



**Full Circle Enterprises, Inc.**

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**1500hp Basic Drilling Rig**  
**152' x 25' 770,000#**

**MAST**

One (1) Full Circle-on-the-floor cantilever beam leg drilling mast with a maximum clear height of 152'-0" x 25'-0" wide base and a rated static hook load of 770,000# on ten (10) lines strung to the traveling block per API 4F specifications. Mast is designed for 80 mph wind load with a full rack of pipe and 105 mph on a bare mast. Mast stem portal truss designed affording excellent driller's view and is complete with raising sheaves and A-frames. Mast has full height straight ladder drill floor to crown and includes the following additional equipment:

One (1) slingline equalizer unit

One (1) set each front and rear shoes.

One (1) set of four (4) standpipe clamps for double 5" standpipe.

One (1) Full Circle flat-running crown block with six (6) 50" minimum diameter cluster sheaves and one (1) 60" minimum diameter fastline assembly, all with tapered roller bearings and grooved for 1-3/8" diameter wireline. Cluster sheaves are mounted on a crown frame so flat face of traveling block faces derrickman. Crown frame includes wireline guards, bumper blocks and pad eyes for hanging, catline and air hoist sheaves. Includes crown safety platform for crown service with 3'-6" high with zerks located handrails and expanded metal flooring. Each sheave is lubricated by individual grease channels on one end of the shaft.

One (1) Full Circle heavy-duty racking platform with a capacity for 15,000 ft. of 5" drill pipe, four (4) stands of 10" drill collars and ten (10) stands of 8" drill collars. Platform is complete with folding diving board, access catwalk and fold-up floor slab for driller's side. Platform is adjustable from 82'-0" to 87'-0" above drill floor and includes 3'-6" high handrails.

Two (2) air hoist sheave units – 14" OD steel sheave grooved for 5/8" diameter wireline and mounted on roller bearings.

Two (2) counterweight systems with buckets, guides, tracks, load lines and 8" snatch block

**HYDRAULICALLY RAISED SUBSTRUCTURE**

One (1) hydraulically raised substructure configured to support the above on floor mast, with a nominal base dimension at the mast shoes of 25'-0" and a static hook load of 770,000#.

The substructure is designed to allow for installing of the mast on the drill floor while the substructure is in the low position and raising the mast to its working position prior to raising the substructure.

Includes a parallelogram type, raising system powered by two (2) hydraulic winches operating two(2) sets of six (6) part raising lines, one (1) hydraulic power unit complete with remote control panel, gauges, hoses and fittings and two (2) hydraulic break-over rams.

All critical load-carrying members are fabricated from hi-strength steel (w/min. yield strength of 50 ksi).

All fabrication procedures/welding is performed in accordance with API 4F specifications incorporating AWS and AISC recommendations.



**Nominal Dimensions:**

Width:	31' - 2 1/2 "
Height:	30'
Length:	54'

**Capacities:**

Dead Load of Mast:	170,000 lbs
Casing Load:	770,000 lbs
Setback Load:	577,000 lbs
Wind Load (Bare Structure):	100 mph
Wind Load (w/Full Setback):	73 mph

**The substructure is complete with:**

**Vee Door:**

One (1) Vee Door ramp 30 high, ramp is 5'-0" wide. Includes heavy-duty pipe rails on pipe ramp sides

**Stairways:**

Two (2) 30'-0" high units at rear of substructure with landing, handrails and serrated grating treads,

One (1) 30'-0" high unit at Dog House, substructure with landing, handrails and serrated grating treads, with rollers for erection with the substructure.

**Flooring:**

One (1) lot of 1/4" thick checkered plate flooring (3/8" thick around rotary table) and sub-floor frames as required.

**Handrails:**

One(1) lot of 3'-6" high handrails with toe boards and safety chain guards at stair openings, around the perimeter of the drill floor.

**Mast Stand:**

One mast stand 15'-0" high and two assembly stands 10' tall.

**Deadline Anchor:**

One (1) FCE Deadline Anchor

**Dog House supports:**

One set dog house supports for customer furnished dog house

**Coatings:**

The substructure and fabricated accessories will be sandblast cleaned to the paint manufactures recommendation and painted with an industrial primer and top coated with industrial enamel. Top coat color to be selected by customer.

**DRAWWORKS**

Full Circle 1500hp

Electric Drawworks with the following equipment:

Input HP = 1,500 hp

(2) New Amerimex 752 High Torque DC motors

Drum Size - Diameter 27", Length - 49

Grooving – 1 3/8"



4 Hoisting speeds

42VC1200 High and Low Clutch

Both Clutches mounted on output shaft of transmission

Rotary counter shaft assembly for chain drive rotary with 24" clutch (optional)

Braking - (1) W36-OM-405 (2) disc copper cooled / (2) disc spring set combination brake (2) Caliper type disc brake located directly on the main drum

(2) Rotary type hydraulic catheads, fully adjustable torque range:

\*torque sensor mounting brackets (load cells optional)

\*Make-up and Break-out: identical in construction-allows for interchangeability of units; eliminates need for additional spares; can accept either 3/8" chain or 9/16" cable

\*Controlled with variable speed controls and maximum torque is remotely controlled from the driller's console

\*Single line pull is 10,000lbs at 3,000 psi - Hydraulic pressure

\*Recommended HPU requirements 30-60GPM at 3,000psi (optional)

Drawworks driven HPU to provide hydraulics to catheads (optional)

(1) Electric hydraulic power unit (HPU) to provide hydraulics to catheads: 60hp, 37gpm, 3000psi (optional)

Adjustable crown and floor protection and emergency stop

Dual independent oil system for each bearing and chain.

Chain lubrication system is designed to maximize chain life by flooding oil onto each chain

Instrumentation: (1) Weight Indicator, (2) Tong torque gauges, (1) Pump pressure gauge, with stainless steel instrument console (1) Electric rotary torque gauge, (1) Automatic driller (satellite) incorporated into the stainless steel driller's console

Driller's console complete with all valves, gauges and hoses for all operations

Total equipment dimensions:

Length 13'10", Width 18' 8 1/4", Height 7'

(1) 1000 Gallon brake water closed loop cooling system with heat exchanger, (2) 2x3x13 centrifugal pumps and safety package - includes piping and wiring

#### **PRIME MOVERS**

(3) ea. Caterpillar 3512-1477 hp engines. Generator sets with 1365 KW. Generators Mounted on oilfield skid with tail board loading either end.

3512C LAND ELEC DRILLING ENGINE

\* 2006 EPA/CARB TIER 2 NON-ROAD EMISSIONS CERTIFIED \*

ENGINE RATING = 1101 bkW (1476 BHP) @ 1200 RPM.

Includes one Caterpillar 12-cylinder, direct-injected, turbocharged, aftercooled diesel oilfield engine; 4 cycle, 170 mm bore x 191 mm stroke (6.7 in bore x 7.5 in stroke) with separate-circuit after-cooler and optimized for low emissions. Engine rotation is standard (counter-clockwise as viewed from flywheel end).

Complete With the Following Standard Consist As Modified Or Replaced By The "Additional Accessories" Included In This Proposal:

**AIR INLET SYSTEM**

Aftercooler core, corrosion resistant  
Air cleaner, regular duty, with soot filter.  
Service indicators.

**CONTROL SYSTEM**

Caterpillar ADEM A3 ECM, LEFT HAND.  
Requires 24V DC 10-amp continuous, 20-amp intermittent, clean electrical power.

**COOLING SYSTEM**

In order to ensure compliance in use, optional or customer-supplied radiators must be capable of rejecting enough heat to allow proper operation at worst case site conditions, and also must supply 122 deg F (50 deg C) SCAC cooling water to the aftercooler inlet, with an SCAC flow rate of at least 100 GPM (379 l/m) with an ambient temperature of 86 deg F (30 deg C) and at-site conditions (including altitude considerations).  
Maximum allowable SCAC flow rate is 115 GPM (435 l/m).

**RADIATOR COOLED LAND BASED:**

Outlet controlled thermostat and housing.  
Jacket water pump, gear driven.  
Dual outlets:  
88.9 mm O.D. (3.5 in) elbow hose connections.  
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).

**EXHAUST SYSTEM**

Exhaust outlet:  
292 mm I.D. (11.5 in).  
12-10.5 mm dia holes EQ SP, 376 mm bolt hole dia.  
Shipped loose:  
Exhaust flexible fitting:  
318 I.D. mm (12.5 in)  
12-14 mm dia. holes EQ SP, 375 mm bolt hole dia.  
306.6 mm tall with compressed gasket.  
Exhaust adapter:  
297 mm I.D. to 340 mm I.D. (11.7 in to 13.4 in).  
12-10.5 mm dia. holes EQ SP, 376 mm bolt hole dia.  
12-13.8 mm dia. holes EQ SP, 430 mm bolt hole dia.  
158.5 mm tall with compressed gasket.  
Weldable flange:  
360 mm I.D. (14.2 in).  
12-13.8 mm dia. holes EQ SP, 430 mm bolt hole dia.  
17.4 mm wide with compressed gasket.  
Exhaust manifolds, dry.  
Dual turbochargers with w/c bearings.

**FLYWHEELS & FLYWHEEL HOUSINGS**

Flywheel, SAE No. 00  
Flywheel housing, SAE No. 00  
SAE standard rotation

**FUEL SYSTEM**

Fuel filter.  
Fuel transfer pump  
Flexible fuel lines  
Fuel priming pump, LEFT HAND

Electronically-controlled unit injectors.

#### **INSTRUMENTATION**

Electronic instrument panel, LEFT HAND.

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 pan drain valve, 2' NPT female connection

#### **MOUNTING SYSTEM**

- Rails, mounting, floor type, 254 mm (10 in).

#### **POWER TAKE-OFFS**

- Accessory drive.
- Lower LEFT HAND front (available for PTO usage).
- Front housing, two-sided

#### **PROTECTION SYSTEM**

ADEM A3 ECM monitoring system provides engine de-rating, 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 module(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, RIGHT HAND, 620 to 1034 kPa (90 to 150 psi), LEFT HAND control

Air silencer



## GENERAL

Paint, Caterpillar Yellow  
Vibration damper and guard  
Lifting eyes

## WITH THE FOLLOWING ADDITIONAL ACCESSORIES INCLUDED:

### GOVERNOR CONVERSION:

*Installed.*

TECHNICAL: Converts engine to direct rack controls requiring 0-200 MA DC control.

### LUBRICATING OIL:

*Initial service only.*

TECHNICAL: 500 hour oil change interval (333 L) SAE 15W40, Caterpillar DEO (CI4).

### FLEXIBLE COUPLING AND HUB

### TUBULAR SKID BASE:

*Installed at Mustang Cat Shop.*

Tubular sub-base to accommodate engine and generator - includes three point mounting provisions to Master skid. Also includes labor to mount and align engine and generator.

## CATERPILLAR SR4 GENERATOR:

Two bearing, Form wound, 1750 kva, 600 volt, 0.7 P.F., 1200 RPM, VPI, Class H insulation, 80 deg temp rise @ 50deg ambient. 158-6442 Generator Argt. Includes 1200 watt space heater, 10 Ohm copper RTD's, bus bar and cable access box

## SHOP TEST:

Test package at Mustang's shop for one hour (customer witnessed if required).

## SCR SYSTEM

3 Engine X 4 Bay series SCR system complete with all auxiliary equipment connections and generator switch boards with accommodation for Top Drive module drive system.

- 3 CAT D3215 1204KW, DIESEL ENGINES, EACH DRIVING ONE(1) 1700KVA, 60HZ, 600V, 3PH GENERATOR
- 1 1500HP DRAWWORKS, DRIVEN BY TWO(2) 1000HP SERIES DC MOTOR
- 3 1600HP MUD PUMPS, EACH DRIVEN BY TWO(2) 800HP SERIES DC MOTOR
- 1 INDEPENDANT ROTARY TABLE, DRIVEN BY ONE(1) SERIES MOTOR
- 1 TOP DRIVE FEEDER
- 5 MODEL 1400 ENGINE-GENERATOR CONTROL CUBICLES
- 5 MODEL 1400 SCR DRIVE CONTROL CUBICLES
- 1 SYNCHRONIZING SYSTEM
- 1 GROUND DETECTION SYSTEM
- 1 HANDS OFF CIRCUIT
- 1 POWER LIMIT SYSTEM
- 1 SURGE SUPPRESSION SYSTEM
- 1 DRILLER'S CONTROL CONSOLE
- 1 DRILLER'S FOOT THROTTLE
- 1 DRAWWORKS DYNAMIC BRAKE SYSTEM
- 1 (LOT) 600V FEEDER SECTION
- 1 (LOT) TRANSFORMER SECTION
- 1 (LOT) 480V MCC SECTION (PER CUSTOMER SPEC)
- 1 POWER CONTROL HOUSE: 10GA PLATE, 44'x10'x11'6" (GEN STAB BOARDS STANDARD)
- 1 LABOR, SUPPLIES & CONSUMABLES TO INSTALL COMPONENTS AND WIRE HOUSE AIR CONDITIONING AND DUCT WORK WIRE & CABLE



- 4 (LOT) GEN CONTROL RECEPTACLES/PLUGS (PN & APP)
- 1 (LOT) AC POWER RECEPTACLES/PLUGS (APP)
- 6 (LOT) DC CONTROL RECEPTACLES/PLUGS (PN)
- 18 (LOT) DC POWER RECEPTACLES/PLUGS (CL)
- 1 (LOT) SMOKE AND FIRE DETECTOR WITH AUDIO AND VISUAL ALARM
- 32 GEN POWER RECEPTACLES/PLUGS FOR INCOMING AC CONNECTIONS

**(A) ENGINE/GENERATOR CONTROL: EACH SECTION**

- 1 2000AF, STATIONARY MOUNT CIRCUIT BREAKER WITH LSI SOLID STATE TRIP UNIT AND AUX CONTACTS
- 1 CIRCUIT BREAKER PUSH-BUTTON "CLOSE"
- 1 AMMETER, 0-2000AAC
- 1 KILOWATT METER, 0-2000KW
- 1 KILOVAR METER, 0-2000KVAR
- 1 GENERATOR HOUR METER
- 1 ENGINE CONTROL PUSH-BUTTON "OFF\_IDLE\_RUN"
- 1 GENERATOR "RUN" INDICATING LAMP (WHITE)
- 1 GENERATOR "ON LINE" INDICATING LAMP (RED)
- 1 GENERATOR SYNC INDICATING LAMP (AMBER)
- 1 MANUAL ENGINE SPEED ADJUST POTENTIOMETER
- 1 MANUAL VOLTAGE ADJUST POTENTIOMETER
- 1 ENGINE-GENERATOR SOLID STATE CONTROL MODULE WITH:
  - \*VOLTAGE REGULATOR
  - \*ELECTRONIC GOVERNOR CONTROL
  - \*RESPONSE TIME OF 0.8 SECOND TYPICAL
  - \*MAXIMUM LOAD UNBALANCE BETWEEN ENGINES (ONE HOT, ONE COLD) AT ALL POINTS, NO LOAD TO FULL LOAD, +/-5% OF ITS RATED LOAD
  - \*WORKING TEMPERATURE RANGE OF -30DEG C TO +50DEG C
  - \*NO LOAD TO FULL LEAD REGULATION OF +/-1%
  - \*GOVERNOR ELECTRONICS ARRANGED FOR BATTERY POWER TO ADVANCE THROTTLE FOR "BLACK START" CAPABILITY
  - \*REACTIVE POWER IS SHARED BETWEEN THE GENERATORS BY REACTIVE POWER DROOP COMPENSATION
  - \*EXCITER POWER SUPPLY, 12AMP MAXIMUM CURRENT (THE EXCITER CURRENT LIMIT IS SET TO SUIT THE INDIVIDUAL EXCITER)
  - \*EXCITER POWER SUPPLY MAXIMUM VOLTAGE IS 240 VOLTS (THIS IS SET BY THE CHOICES OF THE EXCITER TRANSFORMER AND THE GENERATOR SELF EXCITATION REQUIREMENTS)
  - \*PROTECTIVE FUNCTIONS BUILT INTO THE REGULATOR ARE:
    - \*REVERSE POWER TRIP
    - \*UNDER FREQUENCY TRIP
    - \*OVERVOLTAGE TRIP
    - \*OVERSPEED TRIP
    - \*FREQUENCY / VOLTAGE SCHEDULED FOR ENGINE OPERATION AT IDLE SPEEDS

**(B) SCR: EACH SECTION**

- 1 AC INPUT, 1600AF, STATIONARY MOUNT, CIRCUIT BREAKER SWITCH WITH UV TRIP AND AUX CONTACTS
- 1 VOLTMETER, 0-1000 VDC
- 1 AMMETER, 0-1800 ADC
- 1 SCR "ON" INDICATING LAMP (GREEN)
- 1 6 PULSE, 1800AMP, 750 VDC, VERTICAL AIR COOLED SCR BRIDGE
  - \*THE BRIDGE SHALL BE PROTECTED USING FUSES WITH FORM CONTACTS WHICH ARE ACTIVATED WHEN THE FUSE OPENS.



- 1 SET OF DC ASSIGNMENT CONTACTORS TO ALLOW MULTIPLE ASSIGNING OF THE BRIDGE
- 1 DC CONTROL MODULE WITH:
  - \*PULSE THYRISTOR FIRING CIRCUITS WITH "HARD FIRING" OUTPUTS. THE SYNCHRONIZING SIGNAL ORIGINATES DIRECTLY FROM THE AC LINE SO THAT NO PILOT GENERATOR IS REQUIRED
  - \*HIGH-SPEED CURRENT REGULATOR WITH TWENTY(20) MILLISECOND RESPONSE.
  - \*AUTOMATIC CURRENT LIMIT LOAD SHARING FOR MOTORS DRIVING THE SAME SHAFT AND DRIVEN BY SEPARATE ARMATURE SUPPLIES NO SETUP OR ADJUSTMENT REQ.
  - \*INDIVIDUAL CONTROL OF CURRENT LIMIT FOR ALL DRILLING FUNCTIONS. THE ROTARY TABLE TORQUE LIMIT WILL BE MOUNTED IN THE DRILLER'S CONSOLE.
  - \*RAMP GENERATOR ON THE DRAWWORKS CURRENT REGULATOR TO CONTROL THE RATE OF RISE OF MOTOR TORQUE.
  - \*MOTOR SPEED REGULATORS FOR THE MUD PUMPS AND DRAWWORKS. EACH REGULATOR WILL BE INTERLOCKED WITH ITS RELATED ASSIGNMENT CONTACTOR.
  - \*ALL CONTROLS ARE DESIGNATED 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 CONSISTANT WITH THE OPERATION
  - \*MANUAL FIRING CONTROL FOR EMERGENCY OPERATION AND TEST.
  - \*THYRISTOR GATE SUPPRESSION AT APPROXIMATELY 150% OF THE BRIDGE RATING.
  - \*"ZERO THROTTLE INTERLOCK", THE HAND THROTTLE MUST BE RETURNED TO ZERO AFTER AN ASSIGNMENT CHANGE BEFORE THE MOTOR CAN BE POWERED.
  - \*MODULE FAULT FINDER INCLUDES A METER AND SWITCH MOUNTED ON THE FRONT FOR MONITORING CRITICAL INTERNAL VOLTAGES.

**(C) SYNCHRONIZING SYSTEM**

- 1 SYNCHRONIZING SELECTOR SWITCH FOR 5 GENERATORS
- 2 SYNCHRONIZING LIGHTS (CLEAR)
- 1 SYNCHROSCOPE
- 1 SYNC CHECK RELAY
- 1 VOLTMETERS MAIN BUS, GENERATOR (X) (0-750V)
- 1 FREQUENCY METERS-MAIN BUS, GENERATOR (X) (50-70HZ)

**(D) GROUND DETECTION CIRCUIT (600V)**

- 3 GROUND DETECTION LIGHTS
- 1 % DC GROUND METER
- 1 % AC GROUND METER
- 1 TEST PUSH-BUTTON

**(E) HANDS OFF CIRCUIT (HOC)**

THE HOC WILL SUPPLY POWER FOR THE ENGINE STARTING CIRCUIT AND THE PULSE PICK-UP CIRCUIT IN EACH OF THE AC GENERATOR CONTROL MODULES. THE ITEMS INCLUDED WILL BE:

- 1 SET OF CPT'S
- 1 SET OF FUSES
- 1 VOLTAGE REGULATOR PC
- 2 12V BATTERIES

**(F) POWER LIMIT CIRCUIT**

THE POWER LIMIT CIRCUIT WILL MONITOR THE KW & KVA OF EACH ENGINE-GENERATOR SET. IF EITHER OF THESE PARAMETERS REACH ITS LIMIT, THE POWER LIMIT CIRCUIT WILL REDUCE THE POWER BEING DELIVERED TO THE LOADS SO THAT THE LEAD ON EACH GENERATOR IS HELD AT ITS LIMIT UNTIL THE LOADS ON THE SCR DIVES ARE REDUCED (BY OTHER ACTION) TO A LEVEL BELOW



THE GENERATOR LIMIT. PERCENT POWER LIMIT IS INDICATED BY A METER ON THE DRILLER'S CONSOLE. A WARNING LAMP IS ILLUMINATED ON THE DRILLER'S CONSOLE AT A LOAD LEVEL JUST BELOW THE POWER LIMIT.

- 1 POWER LIMIT TRANSFORMER
- 1 SET OF FUSES
- 1 POWER LIMIT PC
- 1 ANNUNCIATION RELAY
- 1 POWER LIMIT METER

**(G) SURGE SUPPRESSION SYSTEM**

SURGE SUPPRESSION WILL BE PROVIDED TO CLAMP ANY TRANSIENT VOLTAGES THAT MAY BE DAMAGING TO THE SCR DEVICES.

- 1 (LOT) DIODES, CAPACITORS & RESISTORS
- 1 SET OF FUSES

**(H) DRILLER'S CONTROL CONSOLE**

THE CONSOLE WILL BE CONSTRUCTED OF 14 GAUGE NO.304 STAINLESS STEEL AND THE HAND THROTTLE WHEELS OF SOLID STAINLESS STEEL.

EACH WHEEL WILL DRIVE TWO(2) INDEPENDENT POTENTIOMETERS TO PROVIDE 100% BACK-UP OF THE THROTTLE FUNCTION. THE CONSOLE WILL BE WATERTIGHT AND INCLUDE A GASKETED DOOR. THE CONSOLE WILL BE EQUIPPED WITH CSA APPROVED PURGING FOR APPLICATION IN A CLASS I DIVISION 2, GROUP D HAZARDOUS AREA. A RIG AIR SUPPLY FITTING WILL BE PROVIDED FOR CONNECTION TO AN EXTERNAL 85 TO 150 PSI DRY AIR SUPPLY. AN INTERNAL AIR REGULATOR IS INCLUDED TO MAINTAIN A POSITIVE INTERIOR PRESSURE RELATIVE TO THE AMBIENT.

THE CONSOLE COMPLETE WITH THE FOLLOWING CONTROLS & INDICATORS:

- 1 SCR ASSIGNMENT SWITCH
- 1 ROTARY TABLE SPEED CONTROL
- 1 ROTARY TABLE SWITCH, "FWD\_OFF\_REV"
- 1 ROTARY TABLE TORQUE LIMIT SWITCH
- 1 DRAWWORKS SPEED CONTROL
- 1 DRAWWORKS SWITCH "FWD\_OFF\_REV"
- 2 MUD PUMP SPEED CONTROLS
- 2 MUD PUMP SWITCH ON/OFF
- 1 ROTARY TABLE TORQUE METER SCALED FOR AMPS
- 1 POWER LIMIT METER
- 3 GENERATOR "ON" LAMPS (RED)
- 3 SCR "ON" LAMPS (GREEN)
- 1 DRAWWORKS BLOWER "ON" LAMP (WHITE)\*
- 1 ROTARY TABLE BLOWER "ON" LAMP (WHITE)\*
- 3 MUD PUMP AUXILIARIES "ON" LAMPS (WHITE)\*
- 1 POWER LIMIT LAMP (AMBER)
- 1 AUDIBLE ALARM ACTIVATED FOR ITEMS MARKED (\*)
- 1 (LOT) PYLE NATIONAL PLUGS & RECEPTACLES FOR CONSOLE CONNECTION
- 1 DC EMERGENCY SHUTDOWN BUTTON

**(I) DRILLER'S FOOT THROTTLE**

THE FOOT THROTTLE IS CONSTRUCTED OF 12 GAUGE NO.304 STAINLESS STEEL THROUGHOUT, BUILT TO WITHSTAND THE ENVIRONMENT NORMALLY ENCOUNTERED ON THE RIG FLOOR. IT INCLUDES DUAL STAINLESS STEEL RETURN SPRINGS TO A FAIL-SAFE RETURN TO THE OFF POSITION IN THE EVENT OF THE SPRINGS FAILURE. PROVISIONS FOR A DRY AIR CONNECTION TO THE



ELECTRICAL COMPARTMENT ARE ALSO INCLUDED. THE FOOT THROTTLE CONNECTS DIRECTLY TO THE DRILLER'S CONSOLE THROUGH A THREE(3) CONDUCTOR CABLE.

#### **(J) DRAWWORKS DYNAMIC BRAKE**

1 DRAWWORKS DYNAMIC BRAKING SYSTEM

CONSISTING OF THE FOLLOWING:

- 3 DWDB GRID RESISTORS
- 1 DIODE BRIDGE FIELD SUPPLY
- 1 600:6V XFMR
- 1 ENCLOSURE
- 2 FIELD CONTACTORS

#### **(K) 600V FEEDER SECTION**

PROVIDE ONE(1) 600V FEEDER SECTION LOCATED IN THE SCR LINE-UP AND TO CONTAIN THE FOLLOWING ITEMS:

- 1 1600AF/800AT FEEDER CIRCUIT BREAKER TO FEED ONE(1) 750KVA AUXILIARY TRANSFORMER
- 1 400AF/125AT FEEDER CIRCUIT BREAKER TO FEED ONE(1) 112.5KVA LIGHTING XFMR
- 1 1600AF/160AT FEEDER CIRCUIT BREAKER TO FEED TOP DRIVE

#### **(L) TRANSFORMERS**

PROVIDE THE FOLLOWING VENTILATED DRY TYPE XFMRs FOR THE PURPOSE OF POWERING AUXILIARY DRILLING FUNCTIONS.

- 1 750KVA, 600:480V 3 PHASE, 60HZ, ALUMINUM WOUND, DRY TYPE, DELTA/ DELTA AUX TRANSFORMER. THE TRANSFORMER WILL BE ENCASED IN A NEMA 3R ENCLOSURE.
- 1 112.5KVA, 600:127Y220V, 3 PHASE, 60HZ, ALUMINUM WOUND, DRY TYPE, DELTA/ WYE LIGHTING TRANSFORMER. THE TRANSFORMER WILL BE ENCASED IN A NEMA 3R ENCLOSURE.

#### **(M) 480VOLT MOTOR CONTROL CENTER - APPROXIMATELY 12 SECTIONS**

\*THE MCC WILL BE US NEMA TYPE, 480V, 60HZ WITH INDIVIDUAL BREAKERS. THE HORIZONTAL BUS WILL BE COPPER & SUITABLY RATED. THE VERTICAL BUS WILL BE COPPER & RATED FOR 300AMPS. A COPPER GROUND BUS WILL RUN THE FULL LENGTH OF THE MCC LINE-UP. EACH STARTER WILL BE COMPLETE WITH A 480:120 CONTROL POWER TRANSFORMER FUSED ON THE PRIMARY AND SECONDARY, A MAGNETIC ONLY BREAKER, A CONTACTOR AND AN AMBIENT COMPENSATED OVERLOAD ELEMENT (HEATER).

#### **\*LEGEND:**

HOA=HANDS-OFF AUTOMATIC CONTROL

3WRC=3 WIRE REMOTE CONTROL

AF/AT=AMP FRAME/AMP TRIP

FVNR=FULL VOLTAGE NON-REVERSING

#### **MOTOR STARTERS**

SIZE	TYPE	FEATURES
1	FVNR	HOA/RUN LIGHT
2	FVNR	HOA/RUN LIGHT
3	FVNR	HOA/RUN LIGHT
4	FVNR	HOA/RUN LIGHT

#### **FEEDER CIRCUIT BREAKERS**

AMP	TYPE
30A	3P CIRCUIT BREAKER



50A 3P CIRCUIT BREAKER  
60A 3P CIRCUIT BREAKER  
100A 3P CIRCUIT BREAKER

**208Y120 FEEDER CIRCUIT BREAKER**

1 42 CIRCUIT LIGHTING PANEL

**(N) POWER CONTROL HOUSE (44' L x 10' W x 11'6" H APPROX. 52,000 LBS)**

\*THE POWER CONTROL HOUSE WILL BE DESIGNED FOR TRANSPORTATION BY AN OILFIELD TRAILER.

\*THE HOUSE COLUMNS AND CEILING FRAME WILL BE CONSTRUCTED FROM STRUCTURAL STEEL SEAM WELDED. THE OUTSIDE SHALL BE FABRICATED FROM 10 GA SHEET STEEL. ALL CORNERS ARE TO BE FORMED BY BENDING, LEAVING NO SHEET EDGE EXPOSED.

\*THREE(3) OF THE WALLS AND THE FLOOR WILL BE INSULATED WITH MINERAL WOOL. THE PLUG PANEL END WILL BE UNINSULATED, BUT WILL BE SEPARATED WITH A PARTITIONING WALL. THERE WILL BE A RUBBER NEOPRENE MAT RUNNING THE FULL LENGTH OF THE INTERIOR AISLE OF THE HOUSE.

\*TWO(2) STEEL DOORS WITH STAINLESS STEEL PANIC HARDWARE WILL BE SUPPLIED, ONE AT EACH END, AND ON OPPOSITE SIDES OF THE HOUSE. BOTH DOORS SHALL BE DESIGNED TO OPEN TO THE OUTSIDE BY PUSHING DOWN ON THE OPENING BAR.

\*THE TWO(2) AIR-CONDITIONING UNITS WILL BE PACKAGES UNITS, HORIZONTALLY MOUNTED. EACH UNIT WILL BE RATED AT 7.5 TONS.

\*THE INCOMING POWER CONNECTIONS WILL BE LOCATED IN A RECESSED BOX LOCATED AT THE TOP AND ON ONE SIDE OF THE HOUSE. THIS LOCATION IS ON THE SAME SIDE OF THE HOUSE AS THE SCR LINE-UP. THE RECEPTACLES AND PLUGS FOR THE OUTGOING DC POWER AND RIG AC LOADS ARE TO BE INSTALLED IN PANELS WHICH SLANT DOWNWARD TO RELIEVE STRESS ON THE OUTGOING CABLES.

\*THE EXTERIOR COATING WILL CONSIST OF A SUB-COAT OF PRIMER AND A TOP-COAT OF WHITE EPOXY ENAMEL.

\*TRANSFORMERS AND AIR CONDITIONING CONDENSER UNITS WILL BE MOUNTED ON A COVERED PORCH AT ONE END OF THE HOUSE. THE DC POWER AND GENERATOR CONTROL PLUGS AND RECEPTACLES SHALL BE PYLE NATIONAL AND THE MCC AND DISTRIBUTION PLUGS AND RECEPTACLES WILL BE APPLETON.

\*THE PLUG PANEL WILL BE LOCATED AT THE END OF THE HOUSE OPPOSITE THE TRANSFORMER PORCH. IT WILL CONSISTS OF TWO MAJOR SIDES. ONE SIDE WILL BE PRIMARILY THE DC POWER CONNECTIONS AT THE BOTTOM AND LOW VOLTAGE AC POWER AT THE TOP END. THE SECOND SIDE WILL CONSIST OF 480 VAC POWER CONNECTIONS . THE PLUG PANEL WILL UTILIZE CAMLOCK, APPLETON AND PYLE NATIONAL CONNECTORS ALL UL LISTED.THE PANEL ITSELF WILL CONSIST OF A STAIR STEPPED CONFIGURATION WITH APPROXIMATELY SEVEN SHELFs.

\*THE INTERIOR WILL BE EQUIPED WITH THE FOLLOWING SAFETY FEATURES:

- \*EMERGENCY LIGHTING
- \*SMOKE DETECTOR WITH AUDIO & VISUAL ALARMS
- \*FLAME DETECTOR WITH AUDIO & VISUAL ALARMS

**ROTARY TABLE**

American Block 27-1/2"

**TRAVELING BLOCK**

American Block 500 Ton

**MASTER BUSHING**

Varco Mod. MSPC 27-1/2" With no. 3 Insert Bowl

## MUD PUMPS

**Gardner Denver Model PZL (PZ-11) triplex, single-acting, bare drilling pumps with standard features as described below:**

- 1600 bhp for *continuous* drilling service
- 11" stroke
- 115 rpm maximum
- 150,300 lbs. maximum rod load
- 390 to 632 gpm flow range (*dependent on size of pistons/liners selected*)
- Available liner sizes of 5 ½", 6", 6 ½", & 7"
- **5,000 psig** maximum pressure (*5-½" & 6" liner size only*)
- API 7K, API Q1, API ISO 9001-2000 certified

### Standard Features:

- **Frame is ductile iron casting**, 80,000 psig tensile strength, Monolithic structure, no weldments to crack
- Eccentric is **cast nodular iron**
- **Helical gears** 4.38 to 1 ratio, internal
- **Double extended jackshaft, 4340H quenched and tempered alloy steel**, running on heavy-duty straight roller bearings (*specify drive side at time of order placement*)
- **Main gears** are **4140H alloy steel**, heat-treated, and bolted onto the eccentric
- **Main bearings** are double-row spherical roller bearings
- **Nodular iron** connecting rods fitted with roller bearing at both ends
- Replaceable **bronze crosshead slides** in frame
- **Full splash lubrication**, with oil pumped to trough & gravity distributed to working parts
- **Oil pump**, gear driven internally mounted with full flow filter & replacement type element
- Oil lubrication **pressure and temperature gauges**
- **Offset clamp type extension rods** for superior alignment to minimize liner and piston wear
- **Couplings** to clamp extension and piston rod for ease of removing liners and pistons
- **Fluid cylinders are individually forged, heat-treated 4140 alloy steel** and rated for 5,000 psig maximum working pressure
- **Fluid cylinder bores are "autofrettaged"** which greatly improves life
- **Cylinders are interchangeable** between all PZ-10 and PZ-11 pumps
- **Fluid cylinders** are single piece for better VE, smoother flow and compact size
- **Suction manifold is ductile iron casting** with one (1) 10"-150# connections at center of suction manifold
- **Discharge manifold is cast steel** with 5"-5,000# API connections on either side of pump
- **Bolted on rings with threaded lock covers** for ease of valve maintenance
- **Chrome liners and Supergold pistons** (*specify size at time of order placement*)
- **API-7 steel valves**, 3 rib valve seats and steel stem guided valves with polyurethane inserts
- **Piston / liner lubrication and washing system** to include Model CA-122 centrifugal rod washing pump with v-belt drive off of pump jackshaft extension and 90 gallon reservoir tank, shipped loose
- **Oil level sight gauge glass**
- **Steel inspection covers** over cradle area of pump
- Two (2) operating & maintenance manuals to ship with each pump
- Two (2) parts list manuals to ship with each pump
- Pump is shipped on wooden runners
- Bare pump dimensions & weight: 157" L x 106" W x 68" H . . . . . 37,000 lbs.

## MUD SYSTEM (4 Round Bottom TANKS APPROXIMATE 1600 BBLS.)

Three (3) Gardner Denver PZ11 Triplex 1600hp with Two (2) GE-752- 800 hp. series motors mud pump motor rear mounted on oilfield skid. Complete with roofs.



**DITCH MAGNETS**

**CHARGING PUMPS**

(2) Mission Model Magnum, 8 x 6 x 11 with 50 hp Electric Motors, 230/460 Volt

**MUD MIXING PUMPS**

(2) Mission Model Magnum, 8 x 6 x 13 with 100 hp Electric Motors, 230/460 Volt

**MUD TANKS:**

**SHAKER TANK**

(1) ea. 40 L x 8' W x 8' High 400 BBL with porch

**INTERMEDIATE TANKS:**

(1) ea.-40'L x 8' High x 8' wide 400 BBL with porch

**SUCTION TANK:**

(1) ea.40 L-x 8'ft W' x 8' High, 400 BBL with porch

**RESERVE TANK**

(1) ea.40 L-x 8'ft W' x 8' High, 400 BBL with porch

**TRIP TANKS**

(1) 80 BBL Capacity With 3"x 4"transfer Pump X 20 hp.

**PILL TANK:**

(1) 80 BBL Capacity Slug Pit

**SHALE SHAKER**

(3) 504 Derrick Height Speed Linear Motion,

**DESANDER-DESILTER**

(1) With 16 x 4" De-silter Cones and (2) 10" in cone De-sand 6 x 8 centrifugal pump

(2) ea 100 hp. motors 460 volt 3 phase.

**DEGASSER**

(1) Swaco, Model Horizontal Vacuum, 5 hp.60 Hz, 230/460 Volts

**WATER TANK**

(1) Water tank 500 bbl with (2) ea. transfer pumps 2" x 3" with 10 hp electric motors skid mounted on oilfield skid.

**DIESEL TANK**

(1)300 bbl diesel tank with (2) ea. transfer pumps 1.5" x 2" with 5 hp electric motors skid mounted on oilfield skid.

**CLOSING UNIT**

Koomey, Type 80 Unit, 260 Gal. Capacity with 16 Bottle, 14 Outlets, And Auxiliary Air Remote control unit

(2) Air pumps and (1) triplex 3000 psi pump with 20 hp. motor. Dual Remote control panels

**CHOKE AND KILL LINE**

- 2 Ea: Gate Valve, 3-1/16" 10,000 PSI WP, Flocon type "BWH" flanged ends, BX-154, hydraulic operated, SSRG
- 2 Ea: Gate Valve, 3-1/16" 10,000 PSI WP, Flocon type "BWH" flanged ends, BX-154, hydraulic operated, SSRG
- 4 Ea: Gate Valve, 3-1/16" 10,000 PSI WP, Flocon type "BW" flanged ends, BX-154, handwheel operated, SSRG

**KILL LINE, TOP**

- 4 Ea: Gate Valve, 3-1/16" 10,000 PSI WP, Flocon type "BW" flanged ends, BX-154, handwheel operated, SSRG
- 4 Ea: Gate Valve, 3-1/16" 10,000 PSI WP, Flocon type "BWH" flanged ends, BX-154, hydraulic operated, SSRG
- 4 Ea: Check Valve, 3-1/16" 10,000 PSI, "Flocheck", flanged ends, BX-154, SSRG mc "EE"

**KILL LINE, BOTTOM**

- 8 Ea: Gate Valve, 3-1/16" 10,000 PSI WP, Flocon type "BW" flanged ends, BX-154, handwheel operated, SSRG
- 8 Ea: Check Valve, 3-1/16" 10,000 PSI, "Flocheck", flanged ends, BX-154, SSRG mc "EE" BX-154, SSRG
- 4 Ea: Flanged Tee, 3-1/16" x 3-1/16" x 3-1/16", 10,000 PSI bx-154, SSRG
- 88 Ea: Sets (8 Pcs per set) stud with two hex nuts 1" x 7-1/4" ASTM A13/194, GRB7/GR2H, CAD plated
- 100 Ea: Ring Gasket, cad plated, bx-154

**DOUBLE STUDDED ADAPTER**

- 10 Ea: Adapter, double studded, 4-1/16" 10,000 (BX-155) x 3-1/16" 10,000 PSI (BX-154), SSRG

**CHOKE MANIFOLD**

- 1 Ea: 3-1/16" 10,000 PSI WP choke manifold, consisting of the following:
  - (18) 3" 10k gate valves
  - (1) 2" 10k gate valve
  - (2) 3" 10k adjustable choke
  - (1) 3" 10k hydraulic choke
  - (1) Remote control HYD choke console
  - (1) Studded instrument block w/ gage & sensor
  - (1) Studded cross, 5-way
  - (1) Studded tee
  - (1) Buffer tank
  - (1) Adapter spool, studded
  - (2) Spacer spools
  - (1) Lot..misc flanges
  - (1) Lot..studs/nuts, gaskets
  - (1) Heavy duty oilfield skid, adjustable

**BOP's (13-5/8" 10,000 PSI):**

- 1 Ea: Blow Out Preventer, Annular, Control Flow Type "GK"  
13-5/8" 5,000 PSI WP (BX-160) studded top X 13-5/8" 10,000 PSI (BX-159) flanged bottom 316 SS line ring grooves, H2S screwed head design Complete with nitrile element
- 1 Ea: Blow Out Preventer, Single Ram, Control Flow type "U"  
13-5/8" 10,000 PSI WP (BX-159) flanged top  
13-5/8" 10,000 PSI WP (BX-159) flanged bottom  
Two (2) 4-1/16" 10,000 PSI (BX-155) side outlets  
316 SS lined ring grooves, H2S service  
C/W handwheels, "U" joints and stem assemblies
- 2 Ea: Blind Flange, 4-1/16" 10,000 PSI WP, BX-155
- 2 Ea: Ring Gasket, CAD plated, BX-155



**Full Circle Enterprises, Inc.**

- 2 Ea: Sets (8 Pcs per set) stud with two hex nuts 1-1/8" X 8-1/2" ASTM A193/194, GRB7/GR2H, CAD plated
- 1 Ea: Blow Out Preventer, Double Ram, Control Flow Type "U"
  - 13-5/8" 10,000 PSI WP (BX-159) flanged top
  - 13-5/8" 10,000 PSI WP (BX-159) flanged bottom
  - Four (4) 4-1/16" 10,000 PSI (BX-155) side outlets
  - 316 SS lined ring grooves, H2S service
  - C/W handwheels, "U" joints and stem assemblies
- 4 Ea: Blind Flange, 4-1/16" 10,000 PSI WP, BX-155
- 4 Ea: Ring Gasket, CAD plated, BX-155
- 4 Ea: Sets (8 Pcs per set) stud with two hex nuts 1-1/8" X 8-1/2" ASTM A193/194, GRB7/GR2H, CAD plated

**MUD CROSS**

Side Outlets: 4-1/16" - 3000PSI

**STAND PIPE MANIFOLD:**

4" dual stand pipe manifold with goose necks with Kelly hose connection (1) 55'ft.3.5 x 7500 psi rotary hose 5 ea. 4" in 5K mud gate valves 3 ea 2" mud gate valve outlets x 5K.

**AIR COMPRESSOR**

2 Quincy 50 hp units with air driers 125 PSI WP  
(1) Cold start compressor with diesel engine with electric starter.

**WIRE LINE UNIT**

Hoist Driven By 15 HP Elec. Motor W/ 15,000' .092 OD Line with Depth Recorder

**AIR TANKS**

(2) ea. 200 gallon fitted in substructure (1) 200 gallon air tank in compressor house:

**TOOL HOUSE**

(1) Parts and Supply House 30' x 10' x 8'

**DOGHOUSE (New)**

(1) Doghouse 30' x 10' x 8'

**DRILLING LINE:**

7500'ft.drilling wire rope 1-3/8 IWRC on steel reel, Union Wire Rope Co

**RIG WIRING:**

All fixtures explosion proof within 50 ft of well bore

**Electrical Rig Up**

AC Power to be from Five (5) Cat 3512 Engines each with One (1) 1365 KW 600 volt, 60 Hz Generator

DC power for the following loads:

- 1-1500 HP Drawworks with 2-750 HP DC Motor and 10 HP Blower
- 2-1600 HP Mud Pumps each with 2-800 HP DC Motor and 10 HP Blower
- 1-800 HP Top Drive with 1-800 HP AC Motor and 10 HP Blower (Complete by Others)
- 1- PCR with MCC and transformer (internal of PCR)

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2-100 HP Mud Mixers (Suction Tank)  
2-75 HP Desander / Desilter (Shaker Tank)  
2-50 HP Super Chargers  
1-50 HPU Units  
1-20 HP EZ Torque Unit or Wireline Unit  
2-20 HP Water Pumps  
2-20 HP Trip Pumps  
2-5 HP Fuel Pumps  
1-Shaker Tank Feeder for 1-5 HP Dual Linear Shakers and 3-10 HP Mud Agitators  
1-Suction Tank Feeder with 4-15 HP Mud Agitators  
1-20 HP BOP Unit  
2-50 HP Air compressors  
1-15 HP Wireline Unit

120/208 Volt Loads

2-100/2 Company trailers  
1-100/3 Rig Floor Panel

1-60/3 Warehouse / Mechanics Shop  
1-60/3 Electricians Shop  
12-20/1 lighting and auxiliary loads

Lighting System to be 120/208 Volt 60 Hz  
Mast 152 ft and a 30 ft floor Height with 35ft x 50ft substructure  
Lighting System

All fixtures will be provided with Class 1 Division 1 Explosion Proof receptacles and plugs. Each lighting string will be provided with receptacles and plugs as needed for rig moves.

Mast Lighting:  
Twelve (12) Class 1 Div 2 fluorescent fixtures for mounting on mast

Aircraft Obstruction lighting:  
Two (2) obstruction Class 1 Div 2 lights mounted on Crown and one additional near racking board.

Racking Board Lighting:  
Two (2) Class 1 Div 2 fluorescent fixtures for mounting on Racking Board

Dog House Lighting:  
Three (3) Class 1 Div 1 fluorescent fixtures for mounting in Dog House/ Driller's Cabin

Floor Lighting:  
Two (2) Class 1 Div 1 Explosion Proof fluorescent fixtures for mounting on Racking Board

Substructure Lighting:  
Four (4) Class 1 Div 1 Explosion Proof 400 Watt Mercury Vapor Floodlights fixtures mounting in corners of Substructure





Pipe Rack Lighting:

Four (4) Class 1 Div 1 Explosion Proof 400 Watt Mercury Vapor Floodlights fixtures for Pipe Rack

Four (4) Class 1 Div 1 Explosion Proof 400 Watt Mercury Vapor Floodlights fixtures for Area Lighting

Rig Floor Nema 7 Panel Explosion Proof with the following circuits:

1-20/1 Circuit Breaker for Dog House 2-20/1 Circuit Breaker for Mast Lighting

1-20/1 Circuit Breaker for Obstruction Lights (3)

1-20/1 Circuit Breaker for Substructure Lights

1-20/1 Circuit Breaker for Floor Lighting

1-20/1 Circuit Breaker for Pipe Rack Lighting

1-20/1 Circuit Breaker for Drawworks/ Area Lighting

2-30/3 Circuit Breakers for Spares (10 HP Max 208 Volt)

Generator Lighting (5) Skids

15- Fifteen (15) Class 1 Div 2 fluorescent fixtures for mounting on roofs of 3 Generator Skids 3 per skid.

Utility House Lighting

4- Four (4) Class 1 Div 2 fluorescent fixtures for mounting on roofs of Utility House.

Water Tank Lighting (1) Tank

One (1) Class 1 Div 2 fluorescent fixtures with mounting stanchion 1 per tank

Fuel Tank Lighting (1) Tank

One (1) Class 1 Div 2 fluorescent fixtures with mounting stanchion 1 per tank

Koomey Unit / Air Compressor Lighting (1) Skid

Three (3) Class 1 Div 2 fluorescent fixtures roof mounted

Mud Tank Lighting (2) Tanks (Shaker, & Suction)

Four (4) Class 1 Div 2 Metal Halide 400 watt floodlight fixtures with mounting stanchion 2 per tank

Mud Mix/ Desand-Desilt skid Lighting Porches (2)

One (1) Class 1 Div 1 Explosion Proof fluorescent fixtures (1 per porch)

Mud Pumps Lighting (2) Skids

Three (3) Class 1 Div 2 fluorescent fixtures with mounting stanchion 1 per skid

Drilling / Mud watch system complete with gauges and recorders ,pressure , torque, mud volume, spm, rpm, weight, flow, drill rate , etc.

**TOP DRIVE**

(1) CanRig Top drive 500 ton 1250 hp complete with all service loops guide rails, VFD controls built in SCR house to save extra load when moving, complete with drill pipe handling attachment, installed and test before leaving rig up yard.

**COATING**

All Full Circle fabricated items will be properly cleaned, primed w/one (1) coat of shop primer and finished w/one (1) coat of enamel of customer's color choice.