**جدول الكميات لمشروع تاهيل بئر خلة حسين –كفر جمال**

**Electro mechanical works for groundwater well no. 15-18/023 in Kufr Jammal.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Item** | **Description** | | **Unit** | **Unit Price /$US** | **Qty.** | **Total**  **/$US** |
| **Electrical and Mechanical Works:**  The contractor shall submit in his offer and supply maintenance manuals, catalogs, characteristic curves, testing certificates, shipping, lading documents and specifications of pumps, motor, fittings, mechanical and electrical control devices, cables, wiring and all accessories and ancillaries to complete the work. All to be new and not renewed in accordance with the specified specifications. The contractor should verify the design equipments by conducting field visits to the well and must be before ordering any equipment or materials as follows: the contactor must check and verify and match between the reality and the design quantities mentioned in this tender. If he notices any difference or no matching, then he must inform the supervisor engineer and find together a suitable solution to such conditions. This include checking and fitting all dimensions mentioned in the tender as the well's hole diameter, pump diameter, shaft columns diameter, discharge head inlet and outlet. The contractor must check in particular that the size of the hole of the well is enough to install the pump and pumping pipes, and if any water level pipes together. The sizes mentioned in this contract are the best estimate of information we got for this well. The contractor should be responsible technically and financially to supply the suitable materials. All connections including the electrical and mechanical fittings should be according to the general pumping layout view. | | | | | | |
| 1 | | **Electric Motor:**  Disjoin the existing motors and fittings, and then move them outside the operation site to the place within the **Khalet Hussien** area specified by the project committee. Supply, transport, deliver, install, and operate successfully according to the specifications in the tender on the reinforced concrete foundation a new vertical hollow shaft Electric Motor with suitable reinforced foundation. The motor has to be inverter duty as 10:1 (6-60 Hertz) Speed Range Constant Torque voltage 220/380-440. The motor shall be of standard construction and suitable high thrust bearing to carry the loads of the rotating radial thrust, equipped with weather protection as IP56 type-1 standard, insulation class F complete digital thermal protection unit, complete current overload unit. The motor must be not less than  **100 horsepower** at **1500 rpm**, set at continuous steady state service factor 95%-100%, 1 year warranty starting from the date of the handing over certificate or 7000 working hours and whichever comes first; price involves removing existing concrete casting and casting suitable reinforced concrete base for the new motor which fits the motor dimensions and its height matches level to the last vertical shaft discharge head. The concrete used should be B-300 and the two meshes a steel box and bars diameter 10 mm. The price includes supplying all cables and materials and executing all electrical connections needed between the following elements and despite of the lengths required: A- cable one in between the main 3-phase power source at the well site and the Main Electric Control Board inside the pumping room (Taking into consideration there is an existing solar unit connected to the well main control panel and the new panel has to be connected as well) B- a cable between the Main Electric Control Board and the electric motor. The cable size and specifications are as follows: All above cables are to be round, blue or green color, copper conductors are solid and made of pure copper EPR, (see annex cable properties). Conductors size **3x70 + 1x35 mm2**. The price includes all materials and works to install the above cables including whatever of electric, mechanical fittings and accessories as PVC and steel trenches, anchors with clamps, jumpers, stays including base, anchors steel wires, The cables must be lay inside 4"PVC/as rubber pipes of flexible spring type two layers. The price includes excavation inside all types of soil and rock trenches not less than 40\*30 cm and lay the cable inside these trenches and adding pure sand as backfilling to all size of the trenches and casting in the last 10 cm of the trenches with plain concrete over the pipes. The price includes supplying and installing all electric motor control devices (as RTDs thermal, over load) and any other connections including cabling inside or outside the pumping station relevant to this work and according to standard specifications for this work. The opening tender committee will receive an offer about type and motor specifications, catalogues, and an in site testing report which shows that the motor is matching with these specifications.   * The price of this item includes supplying and installing two I steel section (25\*30 cm\*8mm) to hold on the motor and discharge head. * The electrical motor must be supplied **with RTD (PT100)** temperature protection. The type of motor connection must be suitable to present the motor temperature digitally inside the control panel. The price of this item includes all costs of materials and works to install and test the RTD control device. * The motor shall be designed and built for 24hr continuous service at any and all points within the required range of operation without overheating, cavitations, excessive vibration and strain. * Motor has to be new and furnished with a stainless steel name plate with data of the serial number, speed , KW, input voltage, Full load, Hz, power, etc . * All works necessary for transporting, supplying to the site of work, installing, connecting, running and testing are under the contractor expenses. * All works must be according to the Palestinian standards and engineers instructions and the specifications and drawings. * The price also includes any missing works not mentioned to execute this work.   The contractor must submit the motor specifications, certificate of origin , catalogues and on site testing report which shows that the motor is matching with the manufacturer specifications | Lump sum | 12000 | 1 | 12000 |
| 2 | | **Main Electrical Control Panel Unit**: Price includes supply and install suitable control panel for pumping **60 m3 at 200** meter dynamic head, and installing in the site for the mode of operation, a control board according to the following specifications and supervisor instructions: control panel box shall be made of three compartments and the price for this item include all equipments and works mentioned below: The first compartment is for main hour meter and fusses- Main breaker. The second compartment is for the **120 hp inverter** as ABB, or equivalent as shown specifications, main breaker as Siemens, contactor, capacitor(s) bank, main cables inlet/outlet.), It shall be IP56 protected, thermally painted paint as (RAL 7302). All main cables and wiring must be closed with special plastic cover and protected against human electric shock. The third compartment includes all control circuits, and secondary contactor, breakers for the high voltage cabinet or the low voltage. The control panel must be fixed to the wall by ten Jumbo screws and laid on a reinforced concrete foundation 40-50 cm above the ground. The contractor should submit as built drawing including soft and hard copy. In case the contractor will use any digital equipment including PLC he must submit the cable, the software, computer or any other accessories that are necessary to operate and maintain these digital equipment; meanwhile to train the well’s operator how to use and program the PLC. The well is connected to solar unit and new installations should be connected as well. Therefore, the price for this include all types works and materials to connect the solar panel to the system in operation.  The labeled nameplates should be mounted at the front of the main board behind the doors and above every switch and group of lamps. Control electric lamps 24v must be fixed to control all operation system, the starter shall be used to start, run, stop , protect and control manually and automatically by using the general required installation of the following equipments completely. The price for this item includes:   * The power circuit must consist of the following: main circuit breaker MCCB 3\***200A**, 25KA adjustable for the company and for generator (MOLLER) two pieces. The price includes supplying and installing manual change over switch 4\*200A, SOCOMEC type for manual operation. * Bus bar 200A/0.4KV (3 phases and neutral and earth) * Complete 4p \* 20KA **surge arrestors** of replaceable type. With box fuse 3\*63. * Digital screen inverter 120 **hp** (see annex). Solid state frequency converter as ABB type (with bypass contactor **130 hp** as MOELLER type) equipped with over /under load, over temperature and all control system needed with all protections rated at suitable power that matches the pump motor with (0.8-1.2) over load range.   **Capacitor Banks**: Standby capacitor banks with discharge resistors compensating reactor dry type 400v 50 Hz to reach power factor 0.97 Ducati. Three phase capacitor with resistors 20 KVAR Ducati type.   * **Digital multi meter** which is able to read directly from a screen (V, Hz, KW, A, PF). * **No voltage, phase sequence** and **phase failure** device, relays of best quality as MOELLER. * **On-off push button** set and emergency off button. * **Reset push** buttons red color 22 mm. * **Overload relay** unit rated at 1-1.5 of motor full load including digital motor screen protection control board. * **Temperature relay** unit rated at the motor thermal sensor, including **digital motor screen protection** control board with all cables and connections. * **HRC fuses 3\*63A** complete Fernaz type. * **WHM** 50\*50mm. * **24h clock** with 150 hr mechanical reserve. * **Suitable automatic breaker** with adjustable thermal and magnetic protection (ISC>=25KA) NZM. * (0-500V) 96\*96mm Voltmeter with selector switch between phases and neutral. * 3 phase fuse holders set , 10\*38mm , with 20A fuses , * Suitable earth leakage relay class A (AC and Dc trip). * Contactor with discharge 25KVAR Moeller type. * Breakers for service Siemens type. * **Relays and timers 24 V** for **no flow switch** and **high-pressure, low-pressure** sensors. * Three phase 50 Hz 380-440 V (KWh-meter), /**5A-200/5 CT’s.** The KW-h meter as electromechanical meter or solid state and pre-paid card electric type. * 24V/ 50Hz indication lamps installed in front of the **control cabinet..** * **3** position selector switch A-O-M. * **220-24V (AC) transformer 150-**200VA. * the price includes all cables to be used for control purposes shall have the following cross section: * **(3\*70 mm2 + 35 mm2**) for the internal connections inside main board and the contractor has to check and order the exact required length. * \*1.5 mm2 for the driving wheel circuits. * \*2.5 mm2 for the circuits of tension measurements. * \*1.5 mm2 for the sensors. * \*4.0 mm2 for the circuits of intensity measurements. * \*All terminals shall be carefully protected to assure electrical insulation. * Switches, measuring instruments, and warning lights shall be installed in the front side of the panel. * The control panel shall be manufactured with enough space (minimum 40% free space of the total size) to insure easy maintenance and no interface between the wiring for all circuits. * All wires must be coded clearly and fixed with special wire heads to avoid loose connection. * All timers (PSK), relays and contactors shall be of best quality as Siemens * The contractor shall supply any other materials and devices that might be missed here and considered to be essential to complete the work without claiming any changes in unit prices. * The control panel must be equipped with an **alarming bell (100** dB at 8 meters distance) **and flashing red alarm** (should be visible from 300 meter during day). Alarms for all cases of failure as: **voltage drop, no voltage or phase failure high or low pressure and no flow, high temperature etc.** * The control panel must be equipped with **control circuit for either the probe** water sensor or to build digital screen for hydrostatic water level sensor. * **Temperature control as digital screen** * The alarm must be muted without **general reset** and there should a special button in the front door to stop it alone. * Circuits must consist of the all necessary materials to operate and protect the system automatically and manually, the wiring color system, numbering all the components. The price includes the design of the whole system of control the contractor is intending to carry. The contractor should also submit at the end of work a s built drawing.   The control panel deign should include:   * Transformer 230/24V 150-200VA * Water level relay HK type. * 220V AC /80 Watt with **2 fans in each** compartment, one for taking in air and the other for taking out the air with grid ( for the panel) **complete with thermostat protection.** * **SIREN (**alarm system)   Alarm system 24V equipped with on-timers delay for :   1. High pressure outlet 2. Low pressure outlet 3. No flow (non return valve) 4. Soft start fault 5. High temperature  * The price includes **all works, as excavation** works for installing pressure switches, flow switch and level sensor and all the electrical parts with suitable conduits and metal ducts to complete the works. * The price includes installing and testing for the mode of operation all mentioned devices and sensors. The control panel must be equipped with earthling unit so the price includes. * **Earthling** : The price of the control panel includes supplying and installing complete earth unit with earth equalizer compressing C40 box copper B.B. 25 mm2, with minimum two concrete manholes as foundation lines , two earth electrodes, D>19mm, L=1.5m and any other missing materials to earth the pumping station . The price includes testing earth unit so as to fulfill the standard requirements (resistance less than **1.5-2 ohm**). The across different fittings in the piping system. * The price also include supply all materials (as cables, in-out sockets and install, two outlets as 3-phase complete service unit for the pumping room including Main MCB 5\*20A -10 KA MOLLER type. MCB 2 \*10A – 10KA Moeller type the control * The price include **all cable materials** and works to conduct the electrical connections of the thermal sensor inside the motor -(the cable 3x2.5 mm2 , the cable should be of suitable length. Use flexible thermal conduits, cable glands, wire terminals& labeling at both ends and all the accessories needed to complete the work(excavation & backfilling),the cable from the MDB to the head of pump motor. * **Wiring and Lighting the pumping room** Supplying and executing all materials needed for inside and outside lighting of the station (pump and station yard) including all works, trenches, cables, sockets etc. according to the following: * Supply and install 2x36 W flourcent surface mounted (water proof) IP56 for outside the room * One phase sockets number three * Lighting the room from inside by three double-glass fluorescent lamps (36 w) in each room (water proof). * 2x30w emergency 10 hours duration lighting fixture to be fixed in accordance with the supervisor engineer's instructions. * The lighting service should be controlled by a separate DGB. Its power source is directly controlled through a double pole MCB. * Lighting the outside of the rooms by External two projectors each of 250W Metal Halide water proof IP 56 with aluminum body (high quality) (the price includes all materials and works to carry the inside and outside wiring and lighting. The projectors, will be switched on from the service DGB. Distribution box for lighting suitable for 24 circuit breaker (DBG). Also the price includes conduits, (3x2.5mm) and all size of cables& all accessories needed to complete the work. Supplying materials and executing 3 intake power sockets, and another one as 3-phase and the other three as 1-phase. The price includes supplying electric cables, leads, on-off keys, power sockets, trenches…etc. The price includes all any other missed works or materials to execute the lightening item. | L.S | 9000 | 1 | 9000 |
| 3 | | **Flow Control switch**: Supplying and installing an electrical flow switch suitable for 6" pipes, powered by a 24 v-dc power source. Price includes all cables and protection conduits required to connect it with the control panel. | Num. | 100 | 1 | 100 |
| 4 | | **Pressure Control switch** Supply and install two pressure switches 1-25 bar. Price includes all cables and protection conduits required to connect it with the control panel, | Num. | 125 | 2 | 250 |
| 5 | | Supply and install pressure 2" **Relief Valve**, 16 atm, complete, The price includes excavation, cutting, welding, adding screws, bolts and accessories that are needed to assemble the valve and according to specifications Annex 1/ S7. The Price also includes supplying and installing 2" coupling, 2”conical record, 2”nipple and 2" gate valve. | piece | 700 | 1 | 700 |
| 6 | | **Old Pump lifting and installation new pump.** All works related to prepare the site including all civil, electrical and mechanical installations, the discharge head, pumping pipes, turbine, shafts, rubber joints, access pipes, retainers and all related accessories. The price involves checking and operating the pump after finishing all project works to insure no vibration or unusual sound, The price includes all machines and labor works related to well's installation. | Lump sum | 2500 | 1 | 2500 |
| 7 | | **Vertical Turbine Pump;** Supply and install a multi stage vertical pumping turbine complete (pump, screen, shaft bowels, stages, connection head to the 6 inch riser pipes, and all related accessories) all as specified in the technical specifications attached with the tender. The price includes any other works to achieve the required head and quantity and efficiency. The main pumping data as follows:  Current well total well depth is **170** meters; and the well hole is 10” and must be checked and verified. The intended pumping pipes diameter is 6”; and the total pumping pipes length inside the well is **153** meters, and dynamic drawdown is not known. Static water level is around **125-130** meters below surface. The turbine properties is fit as follows:   * Liquid water is potable for human drinking and suitable for field crops and vegetables irrigation. * Design capacity **60** **m3/hr** * Design anticipated total head at the intended turbine discharge **200** m. * Maximum pump column and discharge head assembly head losses (m): 3 * Shut-off head limits (m) min not less than **240 m**. * Turbine overall efficiency at the working point is not less than **73%.** * Min bowel efficiency at run out capacity 80%. * NPSHA at max run out capacity (m) :8 * NPSHA at max anticipated TDH (m): 5. * Pump operating speed (rpm) :**1500** * Maximum pump diameter (inch)**: 8” diameter** * **Closed impellers** manufactured from bronze and cast iron bowels. * **Stainless steel column**, stainless steel screen filter * The well pump shall be capable to run at shutoff head for a few minutes without mechanical problems. * The turbine torque design should be duty inverter at speed range the design values between 1:10 * The price includes supplying and installing all required flanges, coupling, reducers, bolts, spacers, sleeves, nuts, etc. to connect between the turbine outlet, turbine column and the rising pipes and shafts accordingly. The price also includes casting concrete foundation and I steel sections to should the turbine. The price includes all repair works as a result of old turbine disjoin or new turbine installation. * The contractor **shall do in site testing** the turbine in accordance with well hole, static water level, dynamic water level, well over all depth, and submitting the test report. Before ordering or installing any new materials, the contractor must get the initial records for existing conditions of the well including: the well pumping capacity in m3/hr, water level inside the (dynamic and static). Therefore, the contractor must prepare suitable water meter and water level meter to carry on these measures. Therefore, the price of the turbine includes the costs of all these tests. In case the contractor failed to get these measurements, the turbine price will be less by 30% than the price proposed in his tender. | Lump sum | 17000 | 1 | 17000 |
| 8 | | **Gate valve**: Supply and assemble gate valve, 6"complete, 16 bar. Price includes excavation, cutting, welding, adding screws, bolts and accessories that are needed to assemble the valve. The valves could be installed anywhere within the project area and according to specifications mentioned in Annex1, S2 , | Num. | 500 | 1 | 500 |
| 9 | | **Gate valve**: Supply and assemble gate valve, 3"complete, 16 bar. Price includes excavation, cutting, welding, adding screws, bolts and accessories that are needed to assemble the valve. The valves could be installed anywhere within the project area and according to specifications mentioned in Annex1, S2 , | Num. | 300 | 1 | 300 |
| 10 | | **Gate valve**: Supply and assemble gate valve, 2"complete, 16 bar. Price includes excavation, cutting, welding, adding screws, bolts and accessories that are needed to assemble the valve. The valves could be installed anywhere within the project area and according to specifications mentioned in Annex1, S2 , | Num. | 50 | 1 | 50 |
| 11 | | **Pressure gauge**: Supply and assemble pressure gauge, 25 bar with oil liquid Rotal ASME, B40. Price includes excavation, cutting, welding, adding coupling, and accessories that are needed to assemble the gauge, | Num. | 50 | 1 | 50 |
| 12 | | **Dresser:** Supply and assemble 6" dresser complete. Price includes ears 60 cm rods and screws, bolts, excavation, cutting, welding, and adding accessories that are needed to assemble the dresser with NP 16 bar, as shown pumping layout view | Num. | 100 | 1 | 100 |
| 13 | | **Dresser:** Supply and assemble 3" dresser complete. Price includes ears 60 cm rods and screws, bolts, excavation, cutting, welding, and adding accessories that are needed to assemble the dresser with NP 16 bar, | Num. | 70 | 1 | 70 |
| 14 | | **Dresser conical record:** Supply and assemble 2" dresser complete. Price includes rods and screws, bolts, excavation, cutting, welding, and adding accessories that are needed to assemble the dresser with NP 16 bar, | Num. | 25 | 1 | 25 |
| 15 | | **Galvanized 3" pipes**  Supply and install 3” diameter galvanized steel pipes thickness 3.96 mm, and according to specifications Annex 1/ S1-9, | M.L | 15 | 4 | 60 |
| 16 | | **Galvanized 2" pipes**  Supply and install 2” diameter galvanized steel pipes thickness 3.96 mm, and according to specifications Annex 1/ S1-9, | M.L | 15 | 3 | 45 |
| 17 | | **Elbows, T or Saddle OR Elbows:** Supply and install 6"/90 or 45 degree black steel elbows or T and Saddle for welding SCH 40 anywhere within the project area | Num. | 40 | 2 | 80 |
| **Total costs of all materials and works** | | |  | | | **42830** |

**Costs Summary**

|  |  |
| --- | --- |
| **Item** | **Total amount /$US** |
| **All Mechanical and Electrical works for the groundwater well. 15-18/023** |  |
| **Total in words (includes) –$US** | |

**Company / Contractor Name: --------------------------------------------**

**Address: -----------------------------------------------------------------**

**Telephone: -------------------------------------- Fax: ---------------------**

**Signature and Stamp: --------------------------------**

**Date: -----------------------------**

**General Information well 15-18/023**

Location: Kufr Jammal-Tulkarem, Khalet Hussien area

Coordinates: X= 152888 Y= 181583, Z= 142 a.m.s.l

ID Number: 15-18/023

Year of Establishing: 1965

Method of Drilling: Tool Percussion

Total Depth: 165-170 meters

Static Water Level: 125 meters below surface

Pump Setting: 153 below surface

Diameter of Drilling: 10”

Existing Pumping pipes diameter: 65”

Existing Pumping Capacity: 50 m3/hr

Irrigated Area: 500 Dunums

Number of farmers: 100 (using water meters)

Average working hours in summer: 600 per month

Average working hours in winter: 200 per month

**Annex 1: Fittings Materials Specifications**

**A-S1: Check valves**

1. Body: Cast Iron
2. Disc: Cast Iron
3. Cover: Cast Iron
4. Seat Holder Cast: Iron
5. Body Seat Ring: Bronze ASTM B62
6. Disc Seat Ring: Rubber (BUNA-N) ASTM D 2000 AA 7008
7. Hinge Pin: Stainless Steel
8. Plug: Malleable Iron
9. Cover: Bolt & Nut: Steel
10. Seat Holder Bolt: Stainless Steel
11. Cover Gasket: Rubber (BUNA-N)
12. Coating: fusion bonded epoxy inside and outside

**A-S2: Gate valves none rising stem:**

1. Body: Cast Iron
2. Bonnet: Cast Iron
3. Packing Box: Cast Iron
4. Disc Cast: Iron
5. Hand Wheel: Cast Iron
6. Body Seat Ring: Bronze
7. Disc Seat Ring: Bronze
8. Gland Cast: Iron
9. Stem Nut: Bronze
10. Stem Bronze
11. Bonnet Gasket: steel
12. Packing Box Gasket: steel
13. Bonnet Bolt & Nut: Steel
14. Gland Stud & Nut: Steel
15. Packing Box Stud & Nut: Steel
16. Top Nut: Steel
17. Washer: Steel
18. Packing: Graphite Fiber Commercial
19. Operating Nut: Cast Iron A 126 Class B
20. Coating: Electro statically applied epoxy inside and outside,

**A-S3: Combination Air Valve**

1. Body: PN21 Sphere Nodular ASTM-536 60-40-18
2. Rolling Seal: Rubber E.P.D.M
3. Clamping Stem: Reinforced Nylon
4. Float: Foamed Polypropylene
5. Base: Brass ASTM B-124
6. O-Ring: Buna-N
7. Cover : PN21 Cast iron ASTM A-48 CL-35B
8. Nozzle Seat: Bronze ASTM B-62 B-271 C83600
9. Nozzle Seal: Rubber E.P.D.M
10. O-Ring: Buna-N
11. Bolt and Nut: Galvanized Steel, Chromate Plated
12. Float: Stainless Steel 304L
13. Body: PN21 Cast iron ASTM A-48 CL-35B
14. Sleeve: Reinforced Nylon
15. Threaded Outlet: Brass
16. 16: Coating: fusion bonded epoxy inside and outside

**A-S4: Butterfly Valves: (GEAR)**

1. Stem: Stainless steel
2. Body: Cast iron
3. Bushing: Brass
4. O ring: EPDM
5. Bushing (spacer): Polymeric
6. Disc: Stainless steel
7. Liner: EPDM
8. Washer: Bronze
9. Retaining ring: Spring steel
10. Plug: Plastic
11. Coating: Fusion bonded epoxy inside and outside

**A-S5: Water meter specification and materials.**

1. Working pressure 16 or 25 bars as required.
2. Max. temperature 60 C
3. Body: cast iron
4. Coating: epoxy
5. Connection: Flanged ends

**A-S6:** **Strainers Specifications:**

1. Body: cast iron ASTM 126 class B
2. Cover: cast iron ASTM 126 class B
3. Screen: stainless steel
4. Gasket: Buna -N
5. Plug: steel
6. Bolts: steel
7. Coating: fusion bonded epoxy inside and outside

**A-S7: Control Valves specifications (float valves and pressure reducing valves)**

1. Connection: flanged
2. Water temperature up to 60 C
3. Working pressure 25 bars
4. Valve body and cover ductile iron (ASTM A-536)
5. Valve internals: stainless steel and bronze
6. Control trim: brass
7. Elastomers: Buna-N
8. Coating: fusion bonded epoxy

**A S-8: Painting works include** adding two faces (red oxide as priming paint and zinc oxide base oil paint for finish). The pipe surface must be painted with two coats from all sides, particularly lower part to the ground. Therefore, the pipe must hold on supports above the ground minimum 30 cms, and then released to ground down after the paint was dry. Prepare the surface and stir the paint before use or mix using a power agitator. Before applying paint, a thinner liquid has to be added to the pipes surface to clean away oil and grease, use a detergent to remove excess dirt and contaminants. Remove the metallic debris such as mill scale and rust using disc sanders, sandpaper or wire brushes which ensures an adhesive surface.

**A-S-9: Carbon steel line shafts: According to ASTM A576**

**A-S-10: Irrigation Steel Pipes Welded Black Steel Pipes,** [**ASTM A53**](http://www.techstreet.com/cgi-bin/detail?product_id=911886) **or as API5L:**

**A53 Type F**, which is longitudinally furnace butt welded or continuous welded (Grade A only),

**A53 Type E**, which is longitudinally [electric resistance welded](http://en.wikipedia.org/wiki/Seam_welding) (Grades A)

**B- The Vertical Hollow Shaft Electric Motor Set** shall be complete with the accessories and ancillaries needed in accordance with the following specifications:

* An efficient approved engine speed 1500/1800 rpm inverter duty VFD and fitted to maintain engine speed at all condition of load.
* The cooling system shall be a closed type with, class F insulation, temperature rise class B, and internally built thermal senor to be connected to the MCB.
* The Electric Engine set shall be mounted on a suitable reinforced concrete foundation with common steel frame and no vibration and high thrust capacity
* Other standard parts and instruments needed for good operation. As power factor at full load not less than 90% and efficiency at full load not less than 94%
* Winding design as standard 3-phase motor 415 V, 50 Hz and permissible and preferences for variable speed motor or duty frequency motor (in the range between 10-70 Hertz), tolerance of 10% in voltage in the range 380-480 volt.
* Rated and output power apply for standard ambient conditions of 40°C
* Motor frame, end shields, terminal box are made of cast iron, fan made of sheet stainless steel.
* High capacity bearing, single output shaft of stainless steel
* Degree of protection as standard IP 56
* The offer must be supplied with catalogue (M&O) for the motor set, curves power, efficiency, engine specification and test certificate, etc…
* The contractor is responsible to issue a 1 year warranty starting from the date of the taking over certificate.

**C- Solid state frequency inverter**

* Wide Voltage Range: 320 ~ 480V
* Input Frequency Range: 40 ~ 65Hz
* Output Voltage Range: 0 ~ rated input voltage
* Output Frequency Range: 0 ~ 500Hz
* Overload Capacity: 60s with 150% of rated current, 2s with 180% of rated current
* From 0.75 ~ 7.5KW Plastic house; 11 ~ 630KW is metal house
* Control Mode: High Quality V/F Control
* Speed Accuracy: V/F + 0.5% of maximum speed
* 20 channels for frequency setting
* Analog signal: 0 ~ 10V,-10V ~ 10V,0 ~ 20mA.
* Pulse setting input: 0~50 KHz.
* Built-in RS485 communication port
* Solid state programmable screen and PLC configurations
* All model are integrated IGBT
* The malfunction ratio is 0.8% within 24 months warranty

**D- Cable Specifications:**

The cable is flat with a light blue outer sheath -, drinkable conductors for permanent submersion in potable water, to respective depths and up –to 600 meters. It is water resistance tested to the European standard EN 505825-2-21 (AD8 condition complete submersion in water) and meets the requirements of BS 6920, and IEC 60228 covering the suitability of non-metallic materials and products for use in contact with water. The EPR (Ethylene Propylene Rubber) insulation and Elastomeric Cross-linked outer sheath should provide a robust and water-tight barrier.

The voltage rating is 0.6/1kV and a temperature rating of -25oC to +90oC. It is suitable for use in water of a maximum temperature of 80oC

the conductor main construction properties are as follows:

* Class 5 (Flexible Conductor) fine stranded tinned pure Copper
* Voltage rating: (0.6/1kv) 600 V between the conductor and earth, and 1000 V rms between adjacent conductors.
* Inner Insulation: EPR (Ethylene Propylene Rubber)
* Outer sheath/ Jacket: Elastomeric Cross-linked compound including filler materials
* Conductors sizes as specified in the BoQ, 3GI3 quality insulation). The junction box (Water Proof) and main connection. The cable is fixed inside PVC pipes under the ground and protected by a concrete cover not less than 10 cm. The price includes the costs to carry the cable insulation resistance with megger and connect to control panel.