW engine loading and the kVA generator loading of each engine/generator set and then transfer the desired parameters to PLC system via PROFIBUS field bus.

If any of these parameters reach their limitations, the PLC 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 variable-frequency drives are reduced (by other action) to a level below the generator limit.

VARIABLE-FREQUENCY-UNIT

ACS800 multidiive converter, 6-pulse Diode Supply Unit (DSU), IGBT inverter, Direct Torque Control (DTC), “one-to-one” mode.

Configuration of VARIABLE-FREQUENCY-UNIT

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>Type</th>
<th>Code</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6-pulse Diode Unit (DSU)</td>
<td>ACS 800-307-1810-7</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Multi-drive Inverter for MP1, MP2</td>
<td>ACS 800-107-1740-7</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Multi-drive Inverter for DW, RT</td>
<td>ACS 800-107-1160-7</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Braking Unit</td>
<td>ACS 800-607-0800-7</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Converter for automatic Drilling (55KW)</td>
<td>ACS 800-01-0075-5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Communication module</td>
<td>NPBA-12</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Pulse encoder interface module</td>
<td>RPAC-01</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output filter</td>
<td>ABB made</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
- Two (2) 1400kw(3×R8i) Multi-drive inverter for two(2) mud pump motor (one 1200 KW motor each mud pump).
- Two (2) 900kw(2×R8i) Multi-drive inverter for drawworks(one 600 KW motor each).
- One (1) 900kw(2×R8i) Multi-drive inverter for Rotary Table(R.T.)(one 800 KW motor)
- One (1) 75kw converter for automatic drilling motor.
- Basic description on Multi-drive inverter for MP1-2 (ACS800 1400kw(3×R8i))

### Basic description on Multi-drive inverter (ACS800 1400kw(2×R8i))

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>parameters/ specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dimensions</td>
<td>800(width) × 600(Depth) × 2200(Height)</td>
</tr>
<tr>
<td>2</td>
<td>Main component</td>
<td>Capacitor / IGBT / DCU / interface modules</td>
</tr>
<tr>
<td>3</td>
<td>usage</td>
<td>Drive and control for the Motors(MP,RT,DW,TD)</td>
</tr>
<tr>
<td>4</td>
<td>Rated input parameters</td>
<td>• voltage: 3AC 525--690V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• frequency: 48--63HZ</td>
</tr>
<tr>
<td>5</td>
<td>Rated output parameters</td>
<td>• rated power: 1400KW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• rated current: 1414A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• maximum current: 2116A</td>
</tr>
<tr>
<td>6</td>
<td>Communication mode</td>
<td>• field bus: PROFIBUS-DP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• BPS : 6M/S</td>
</tr>
<tr>
<td>7</td>
<td>Cooling mode</td>
<td>• Forced ventilated air-cooled</td>
</tr>
<tr>
<td>8</td>
<td>Main protection</td>
<td>• Over current</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Over voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Over load</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fused protection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Maximum output current limitation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Wind failed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lots protections and diagnosis for digital system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Mis-operation</td>
</tr>
</tbody>
</table>

### Basic description on Multidrive inverter (ACS800 900kw(3×R8i))

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>parameters/ specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dimensions</td>
<td>800(width) × 600(Depth) × 2200(Height)</td>
</tr>
<tr>
<td>2</td>
<td>Main component</td>
<td>Capacitor / IGBT / DCU / interface modules</td>
</tr>
<tr>
<td>3</td>
<td>usage</td>
<td>Drive and control for the Motors</td>
</tr>
<tr>
<td>4</td>
<td>Rated input parameters</td>
<td>• voltage: 3AC 525--690V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• frequency: 48--63HZ</td>
</tr>
<tr>
<td>5</td>
<td>Rated output parameters</td>
<td>• rated power: 900KW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• rated current: 953A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• maximum current: 1425A</td>
</tr>
<tr>
<td>6</td>
<td>Communication mode</td>
<td>• field bus: PROFIBUS-DP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• BPS : 6M/S</td>
</tr>
<tr>
<td>7</td>
<td>Cooling mode</td>
<td>• Forced ventilated air-cooled</td>
</tr>
<tr>
<td>8</td>
<td>Main protection</td>
<td>• Over current</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Over voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Over load</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fused protection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Maximum output current limitation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Wind failed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lots protections and diagnosis for digital system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Mis-operation</td>
</tr>
</tbody>
</table>

### Basic description on Multi-drive inverter for automatic drilling motor (ACS800 55kw)

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SURGE SUPPRESSION SYSTEM

- Surge Suppression System used to clamp any transient high voltage spikes, which would be damaging to the converter devices.
- The Surge Suppression System will consist of a set of fused metal oxide varistor (MOV)s and will include a “Surge Suppressor ON” lamp.

OUTPUT FILTER

- Output du/dt filter used to suppresses inverter output voltage spikes and rapid voltage changes that stress motor insulation. Additionally du/dt filtering reduce capacitive leakage currents and high frequency emission of the motor cable as well as high frequency losses and bearing currents in the motor.

SYSTEM HOST PLC

- Siemens S7-400 Modular PLC
- (two sets PLC working in redundant mode)
- Hot backup

PROFIBUS Communication System

- PROFIBUS communication system adopts digital communication technology.
- The drillers’ console, automatic drilling system, intelligent traveling block anti-collision protection system, integrative drilling Instrumentation system, variable-speed drives system and engine-generator control system, industrial PC and HMI, are combined by PROFIBUS communication system.
- It also can display the related data and states in the HMI
- PROFIBUS communication system includes all necessary PROFIBUS-DP communication card, communication module and program.

INDUSTRIAL PC

- Two sets of Industrial PC are used in this system, one in VFD house, one in supervisor’s room.

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>parameters/ specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dimensions</td>
<td>600(width) × 600(Depth) × 2200(Height)</td>
</tr>
<tr>
<td>2</td>
<td>Main component usage</td>
<td>Capacitor/IGBT/DCU/Interface modules</td>
</tr>
</tbody>
</table>
| 4   | Rated input parameters | • voltage: 3AC380~500V  
• frequency: 48~63HZ |
| 5   | Rated output parameters| • rated power: 75KW                                  |
| 6   | Communication mode     | • field bus: PROFIBUS-DP  
• BPS: 6M/S                                            |
| 7   | Cooling mode           | • Forced ventilated air-cooled                      |
| 8   | Main protection        | • Over current  
• Over voltage  
• Over load  
• Fused protection  
• Maximum output current limitation  
• Wind failed  
• Lots protections and diagnosis for digital system  
• Mis-operation |

No. | Items |
---|-------|
1 | Dimensions |
2 | Main component usage |
4 | Rated input parameters |
5 | Rated output parameters |
6 | Communication mode |
7 | Cooling mode |
8 | Main protection |

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>parameters/ specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dimensions</td>
<td>600(width) × 600(Depth) × 2200(Height)</td>
</tr>
<tr>
<td>2</td>
<td>Main component usage</td>
<td>Capacitor/IGBT/DCU/Interface modules</td>
</tr>
</tbody>
</table>
| 4   | Rated input parameters | • voltage: 3AC380~500V  
• frequency: 48~63HZ  |
| 5   | Rated output parameters | • rated power: 75KW                                          |
| 6   | Communication mode | • field bus: PROFIBUS-DP  
• BPS: 6M/S                                              |
| 7   | Cooling mode | • Forced ventilated air-cooled                                 |
| 8   | Main protection | • Over current  
• Over voltage  
• Over load  
• Fused protection  
• Maximum output current limitation  
• Wind failed  
• Lots protections and diagnosis for digital system  
• Mis-operation  |
Industrial PC collected all necessary data from PLC, display the necessary data and graphic state and diagnostic in the screen.

All the necessary data will be stored in the hard-disk of IPC. If the hard-disk is full, the oldest data will be deleted automatically, new data will be stored. The necessary repots will be created automatically.

IPC will display the following information:
- Access of all AC drive in the network
- Diagnostic of faulty component of each ac drive and warning
- Testing and verifying possible fault causes
- Tracing of faulty component
- Performing step-by-step replacement procedure
- Motor operation history/drive parameter record for last 30 days.

**TWO SETS LAPTOP WITH ADJUSTING SOFTWARE**

*Software has Spanish version*

INTEGRATIVE DRILLERS CONSOLE

- The throttle hand wheels will be of solid stainless steel
- 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.
- Two sets of Industrial touch screen computer are redundantly used in this console, in the normal situation one MP370 are used for system control, one for parameters monitoring.
- The mud pump will be operated on the touch screen instead of hand throttles.
- The drawworks will be operated with drawworks joystick and when the handle failed to work, it is also can be operated on the touch screen.

### Specification of the Drawworks handle

<table>
<thead>
<tr>
<th>Item</th>
<th>QTY</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>• Type code: 3SJ3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Input voltage: 24V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• output: voltage:0~±10V</td>
</tr>
</tbody>
</table>

- One hand throttle, which installed on the driller's chair, will be used for operating Rotary Table

600 VOLT FEEDER CIRCUIT BREAKERS:

800AF/800AT, 600Volt, 3 pole, 65 kA IC, UL/CSA Rated

<table>
<thead>
<tr>
<th>Item</th>
<th>QTY</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
<td>• 1000AF1000AT, 600Volts, 3 Pole.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Manually charged, manually closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Drawer mount</td>
</tr>
</tbody>
</table>

Transformer

600: 480 Volt Transformer
- The secondary side of the transformers will be connected to circuit breakers in Motor Control Center.

<table>
<thead>
<tr>
<th>Item</th>
<th>QTY</th>
<th>Description</th>
</tr>
</thead>
</table>
| A    | 2   | - 750kVA, 600:480 VAC, 3 Ph, 60 Hz,  
      |      | - Del: Wye  
      |      | - Dry-type  
      |      | - Copper Winding  |

**480: 208/120 Volt Transformer**
- The secondary side of the transformers will be connected to circuit breakers in Motor Control Center.

<table>
<thead>
<tr>
<th>Item</th>
<th>QTY</th>
<th>Description</th>
</tr>
</thead>
</table>
| A    | 2   | - 160kVA, 480:208/120 VAC, 60 Hz,  
      |      | - Del: Wye  
      |      | - Dry-type  
      |      | - Copper Winding  |

**480 Volt Secondary Circuit Breaker:**
- 1200AF/1200AT, 600Volt, 3 pole, 65 kA IC, UL/CSA Rated

<table>
<thead>
<tr>
<th>Item</th>
<th>QTY</th>
<th>Description</th>
</tr>
</thead>
</table>
| A    | 2   | Circuit Breaker  
      |      | - 1200AF/1200AT  
      |      | - 42kA IC  
      |      | - Manually charged, Manually operated  
      |      | - Drawer Mount  |

**480 Volt Auxiliary Generator Incomer**
- Breaker – 1000AF/1000AT, 600Volt, 3 pole, 65 kA IC, UL/CSA Rated
- To prevent “back feeding” power to the Main 600 volt AC bus through the transformers, this circuit breakers will be electrically interlocked with the transformer secondary breaker so that only one 480V circuit breaker can be closed at the same time. So auxiliary power cannot be “back feed” to the Main 600 volt AC bus.

<table>
<thead>
<tr>
<th>Item</th>
<th>QTY</th>
<th>Description</th>
</tr>
</thead>
</table>
| A    | 1   | Circuit Breaker  
      |      | - 1000AF/1000AT  
      |      | - 42kA IC  
      |      | - Manually charged, Manually operated  
      |      | - drawer Mount  |

**480 Volt MCC Unit**
- The MCC will be wired 480 Volt, 60 Hz, with individual breakers.

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>dimension</td>
<td>800 (width) × 800 (depth) × 2200 (height)</td>
</tr>
<tr>
<td>2</td>
<td>Main component</td>
<td>Break/contactor/sensor/button/lamp etc.</td>
</tr>
<tr>
<td>3</td>
<td>Specifications</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rated voltage: AC480V/AC280V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rated frequency: 60Hz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rated current for horizontal Bus: ≥4000A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rated current for vertical Bus: ≥1000A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rated peak withstand current: 105 KA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rated short-time withstand current: 50 KA</td>
<td></td>
</tr>
</tbody>
</table>

- The horizontal bus will be tin plated copper and rated for 4000 amps.
- The vertical bus will be tin plated copper and rated for 1000 amps.
- A copper ground bus will run the full length of the MCC line up.
- The Motor Control Center is manufactured to NEMA style cubicle.
- Legend:
  - HOA = Hands-Off-Automatic Control
  - 2WRC = Two (2) Wire Remote Control
  - PBSS = Pushbutton Stop/Start
  - 3WRC = Three (3) Wire Remote Control
  - AF/AT = Amp Frame/Amp Trip
  - FVNR = Full Voltage Non-Reversing

Remote control power supply loops 9
Breaker 31
One 250A breaker loop for camp for drilling crew.
Local control Power supply loops 23
Included 75HP power catwalk loop

The precise number and parameters of MCC can be confirmed afterwards.

208/120 Volt Lighting Panel
- The circuit panel will be a 208/120Volt, 3 phase, 4 wire, Light distribute panel feed from MCC. 27 units

The precise number and parameters of lighting panel can be confirmed afterwards.

POWER CONTROL HOUSE
- The two (2) 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 runners of the skid will be W12 x 45# beams, with integral cross members for a total skid height of 12.25 inches.
- Three of the walls will be insulated with three (3) inch thick polystyrene block insulation.
- The door will open to the outside by pushing on a “panic bar”.
- Three (3) air conditioners will be supplied for the VFD house.
- The units will be split system type with the condenser unit (compressor and coil) will be located on an elevated rack on the porch on one end of the house.
- There isolated layer on the top of the roof.
The generator and others control plugs and receptacles will be located at the same of each window.
Control wires in the VFD/generator cubicle are single conductor apparatus cable rated 600Volts or 2000Volts, AC, insulated a thermosetting (cross-linked) flame retardant polyolefin, for normal operation at 110 deg C.

Cable and Accessories

Whole set of power and control cables include:

- Control cable from master generator to VFD House
- All power and control cables inside VFD House
- Power and control cables from outgoing board of VFD house to 5 set frequency conversion motors
- Power and control cables, plugs/receptacles between VFD house and one of the the generator power house
- Brake resistor’s power cables and motor cables
- Main power supply and main motor power adopts copper bus method to connect with the terminals of VFD house.
- Power cables adopt Chinese made power cable specially designed for rig and ocean platform cable.
- All power receptacles of MCC adopt APPLETON brand
- One set dehumidity unit
- The power and control cable between VFD and rig floor should meet 120m rig moving requirements. There are transfer cases to handle cables
- The program of PLC should by English and Chinese

4. Air Supply System

Features:

- Equipped in auxiliary generator house, consisting of 2 screw air compressors, 1 cold start air compressor, 2 dryer, 1 set of 6 m³ air storage tank and air lines
- Screw air compressor can automatically start and stop
- Driven by electric motor, its max. continuous power is 37KW.
- Air supply system flow sheet:
- Air compressors--dryer--air tank—lines
- Total volume: described as follows
- Total weight: described as follows

Air hose should meet 120m rig moving requirement, each pipe is 8 meter with valve on one side for convenient connection while rig moving.

4-1. Screw air compressor

Model: LS-12-50HH QTY: 2 sets
Specifications:

- Rated power: 37kW
- Work pressure: 1 MPa
- Air production: 5.6m³/min
- Noise: 74dB

4-2. Cold start air compressor

QTY: 1 set

- Driven: R180 diesel engine
- Rated power: 7 HP
- Air discharging pressure: 1 MPa
- Air production: 0.8 m³/min
- Rotating speed: 1000 rpm

4-3. Dryer

QTY: 2 sets

Specifications:

- Type: regenerative/dessicant
- Rated power: 1.2KW
- Work pressure: 1 MPa
- Capacity: 6 m³/min

4-4. Air storage tank

Specifications:

- Volume: 2.5 +4m³
- Work pressure: 1 MPa

4-5. Main air lines

Specifications:

- Diameter: 2"
- Work pressure: 1.2 MPa

5. Mast

QTY: 1 set

Features:

- The mast conforms to API 4F
- 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.
- 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
- Add pressure meter for each buffer cylinder of the mast
- Enhancing the strength of the stalling base of the air winch

### Specifications:

- Available height: 45m
- Static hook load capacity: 3150kN(700,000lbs)
- Width of top (face/side): 2.2/2.2m
- 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: 47000kg
- Racking platform capacity of 5” DP: 3200m
- Racking platform capacity of 5”DP HWDP: 280m
- Racking platform capacity of 61/2”DC: 230m
- Racking platform capacity of 91/2”DC: 81m
- Racking platform capacity of 8”DC: 230m
- The height of casing stabbing board: 6m

### Casing stabbing board

**Features:**

- Entirety frame is made of channel steel
- Lifted by electric 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

### 6. Substructure

**QTY:** 1 set

**Features:**

- Conforms to API 4F
- The substructure is low position installation.
- 2 units buffer tanks for substructure lifting and lowering.
- Corrugated ramp, escape slide rail (two sections), 2 tong tail piles, 3 ladders which one is on right (face drawworks) to 1# mud tank, one is on back floor, the other is on fore head (as a whole body with ramp), the width of ladder is 800mm.
- Installing auto power cat walk
- Add pressure meter for each buffer cylinder of the substructure
- Add one set eye wash basin
- There is a 40 ton capacity handling and lifting equipment under the beam; one 4m³ storage tan
- Two 2m high Y drill protector uprights on ramp door, Which are fixed by drill pipe joint, connected with 3 protector chains.
- Drill floor is flush mounted (includes rotary table and setback).
- With 150mm high kicking boards around drilling floor, 3-5mm clearance from 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.
  - With side saddle to moving main rig while rig moving between cluster wells
  - With a skid to mount Shale shaker tank
  - Cooling tank also installed on the substructure
  - Water hose to rig floor:
    - Working pressure: 250 PSI
    - Test Pressure: 300 PSI
    - OD/ID: 3”/2.5”

Specifications:
- Floor height: 9m
- Floor area: 12.5m×12.3m
- Available height below R/Table beam: 7.6m
- Max. Capacity of R/Table beam: 3150kN(700,000lbs)
- Setback capacity (4-1/2” drilling pipe, 28m stand): 4000m
- Setback load: 1800kN(400,000lbs)
- Weight: 130000kg
- The quality of the setback should better than before, could tolerant the weight of the drill pipes.

7. Hoisting equipment

7-1 Crown block

QTY: 1 set

Features:
- Conforms to API 4F/ 8A specification.
- Consists of frame, guide shaft assembly, main pulley block and rail, match rope roll with sheave.
- Equipped with one lifting rack of 50kN, one sand sheave, two sheaves for air winches with 50kN
and one cantilever sheave for hydraulic tong with 50kN. Fixed buffer wood for crown block frame.

**Specifications:**
- Max. Load: 3150kN (700,000lbs)
- No. of sheaves: 6
- Dia. of main sheave: 50’ (φ1270mm)
- Dia. of drill wire line: φ32mm (1-1/4”)
- Auxiliary pulley diameter: φ400mm
- Overall dimension: 2668×2709×2469mm

### 7-2. Traveling block

**QTY:** 1 set

**Features:**
- Conforms to API 8A specification.
- Consists of upper beam, sheaves unit, left and right plate units, keyway and down hoisting hoop.

**Specifications:**
- Max. Load: (6 x 7 line): 3150kN (700,000lbs)
- No. of sheaves: 5
- Dia. of sheaves: 50’ (φ1270mm)
- Dia. of wire line: φ32mm (1-1/4”)
- Overall dimensions: 2294×1190×630mm

### 7-3. Hook

**QTY:** 1 set

**Features:**
- Conforms to API 8A specification.
- 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. capacity: 3150kN (700,000lbs)
- Spring travel length: 180mm
- Main hook open size: 190mm
- Rotary radius: 420mm
- Overall dimension: 2545×780×750mm
- Weight: 2175kg

### 7-4. Combination Swivel
QTY: 1 set

Features:
- Conforms to API 8A specification.
- 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.
- 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: 2250kN (500,000lbs)
- Max. Speed: 300r/min
- Max. Working pressure: 35MPa (5000psi)
- ID of Center pipe bore hole: 75mm (3’)
- ID of Gooseneck and wash pipe: 75mm (3’)
- Connections
  - For center pipe: 6-5/8"REG-LH
  - For Kelly: 6-5/8"REG-LH
  - For gooseneck: LP4"-8TPI
- Overall dimension: 2880×1046×1065mm
- Weight (Including kelly spinner): 2570kg

7-5. Dead line anchor
QTY: 1 set

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: φ32mm (1-1/4 ")
- Max load: 340 KN
- Weight: 700 Kg

8. Hexagonal Kelly
QTY: 2 nos

Specifications:
- Size: 5-1/4" & 3-1/2"
9. Rotary hose

QTY: 2 nos

Technical specifications:

- Working pressure: 35MPa (5000psi.)
- Test Pressure: 56MPa
- OD/ID: 5” 1/4”
- Pipe connection: 4” LP
- Length: one is 19m, the other is 23m
- Adopt good quality of the rubber

10. Drawworks

QTY: 1 set

Features:

- VFD Controlled AC Motor powered complete Draw works package, mounted on heavy duty oilfield type skid with accessories suitable for drilling oil/gas wells of depth range 4000m with 4-1/2” drill pipe.
- The drawworks is driven by two VFD controlled AC motors compound together, and the power is transferred to the main drum through one gear reducer and coupling.
- The drum body is casting welded with Lebus groove to make the wire line (φ32mm) winded orderly.
- Pneumatic over roll anti-crush device.
- The driller’s console is installed in the driller’s house to operate drawworks, Kelly spinner, main brake, hydraulic catheads, Crown-O-Matic. It is also equipped with air horn, display gauges of air pressure, machine oil, hydraulic pressure.
- Instrument console is also centralized in this house.

Specifications:

- Rated Horse Power: 1000 HP.
- Drive Motors: Two AC Motor, each of 600kW explosion proof VFD motors.
- No. of Drum: Single.
- Drum size: 640 × 1208mm
- Grooving: Lebus Grooved for 1-1/4” drill line.
Hoisting speed: Single, step-less change
Transmission: Direct Gear driven.
Brake: Water cooled hydraulic disc brake
Auxiliary brake: Regenerative type braking system.
Crown & Floor Saver System: Electronic system for preventing accidental hitting of crown block or rig floor by the traveling block
Skid: Heavy duty oil field type skid

Drawworks brake Cooling system
- Include a 30 m³ rectangular steel tank with two no's of centrifugal pumps, directly connected to two no's of 30 H.P, 3P, 60 HZ, 480 V, 1800 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 hydraulic Disc brake.

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 (Crown & Floor Saver System):
- Crown & Floor Saver System: Electronic system for preventing accidental hitting of crown block or rig floor by the traveling block
- The system is designed with direct drum shaft detector to detect the operating height of the traveling block.
- The traveling block position will be monitored by PLC that get the data from sensor mounting in drum shaft.
- When the traveling block moves to the preset alarming position, it will make audible and visual alarm automatically. When it moves to speed reducing position, it will speed down automatically.
- When it moves to the emergency position, the system will give braking signal automatically and start braking device to prevent the traveling block from collision.
- 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.

10-1. Hydraulic disc brake

Features:
- Consists of 4 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.
- Adopts electronic hydraulic brake, increasing accuracy of the brake

**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

**10-2. Driller’s house**

- Hydraulic disc control handle, drill watch, air control panel, VFD control panel, TOP DRIVE panel 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.
- The power of the driller house air conditioner is individual loop, the power of the hydraulic brake has backup loop.
- CCTV monitoring system

**MODEL:**
Four cameras for monitoring.
The screen should be 10", and sunlight readable.
One for flow line
One for platform
One for mud pump
One for drawworks

- Complete with explosion proof air conditioner to make driller work comfortable.

10-3. Auxiliary brake-regenerative braking system

- Consist of Brake unit and resistor box.
- The rated power of the brake unit is ten units of 200kW. Electric energy is fed into converter when the motor of drawworks is decelerated.
- In order to prevent overvoltage tripping, a braking resistor box is used to convert this energy into heat. This resistor box may be a part of the braking unit or it is connected to it. The braking unit is connected to the DC bus terminals of the drive of drawworks.
- When the DC bus voltage reaches a pre-defined limit, the braking unit automatically turns on and prevents the DC bus voltage from continuing to increase.
- The braking unit operates autonomously.
- The power supply of the electronics is integrated in the unit.

10-4. Automatic Driller

- Automatic driller unit consists of variable-frequency drive controller, auxiliary drawworks VFD controlled AC motor, encoder, pressure sensor, and industrial human machinery interface, etc.
- It will compare the main control circuit feedback signals, such as drilling pressure, drilling speed, and rotary table torque, with the set point of drilling pressure and speed, and control the auxiliary drawworks VFD controlled AC motor variable frequency system by digital controller, to ensure the pressure and speed stability and accuracy of bit feeding.

VFD controlled AC motor

Model: Siemens 1LG42234AA94Z

- Rated power: 42.5kW
- Rated voltage: 460V
- Rated current: 67A
- Rated rotary speed: 1775 rpm
- Max. rotary speed: 2800 rpm
- Rated frequency: 60 Hz
- Max. frequency: 100 Hz
- Rated torque out: 229 N.m
- Protection class: IP54

Function

- Weight on bit limit to prevent the drill bit stuck.
- Penetrate rate limit to prevent the drill bit sliding.
- Rotary table torque limit to prevent over torque.
- Weight on bit Accuracy: ±5kN

10-5. A.C. motor

QTY: 2 sets

Specifications:
- Rated power: 600KW
- Rated voltage: 600V
- Rated current: 714A
- Rated speed: 661rpm
- Rated torque: 8684N.M
- Insulation class: 200
- Cooling: forced air
- Protection class: IP54
- Blower: 15Hp (include Air cleaner)
- Dimension: 1450×1080×1650mm
- Weight: 2650 kg

10-6. Water tank

QTY: 1 set

Features:

The tank consists of cooling water compartment:

Cooling water compartment:
- Equipped with two centrifugal pump
- Completed with one level meter, an explosion proof electric control box, lightening pipe, a 2kW electric heater in pump cabin and an explosion proof fan

Centrifugal pump
- Lift: 26m
- Discharge: 85m³/h
- Ac motor power: 15KW
- Discharge: 85m³/h

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<tr>
<td>Total</td>
<td></td>
<td>32m³</td>
<td>30m³</td>
</tr>
</tbody>
</table>

11. Rotary table

QTY: 1 set

Features:
Conforms to API 7K specification.
Independently driven, and has an emergency drive unit from drawworks shaft.
With master bushing for full range of insert bowl for running 20", 13-3/8", 9-5/8", 7" and 5-1/2" casing.
Should consider the protection for the mud and fuel going into the motor from drilling floor
Add one set of rotary table protecting mat

Specifications:
- Max. Opening: 699mm (27-1/2")
- Max. Static load: 4500kN(1,000,000lbs)
- Max. Output torque: 27459N.m
- Max. Rotary speed: 300rpm
- Gear ratio: 3.67:1
- Overall dimension: 2405×1670×685mm
- Weight (exclude main bushing): 6195kg

11-1. AC motor

QTY: 1 set

Specifications:
- Rated power: 600KW
- Rated voltage: 600V
- Rated current: 714A
- Rated speed: 661rpm
- Rated torque: 8486 N.M
- Insulation class: 200
- Cooling: forced air
- Protection class: IP54
- Blower: 15Hp (include Air cleaner)
- Dimension: 1450×1080×1650mm
- Weight: 2650 kg

11-2. Transfer case

- Consists of input shaft, output shaft, clutch, and brake.
- Main drive skid
- Standard Air Inertia Brake
- Transmission support feet
- Shafting
- Flexible couplings
- Coupling spacer between rotary table and transmission.

11-3. Bushings
QTY: 1 lot

- Complete range of bushing to run different sizes of casing with lifting sling and hooks,
- One number of pin drive hinged master bushing for 37-1/2" rotary table.
- Insert bowl No.1 for 13-3/8" and 11-3/4" casing.
- Insert bowl No.2 for 10-3/4" and 9-5/8" casing.
- Insert bowl No.3 for 2-3/8" --8-5/8",
- 20" insert bowl to run 20" casing
- One set roller Kelly bushing for 5 ¼" hex Kelly complete with wrench.

11-4. Rotary table anti-mat.

QTY: 1 set

12. Drill floor equipment

12-1. Hydraulic cathead

QTY: 2 set

Specifications:

- Rated working pressure: 16MPa
- Rated flow: 120L/min
- Drawing length: 1500mm
- Drawing strength: 160kN

12-2. Counterweights

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

12-3. Mouse hole

In order to use short drilling tools conveniently, should has movable pin on the mouse hole starting 10’ from the bottom of it, partition distance is 3’.

- OD 11-3/4 x 12 m
- About I.D -10".

12-4. Rat hole

- OD 9-5/8” x 15 m
- About I.D -8”.

12-5. Air winch on racking board (INGERSOLL)

MODEL: BU7A

QTY: 2 sets

QTY: 2 set

- Air pressure request: 0.63 MPa
- Working load limit: 454 kg (1,000 lbs) in the mid layer
- Line speed: 13 m/min in the mid layer
- Temperature range: 0°C / +60°C
- Drum length: 4.5” (114 mm)
- Drum Finishing: plain
- Drum capacity: DIA 6 mm (1/4”) x 70m
- Drum Guard: Install
- Motor: 1.6 hp, 50scfm / 1.4 m3/min @ 90 psi / 6.3 bar
- Brake: Band brake
- Air prep package: Filter, Lubricator, regulator and muffler
- Paint: Yellow, IR standard
- Dimension: 503 mm (L) * 254 mm (W) * 300 mm (H)
- Weight: 34 kg without rope and FRL unit
- Wire rope: 228ft (70m) of 1/4” wire rope installed on the winch

12-6. Air winch on rig floor (INGERSOLL)

**MODEL:** FA5i  **QTY:** 2 sets
- Air pressure request: 0.63 MPa
- Working load limit: 5,000 kg (11,000 lbs) in the top layer
- Line speed: 16 m/min in the top layer
- Temperature range: 0°C / +60°C
- Control: mounted lever throttle
- Drum length: 24” (610 mm)
- Drum Finishing: Grooved, 3/4” wire rope
- Drum capacity: DIA 19 mm (3/4”) x 347m
- Motor: 25 hp, 700scfm / 19.9 m3/min @ 90 psi / 6.3 bar
- Brake: Manual drum brake and automatic disc brake
- Air prep package: Filter, Lubricator and regulator
- CE option: Including Drum Guard, Emergency Stop Valve (main air shut-off), Overload protection, Exhaust Muffler, Limit Switches
- Manual wire rope guide: Wire rope take-off angle is Vertical
- Paint: Yellow, IR standard
- Dimension: 1,386 mm (L) * 889 mm (W) * 922 mm (H)
- Weight: 849 kg without rope and FRL unit
- Wire rope: 400 ft of 3/4” wire rope (IWRC, EIPS, 19 x7, Bright, Non rotating)

13. Rig Pumps and others

13-1. Mud pumps

**QTY:** 2 sets

**Features:**
- Each pump is driven independently by one 1200 kW VFD controlled AC motor through belt
transmission device. It is located on long oilfield skid. AC motor is 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 belt transmission components for pumps, including skid, motor seat with terminal strand, combined narrow V belt, sheave and guards.

✧ **The connectors between the 12’ pipes adopts union type**
✧ **With three air balloon for spare parts**
✧ **Providing one set of 3000kg pole to lift liner and piston etc.**

**Technical specifications:**

- Type: triplex single-acting piston type
- Maximum liner Dia. × stroke: 180×350mm
- Rated strokes: 120spm
- Max strokes: 130spm
- Nominal power ratings for one: 960KW (1300hp)
- Lubrication: pressure & splash
- Valve pots: valve over valve, API #7
- Valve cover: screw type
- Liner lock: Screw type, Metal to metal
- Liner available size: 5-1/2”, 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.

13-2. Rig Pump Driving Unit-AC motor

**QTY:** 2 sets

- **Blower should consider installing sand cleaner**

  - Rated power: 1200 KW
  - Rated voltage: 600V
  - Rated current: 1265A
  - Rated speed: 1000rpm
  - Rated torque: 10502 N.M
  - Insulation class: 200
Cooling: forced air
Protection class: IP54
Blower: 15Hp (include Air cleaner)
Dimension: 1750×1250×1650mm
Weight: 3200 kg

13-3. Super charging pump
QTY: 2 sets
- Capacity: 200m³/h
- Lift: 35m
- Ac motor power: 75KW, 60Hz

13-4. 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"(5 9/16")/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)

13-4-1. 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
- Equipped line for jet Cellar and line for killing
- With fill up outlet and two 2” outlets having fig.1502 connections
- Should consider about rig moving between cluster wells ,max distance is 120m

Technical specifications:
- Working pressure: 35Mpa (5000psi.)
- Test pressure: 56Mpa
- OD/ID: 5"/4"
- Working medium: water, mud, mixture of fluid
- No. of 4" API gate valve DN100 union: 5
- No. of 2" API gate valve DN50 union: 2
- Ambient temperature: -29℃ ~ 80℃

13-4-2. 15' Short hose

Technical specifications:
- Working pressure: 35MPa (5000psi.)
- Test Pressure: 56MPa
- OD/ID: 5"/4"
- Pipe connection: 4" LP
- Length: 15'

14. Mud System

- The system consists of 4 main mud tanks, one trip tank, 4 active tanks total volume is 250m³
  - Except shale shaker tank, other tank base is equipped on oil field type skid. Consist of different number of cylinder.
  - All AC motors are explosion proof type.
  - Shale shaker tank moving with the main rig while rig moving between wells, using Two 55kW sand pump to transport mud to treating tank
  - The connecting pipes between cylinders should have valves.
  - Add one set eye wash basion

  Lower pressure turn back pipes:
  - Working pressure: 600 psi.
  - Test Pressure: 1200 PSI
  - OD/ID: 8"/7"
  - Pipe connection: union

14.1. Shale shaker tank

QTY: 1set

- The tank consists of three compartments: sediment compartment and metering apartment and one transfer apartment.
- This tank is rectangular style.
- one 10HP (7.5kW) agitators and one 15HP agitator
- Two shale shakers be installed
- Two 55 kW mud transfer pumps

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<tr>
<td>2</td>
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<td>3</td>
<td>transfer compartment</td>
<td>14</td>
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<tr>
<td></td>
<td>Total</td>
<td>14 m³</td>
</tr>
</tbody>
</table>

14.2. Treating tank
QTY: 1set
- The tank consists of four compartments (cylinders), one 15HP (11kW) agitator and five 7.5kW agitators.
  - *Three 55 kW sand pumps to supply mud to de-sander, de-silter, degasser*
  - *Installing de sander desilter degasser and centrifuge*

<table>
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<th>Item</th>
<th>Name</th>
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<tbody>
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<tr>
<td>2</td>
<td>De–sanding and de silting compartment</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>Centrifuge compartment</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>44 m³</td>
</tr>
</tbody>
</table>

**14.3. Intermediate tank**

QTY: 1set
- The tank consists of four compartments (cylinders), one 15HP (11kW) agitator in each compartment.

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>suction compartment</td>
<td>16.5</td>
</tr>
<tr>
<td>2</td>
<td>storing compartment</td>
<td>16.5</td>
</tr>
<tr>
<td>3</td>
<td>Centrifuge compartment</td>
<td>16.5</td>
</tr>
<tr>
<td>4</td>
<td>shearing compartment</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>64 m³</td>
</tr>
</tbody>
</table>

**14.4. Suction tank**

QTY: 1set
- The tank consists of four suction compartments (cylinders), one 15HP (11kW) agitator in each compartment.

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Suction compartment</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>Suction compartment</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>Suction compartment</td>
<td>16</td>
</tr>
</tbody>
</table>
14.5. Mix tank
QTY: 1set

- The tank consists of three compartments (cylinders), one 15HP (11kW) agitator in each compartment.

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Circulate compartment</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>Circulate compartment</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>Circulate compartment</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>Circulate compartment</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>64m³</td>
</tr>
</tbody>
</table>

14-6. Rain shield

14.7. One set of skid mounted hopper with sand pumps.
QTY: 1set

15. 100m³ Water tank
QTY: 1 set

Features:

- One set of 100 m³ water supply system. It is completed with two tanks (one can be put into another when remove), two sets of electric cooling water pump (driven by explosion proof motor), lever meter, pipes and check valves etc.
- The tank is made up of triangular groove armor plate with thickness 6mm. The height of the tank base is 320mm, and two main girders made of “I” form steel products. The top of the tank is spread with flower pattern steel plate.
- A sand discharge gate is fixed on one side of the tank.
- Dustproof breath valve and manhole are fixed on the top of the tank.
- The water tank has sand-proof pump room. 2 units ISG80-125 O centrifugal pumps (handling capacity 60 m³/h, raise head 18m, motor power 4kW) are contained in the pump room.
- The pump unit can supply water from tank truck to water tank or from the water tank to solids control system.
- The pipeline is connected by hammer tie-in with DN80.
- An explosion-proof control box (start stop station), a head-lamp and a water level meter are fixed in the pump room.
All joint such as bolts are galvanized
All valves are stainless steel ball valves.

*The centrifugal pumps should adopt horizontal type*

**Specifications:**

- Overall dimension: 11800×3200×2900mm
- Capacity: 100 m³

**16. Solids control system**

**QTY:** 1 set

- Seven sand pumps, three hopper and one shearing pump are mounted on one skid complete with piping to connect with mixing tank.

**16-1. Sand pump**

**QTY:** 5 sets

- Capacity: 200m³/h
- Lift: 35m
- Ac motor power: 55KW, 60Hz
- For weighting pump.

**16-2. Feeding pump**

**QTY:** 2 sets

**Model:** SB6”x8”-12-1/2”

- Suction line size: 8”
- Suction line size: 6”
- Impeller size: 12-1/2”
- Capacity: 200m³/h
- Lift: 35m
- Ac motor power: 55KW(75HP)
- Voltage/ Frequency: 460V/ 60Hz, Ex proof.
- Motor speed: 1800 rpm
- Feeding pump seal is mechanical type.

**16-3. Shearing pump**

**QTY:** 1 set,

**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"
- Nominal diameter of turbine: 10"
- Flow rate: 155 m3/h
- Lift distance: 32m
- Rotating speed: 2280rpm
- Matching power: 55KW

17. Poor boy degasser

QTY: 1set

- Treatment Capacity: 8000m3/day
- Content of H2S gas in media: ≤100ppm
- Max. working pressure: 1.5 MPa
- Overall dimension: 2300×2300×9000mm

18. Well Control equipment

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

18-1. Annual BOP

**Annular 21 1/4”×2000psi**

- Model: 21 1/4"-2,000PSI
- Bore: 21 1/4in
- Working Pressure: 14MPa/2,000psi
- Strength Test Pressure: 21Mpa/3,000psi
- Hydraulic Pressure: ≤10.5 MPa/1,500psi
- Closing Fluid volume: 25.2 gallon (94.5L)
- Opening Fluid volume: 25.4 gallon (95.3L)
- Hydraulic connection: NPT1"
- Top Connection Type: 21 1/4"-2,000 6B R73 Studded
- Bottom Connection Type: 21 1/4"-2,000 6B R73 Flanged
- Weight: 17022 lbs (7660kg)
- Dimensions: 5×5×4.7 ft (1512×1512×1437mm)

**Annular 13 5/8”×5000psi**

- Bore: 13 5/8"
- Working pressure: 5000psi (35MPa)
- Top connection type: 13 5/8"-5000PSI 6BX BX160 Studded
- Bottom connection type: 13 5/8"-5000PSI 6BX BX160 Flanged
- Net / Gross weight (Kg): 6415 / 6550
- Dimensions (mm): 1271×1271×1150 / 1400×1400×1400

18-2. Single ram preventer
Bore: 13 5/8"
Working pressure: 5000psi (35MPa)
Top connection type: 13 5/8"-5000PSI 6BX BX160 Flanged
Bottom connection type: 13 5/8"-5000PSI 6BX BX160 Flanged
Net / Gross weight (Kg): 3570 / 3700
Dimensions (mm): 2400×800×885 / 2500×900×1050

18-3. Double ram preventer
Bore: 13 5/8"
Working pressure: 5000psi (35MPa)
Top connection type: 13 5/8"-5000PSI 6BX BX160 Flanged
Bottom connection type: 13 5/8"-5000PSI 6BX BX160 Flanged
Side outlets: 1×4 1/16"-5000PSI 6B R39 studded; 1×2 9/16"- 5000PSI 6B R27 studded
Net / Gross weight (Kg): 6150 / 6300
Dimensions (mm): 2400×920×1340 / 2500×1020×1500

18-4. Drilling spool
Drill spool Working pressure 21-1/4"X2000psi
- Flanged top and bottom
- Two 4-1/16" flanged side outlets with valves
Drill spool Working pressure 13-5/8"X5000psi
Bore: 13 5/8"
Working pressure: 5000psi (35MPa)
Top connection type: 13 5/8"-5000PSI 6BX BX160 Studded
Bottom connection type: 13 5/8"-5000PSI 6BX BX160 Flanged
Side outlets: 1×4 1/16"-5000PSI 6B R39 flanged; 1×2 1/16"- 5000PSI 6B R27 flanged
Net / Gross weight (Kg): 800 / 850
Dimensions (mm): 950×678×650 / 1050×780×850

ADAPTER FLANGE
1 FLANGE ADAPTER: 13-5/8 X 5000 PSI X 13-5/8  3000 PSI
1 FLANGE ADAPTER: 13-5/8 X 5000 PSI X 11" X 3000 PSI
1 FLANGE ADAPTER: 11" X 3000 PSI X 7 1/16 X 3000 PSI
1 FLANGE ADAPTER: 13-5/8 X 5000 PSI X 11" X 5000 PSI
1 FLANGE ADAPTER 11"x 5000PSI X 11"-3000PSI

18-5. Pipe ram assembly
9-5/8"1 set
7" 1 set
6-5/8"1 set
5" 1 set (2 sets)
4-1/2"1 set (2 sets)
18-6. Hydraulic choke valve
- Nominal diameter: 4-1/16", working pressure: 5000psi
- Outside connection: flanged, working temperature: P~U
- API16C, PSL2, PR1,

18-7. Hydraulic kill valve
- Nominal diameter: 2-1/16", working pressure: 5000psi
- Outside connection: flanged, working temperature: P~U
- API6A, PSL2, PR1,

18-8. Manual choke valve
- Nominal diameter: 4-1/16", working pressure: 5000psi
- Outside connection: flanged, working temperature: P~U
- API16C, PSL2, PR1,

- Nominal diameter: 2-1/16", working pressure: 5000psi
- Outside connection: flanged, working temperature: P~U
- API16C, PSL2, PR1,

18-10. Choke & kill manifold
- Nominal diameter: 4-1/16", working pressure: 5000psi
- Outside connection: flanged, working temperature: P~U
- API16C, PSL3, PR1,
  - Mounted on the substructure.

18-11. BOP control system
QTY. 1 EA, Mode FKQ720-6

Features:
- FKQ720-6 model BOP Control System will be a complete air/hydraulic system designed for the control and the operation of Surface Mounted BOP Stack.
- Should consider about the power cable extending 120m
- BOP control system will be mounded on the skid moving with substructure.

BOP Control System consisting of:

Remote control panel:
One (1) remote control panel include the following major components unitized and mounted on an oilfield skid of heavy duty welded steel construction:
- One (1) 1290 liter (340 gallon) oil tank, complete with 1” drain plug, 2” air vent, internal baffles, electric low level switch, sight glass gauge and four (4) 4” large inspection port.
- Twelve (12) 60 liter (15 gallon) capacity 21MPa (3000 psi) WP accumulators, which are arranged in both sides and equipped with ball valve in any bank, bladder type pre-charged with nitrogen gas. This vessel meets API requirements. Accumulators are provided with ASME U-1A certificates.
- One (1) electric motor driven triplex pump, completes with automatic pressure switch and relief valve. Pump flow rate 42 liter/min. (11.4GPM) at 21MPa (3000psi) output pressure. Explosion proof motor 18.5 kW. 3ph 380V/50 Hz.
- Two (2) pneumatic pumps with capacity of 4.5 liter/min. (1.2 GPM) and 21MPa (3000 psi) output pressure with a 0.53MPa air supply. The ratio of liquid/air is 60:1.
- One (1) control manifold consisting of the following major components:
  a) Six (6) 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)
     - Chock valve (open/close)
     - Kill valve (open/close)
  b) Three (3) 100 mm OD pressure gauge for the following pressure indication:
     - Accumulator pressure: 0~40MPa (0~5800 psi)
     - Manifold pressure: 0~40MPa (0~5800 psi)
     - Annular supply pressure: 0~25MPa (0~3570 psi)
  c) One (1) 1” hydraulic regulator assembly:
     - One (1) 1” manual/air remote regulator
     - One (1) air pressure regulator
     - One (1) 2-position, 3-way distribution valve
  d) One (1) 1” hydraulic regulator assembly for the regulating of the manifold function pressure.
  e) One (1) 1” 2-position, 4-way manual/remote operated control valve for operation of the manifold pressure bypass function.
  f) Three (3) air transmitter for the remote indications of the following pressure reading:
     - Accumulator pressure: (0~5800 psi)
     - Manifold pressure: (0~5800 psi)
     - Annular supply pressure: (0~3570 psi)

**Driller panel:**

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

Seven (7) 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)
- 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
- Accumulator Pressure: 0~40MPa
- Manifold Pressure: 0~40MPa
- Air Supply Pressure: 0~2.5MPa

**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):

- Seven (7) 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 ram preventer (Open/Close)
  - Pipe ram preventer (Open/Close)
  - Choke Valve (Open/Close)
  - Backup Valve (Open/Close)
  - Manifold bypass valve (Open/Close)

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

**Air cable:**

Two (2) air cables will be 50 meters.

**Pipe racks and hydraulic hose:**

Hydraulic Hose 1”, 10m

Twelve (12) of hydraulic hose, 1” 35MPa (5000 psi) WP, 10 meter long, for interconnection between pipe rack and universal self-seal pipe joint, fire shielded to API 16D.
Pipe racks
Three (3) interconnecting pipe racks, 35MPa (5000 psi) WP, 5 meter long each, with 12x1” 35MPa (5000 psi) WP steel pipes with hammer unions at both end for connecting.

Hydraulic Hose 1”, 5m
Twenty four (24) of hydraulic hose, 1”, 35MPa (5000 psi) WP, 5 meter long, for interconnection of control system and pipe rack, fire shielded to API 16D.

Universal self-seal pipe joint
Twelve (12) universal self-seal joint, connecting BOP and hydraulic hose (10m).

Hammer unions
Thirty six (36) hammer unions

19. Drilling Instrumentation

Technical Specifications

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 access 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 English & Spanish. The meters utilize SI Metric/ANSI unit.
- The derived parameters of bit time, ROP, accumulated SPM, total SPM and kN.m are displayed on computer.

With P400/256M/4G U key

SK-2Z16 software.

Specifications
- Power Supply: 110V AC +20%, 60Hz +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%

**Equipment Supply**

19.1 Sensors:
- 1×Weight load sensor
- 1×depth sensor
- 2×Pump SPM sensor
- 1×Pump RPM sensor
- 1×Pump pressure sensor
- 1×Mud return flow sensor
- 1×Rotary torque sensor (Electrical)
- 1×Tong torque sensor
- 8+1×Ultra-sonic probe

19.2 Display System at driller’s console.
- TFT LCD with touching screen to display electronics as follows:
  - Hook load
  - Weight on bit
  - Rotary table & top drive RPM
  - Rotary table & top drive torque
  - 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

19.3 Data Acquisition System
- Device Net CAN BUS with CAN card

19.4 Recording System
- 1×Industrial PC
1×Wide Color printer
1× software in English & Spanish
1×Online UPS

19.5 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

19.6 Hydraulic Hose, Cables and Fittings
- Weight indicator hose,
- Pump pressure hose,
- Tong torque hose, 15m
- 2*cable from pump SPM sensor1, 2 to signal barrier box, each
- 1*cable, from signal barrier box to CAN BUS,
- Cable, rotary torque sensor to CAN BUS,
- Cable, depth sensor to CAN BUS,
- 9*cable, ultra-sonic probe to CAN BUS ,
- 1*Cable, DAQ to LCD screen, 30m
- Co-axial cable, DAQ to recording unit,
- Cable, rig site power supply control case to system power supply,

✧ The signal cables from mud tanks to drill cabin could be extend 120mm

20. Others

20-2 pipe tracks

QTY: 10sets

✧ Length of pipe rack: 7 m

20-3. Necessary parts

- Including cable channel, dead line stabilizer, fast line guide, assemble parts and tools, ladders with hand rail, an escape slide, etc.

20-4. 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.
20-5. 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 handle tools.
- Mounted one set 16’ table vice.

20-6. 7000ft Drilling line

- Conforms to API 9A
- Model: 6 ×19S IWRC EIPS
- Diameter: φ35 mm (1-3/8 “)
- Complete with support frame for drum/cover, and has drilling line drum power driver.

20-7. Drilling line spooler

- Used for spooling, pulling out and storing drill line
- Rated work pressure: 16 MPa
- Capacity of the spooler could wind 7000’ wire line

20-8. BOP Trolley unit

- BOP trolley unit and hoisting equipment are mounted under the substructure.
- C/w rail and hydraulic hoists to move BOP, two 200KN jib crane.

21. Electricity Circuit System

21.1. Electricity Circuit System on well site

Technical proposal

- Rated voltage: 480/120V (3 phase, 4 wire)
- Rated frequency: 60Hz

System includes: solid control district, drilling floor district, pump district, water supply district, well site control district, houses of well site, etc., electric equipment, illumination lamp of districts above buildup power supply system by explosion-proof plugs and receptacles, heavy rubber cover soft cables, pipe covering of cable, explosion-proof flexible pipe, cable groove, explosion-proof junction box, and also the grounding system for the drilling rig.

21.1.1. Solid control tank district

- The alternating current dynamo more than 30 kW are controlled in MCC house and self power supply, start in two different place.
- The alternating current dynamo less than 30 kW adopt separate area power supply of separate area. In the side of motor only setup control button, the button can carry out mechanical lock out.
- All area illuminate and power electrical source are lead to from MCC house.
- The APPLETON plugs and receptacles is used for mud tank area power supply.
- Power and lighting cable of 1 # shaker tank, should meet rig moving about 120 meters requirements.

21.1.2 Drilling floor district

Drilling floor can supply power own, dog houses of it is mounted one multistage explosion-proof style
illuminated control box for controlling equipment and illumination.

One trip pump can be long-distance controlled, the button is introduced into the drilling worker control house.

21.2. Lighting system for main rig

- Each one have an APPLETON explosion proof plug and receptacle disconnects to be provided at another location without interruption of any power or illumination. Receptacles to have weather proof protective caps.
- Explosion Proof heavy duty 2 X 40 W. fluorescent and 400 watt. Explosion-proof lamp lighting system designed for use with land Rig Mast, substructure, Mud Tank system and other related drilling equipment and its surrounding area. Rig lighting system should be 208/120 V A/C, 60 HZ. All cables, Plugs, Sockets, Junction boxes used in this Rig lighting system should be explosion Proof.
- We use explosion-proof junction box and steel pipes for derrick and the explosion-proof junction box is fixed. The connection of lamps and each section derrick use connector assembly. Derrick illumination is introduced and controlled from two sides of derrick. There are about 14 sets 40w double-pipe explosion-proof lamps. Amount of them, 2 sets 40w double-pipe explosion-proof lamps are mounted on the derrick distance 3m about form drilling floor. One set 40w double-pipe explosion-proof lamps lash-up is mounted on the monkey board. It should be consider the reliability of falling-proof unit when installing lamps.

21.3. Emergency lighting:

- Portable Emergency lighting system with battery backup at important locations like rig floor, stairs, VFD and generator house etc. should be considered.
- Backup time: 2 hours.
- 2 no. 40 watt (min) fluorescent bulb with high quality reflector.
- Charging system: self-contained automatic charger 208/120 volt,60 HZ

21.4. Rig area/camp area lighting

4 sets 400W floodlights for the well site explosion-proof lighting in other regions

<table>
<thead>
<tr>
<th>No.</th>
<th>Product Name</th>
<th>Use of the site</th>
<th>Quantity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Explosion-proof fluorescent lamp</td>
<td>Well field</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Explosion-proof Emergency fluorescent</td>
<td>Well field</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Explosion-proof floodlight</td>
<td>Well field</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Explosion Aviation Light</td>
<td>Crown</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

21.5. Rig ground system

The whole electrical installation of the rig shall be earthed by inline quick disconnect type adequate
rating copper wires and rods according to accepted international standards.

**22. Communication system (Canada)**

QTY: 1 set

- This system is a network which ensures easy communication, either individual or general, between different posts in different places on a drilling rig (about 200X200) meters area, including hazardous and non-hazardous locations:
- 24hours super visor (non-hazardous locations).
  - Driller (explosion proof).
  - Mud tanks (explosion proof).
  - Racking platform (explosion proof).
  - VFD house (explosion proof).
  - Company man
  - Toolpusher

And others (non-hazardous locations).

The system must include the followings:

- Outdoor communication stations must include speaker amplifier and visual alarms (compacting system for evacuation).
- Cables for system interconnection if applicable (Rig up kit).

Accessories:

- Battery back-up system.

Operating conditions:

- Every station of the system must comply with it's emplacement on the site, either hazardous (explosion proof) or non-hazardous location. The offices' communication stations (hand sets) should include speaker amplifier and visual alarm.

Power Supply: 85-265 VAC, 50-70Hz

**A. Down hole tools and handling equipment.**

**1-1. Slips**

- 5” O.D drill pipe; W5/350T (Equivalent to Varco SDXL) 2 units
- 3 ½ O.D drill pipe; W3-1/2/125T (Equivalent to Varco SDML) 2 units
- For 9-1/2” D.C, WT8-9-1/2 2 units
- For 8” D.C, WT6-3/4-8-1/4 2 units
- For 6-1/2” D.C, WT5-1/2-7 2 units

**1-2. Elevators**

- 5” O.D drill pipe; 350 ton, DDZ133/3150 2 units
- 3 ½ O.D drill pipe; 250 ton, DDZ101/2250 2 units
- For 9-1/2” D.C, CD9-1/2/200T 2 units
- For 8” D.C, CD8/200T 2 units
- For 6-1/4” D.C, CD6-1/2/200T 2 units
1-3. DP and DC Rotary Tongs
Range from 4” to 12”
QTY: 2 units
- With latch lug jaws 5a for 3-3/8”-5-1/4” pipe size
  - Max. torque: 55 KN·M
- With latch lug jaws 5b for 4-1/4”-6-3/4” pipe size
  - Max. torque: 75 KN·M
- With latch lug jaws 5b-1 for 5”-8” pipe size
  - Max. torque: 75 KN·M
- With latch lug jaws 5c for 6-5/8”-8-5/8” pipe size
  - Max. torque: 75 KN·M
- With latch lug jaws 5d for 8-1/2”-10-3/4” pipe size
  - Max. torque: 55 KN·M
- With latch lug jaws 5e for 11-3/4”-12-3/4” pipe size
  - Max. torque: 55 KN·M
- Equivalent Varco BJ B type manual tong

Range from 3½ to 13 3/8
QTY: 2 units
- With latch lug jaws 1# for 3-1/2”-8-1/4” pipe size
  - Max. torque: 90 KN·M
- With latch lug jaws 2# for 8”-11-1/4” pipe size
  - Max. torque: 90 KN·M
- With latch lug jaws 3# for 11-3/4”-14-3/8” pipe size
  - Max. torque: 55 KN·M

1-4. Links Elevators
DH350 Forged Elevator links
QTY: 1 set
- Comply with API SPEC 8A
- Max static load: 3150kN
- OD: 2-3/4”
- Length: 3300mm(130”)
DH500 Forged Elevator links
QTY: 1 set
- Comply with API SPEC 8A
Max static load: 4500kN
OD: 3-1/2"
Length: 3660mm (144")

1-5. Upper Kelly cock
QTY: 2 nos
- Suitable for Hex. Kelly (5-1/4", 3-1/2),
- Working pressure: 70Mpa (10000 Psi.)
- Min ID: 3"
- Connection: 6-5/8" (LH) Reg.

1-6. Lower Kelly cock
QTY: 2 nos
- Suitable for Hex. Kelly 3-1/2"
- Working pressure: 70Mpa (10000 psi.)
- Max. OD 4-3/4"
- Min. ID: 2-1/4"
- Connection: NC38 (3-1/2" IF)

QTY: 2 nos
- Suitable for Hex. Kelly 5-1/4"
- Working pressure: 70Mpa (10000 psi.)
- Max. OD 6-5/8"
- Min. ID: 2-1/4"
- Connection: NC50 (4-1/2" IF)

Casing and cementing equipment.

2-1. Side door casing elevator
- 13 3/8" x 350 ton  2 units
- 9 5/8" x 350 ton  2 units
- 7" x 150 ton  2 units
- 5" x 100 ton  2 units

2-2. Casing elevator/spider.
QTY: 1 set
- Model: QD450
- One as an elevator, slip type
- One as an spider, slip type
- Capacity: 4500KN
- Overall dimension: 1380×1135×920mm

- For 13-3/8” casing, type WG13-3/8/2250 1 units
- For 9-5/8” casing, type WG9-5/8/2250 1 units
- For 7” casing, type WG7/2250 1 units

2-4. Single joint casing elevator.

- 13 3/8 1 unit
- 9 5/8 1 unit
- 7 1 unit


QTY: 1 set

- With latch lug jaws 1# for 3-1/2”-8-1/4” pipe size
  - Max. torque: 90 KN·M
- With latch lug jaws 2# for 8”-11-1/4” pipe size
  - Max. torque: 90 KN·M
- With latch lug jaws 3# for 11-3/4”-14-3/8” pipe size
  - Max. torque: 55 KN·M

3. Wooden mat and steel mat

Steel mat Suitable for substructure
- 34 nos 2000×3000×160 mm

Wooden mat Suitable for mud pump
- 10 nos 4000×2000×190 mm

Wooden mat Suitable for mud tanks
- 12 nos 4000×2000×190 mm

Wooden mat Suitable for Generator and VFD house
- 10 nos 4000×2000×190 mm

Spares: 10 nos 4000×2000×190 mm
C. Auxiliary equipment

1. Mechanical equipment

1-1. Hydraulic power station

QTY: 1 set

Specifications:

- Rated flow: 120L/min
- Rated working pressure: 16.6MPa
- Max. working pressure: 20.0MPa
- Sufficient Vol.: 587L
- Motor power: 37kW
- Overall dimensions: 1650×1100×1190mm
- Weight: 1100kg

1-3 Hydraulic lifter

QTY: 1 set

Specifications:

- Rated power of motor: 11kW
- Rated speed of motor: 1460rpm
- Rated flow: 35.5L/min
- Work pressure: 20MPa
- Rated load: 15kN
- Lifting height: 9.8m
- Lifting speed: 0.2~0.38m/s
- Dia. of wire line: φ12mm
- Overall dimensions: 1360×1860×12000mm
- Weight: 2500kg

2. Fuel supply system

2-1. Fuel tank

QTY: 1 set

Features:

- Natural suction by diesel engine
- There is a pump cabin at one end, equipped with two DN80 centrifugal oil pump
- Completed with 1 UFZ-04-2000 level meter, an explosion proof electric control box, lighting pipe, 1 LC-50 flow meter and 2 filters
The centrifugal pumps adopt horizontal model.

The two fuel filters of the fuel pumps could be backup with valves for convenient changing filter.

Specifications:

- Dimension: 10600×2800×2400mm
- Effective capacity: 45m³

2 sets DN80 centrifugal oil pump

- Lift: 18m
- Discharge: 60m³/

2-2. Daily Fuel tank

QTY: 1 set

Features:
- There is a pump cabin, and an inlet、outlet
- Equipped with an UFZ-04-2000 level meter
- The centrifugal pumps adopt horizontal model

Specifications:

- Dimension: 10600×2800×2400
- Effective capacity: 35m³

2-3. Barite tank

QTY: 1 set

Features:
- There is two 25 m³ tank complete with air compressor, piping etc.

Specifications:

- Capacity: 50 m³
- Dimension(each tank): 6600×Φ2500mm
- Weight: 4750Kg

E. OTHERS

1. Explosion proof fixed gas detection system:
### Specifikation unit

<table>
<thead>
<tr>
<th>NO</th>
<th>Name</th>
<th>Specification</th>
<th>unit</th>
<th>QTY</th>
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<td>SPSTAXF1</td>
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<td>H2S Gas Sensor</td>
<td>SPSTAXC2</td>
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<td>H2S Calibration Gas</td>
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<td>1.7</td>
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</table>

2. **Cellar pump**

Model: LSB100  
QTY: 1 set

**Specification:**

- **Power:** 45kW
- **Flow rate:** 220m³/h