

جدول الكميات لمشروع تأهيل بئر المروج-راس عطيه

Electro mechanical works for groundwater well no. 14-17/005 in Ras Attiya

Item	Description	Unit	Unit Price /\$US	Qty.	Total /\$US
<p style="text-align: center;">Electrical and Mechanical Works:</p> <p>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 contractor 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, 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 pumping pipes, and the 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 instructions of the supervisor engineer.</p>					
1	<p>Supply and install a multi stage submersible pumping Turbine complete (pump, screen, shaft bowels, stages, connection head to the 6" 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 all according to the Annex.</p> <p>Current well hole is 10" and total well depth is 130 meters; and the existing pump diameter is 8". The existing pumping pipes diameter is 6"; and the total length inside the well is approx. 108 meters, and dynamic drawdown is not know exactly (noticed air pockets in water). Static water level is around 107 meters below surface. The contractor offer for the submersible turbine properties has to fit as follows:</p> <ul style="list-style-type: none"> • Liquid water is suitable for domestic and agriculture uses; which is potable water. • Design capacity (m³/h): 70 	Lump Sum	16000	1	16000

	<ul style="list-style-type: none"> • Design anticipated total head (TDH) (m): Anticipated turbine discharge at TDH at 150 m • Maximum pump column and discharge head assembly head losses (m): 3 • Shut-off head limits (m): minimum 190m • Turbine overall efficiency at the intended point is not less than 75% • Minimum bowl efficiency at run out capacity (80 %) • NPSHA at maximum run out capacity (m): 8 • NPSHA at maximum anticipated TDH (m): 5 • Motor and pump operating speed (rpm): 2,900 • Non-overloaded motor. • Max. Pump and motor diameter (in): 8" • Stainless steel column, stainless steel screen filter • Column pipe and discharge head diameter (in): 6" • Stainless steel Original (not local) Shroud on the motor to direct the water inlet to the pump as to pass from underneath the motor to the pump. • Closed impellers manufactured from bronze and cast iron bowels. • The well pump shall be capable to run on/ off every few minutes with technical warnings. • The electrical motor must be supplied with RTD (PT 100) temperature protection. The type of motor connection must be suitable to present the motor temperature digitally on control panel. The price include all wiring, PT cables and connections and works required to connect the motor inside the well and the main control panel with relay and off-alarm • Contractor has to connect the motor and control panel upon his responsibility. using the flat cables shielded with galvanized sheets to prevent cable scratches with well walls and carry the cable insulation resistance with megger. • The motor shall be designed and built for 24-hours 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 no., speed, Kw, input voltage, full load, Hz, power etc.) and motor must be 1.25 larger than Pump brake horse power or 1.15 larger than the total Input 				
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	<p>Horsepower to the Electrical Motor.</p> <ul style="list-style-type: none"> • The motor shall be furnished with a removable water block lead assembly to prevent ingress of water and a sand slinger shall be installed where the shaft enters the stator. • The motor shall be filled at the factory with a treated glycol water internal lubricating solution for a maximum reliability and long life. • All works from supplying, installing connecting running and testing are under the contractor's expenses. • All works must be according to the Palestinian standards and engineer's instructions and the specification 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. • The well pump shall be capable to run at shutoff head for a few minutes without mechanical problems. • The motor and turbine must fit with each other according to manufacturers' instructions. • The turbine torque design should be duty inverter at speed range the design torque values between 1:10 • The price includes supplying and installing all required non return valve (built in) 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 hold the turbine. The price includes all repair works as a result of old turbine disjoin or new turbine installation. <p>The contractor shall do in site testing the turbine in accordance with the performance curve and submitting the test report. Before installing any new materials, the contractor must get the initial records for existing conditions of the well</p>				
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	including: the well pumping capacity in m ³ /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.				
2	Supply and install submersible electric cable with the following specifications: cable flat, blue color, conductors are solid/strands and made of pure copper, shielded with galvanized steel sheets to prevent cable scratches with well's walls and. PVC Jacket XLPE insulation, filler with inner sheath, 600 V, conductors sizes 3x50+1x25 mm ² (to the pump motor) + the junction box (Water Proof) and main connection as shown in the Annex. The cable is fixed to the pipes by stainless steel clamps each 2 m with soft rubber underneath and pvc ties each meter. The price includes the costs to carry the cable insulation resistance with megger and connect to control panel.	M.L	60	135	8100
3	Main Electrical Control Panel Unit: Price includes supply and install suitable control panel for pumping 70 m ³ @ 15 bars, 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 fuses- Main breaker. The second compartment is for the 75 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	L.S	9000	1	9000

	<p>voltage. The control panel must be fixed to the wall by six 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 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:</p> <ul style="list-style-type: none"> • The power circuit must consist of the following: main circuit breaker MCCB 3*120A, 25KA adjustable for the company and for generator (MOLLER) two pieces. The price includes supplying and installing manual change over switch 4*120A, 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 75 Hp see the annex. Solid state frequency converter as ABB type (see with bypass contactor 75 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. <p>Capacitor Banks: Standby capacitor banks with discharge resistors compensating reactor</p>				
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	<p>dry type 400v 50 Hz to reach power factor 0.97 Ducati. Three phase capacitor with resistors 20 KVAR Ducati type.</p> <ul style="list-style-type: none"> • Digital multi meter which is able to read directly from a screen (V, Hz, KW, A, PF). • No voltage phase sequence and phase failure 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. • (0-300A) 96*96mm ammeter. • 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 390V (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. 				
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	<ul style="list-style-type: none"> • 220-2* 12V (AC) transformer 100VA. • the price includes all cables to be used for control purposes shall have the following cross section: • *(3*50 mm² + 25 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 				
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	<p>control circuit for either the probe water sensor or to build digital screen for hydrostatic water level sensor.</p> <ul style="list-style-type: none"> • 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. <p>The control panel deign should include:</p> <ul style="list-style-type: none"> • Transformer 230/24V 150VA • 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) <p>Alarm system 24V for :</p> <ol style="list-style-type: none"> 1. High pressure outlet 2. Low pressure outlet 3. No flow (non return valve) 4. Soft start fault 5. High temperature <ul style="list-style-type: none"> • 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 				
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	<p>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>19m, 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.</p> <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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 				
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	<p>fixture to be fixed in accordance with the supervisor engineer's instructions.</p> <ul style="list-style-type: none"> • 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. 				
4	Flow Control switch: Supplying and installing an electrical flow switch suitable for 6" pipes, powered by a 24v-dc power source. Price includes all cables and protection conduits required to connect it with the control panel, according to the instructions of the supervisor engineer.	Num.	150	1	150
5	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, according to the instructions of the supervisor engineer	Num.	125	2	250
6	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	piece	800	1	800

	and according to specifications in the Annex. The Price also includes supplying and installing 2" coupling, 2"conical record, 2"nipple and 2" gate valve, according to the instructions of the supervisor engineer.				
7	Pump lifting and reinstallation: All works related to disjoin the existing discharge head, pumping pipes turbine, shafts, retainers, etc and reinstall the new pumping pipes, turbine, shafts, 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, according to the instructions of the supervisor engineer. The price includes all machine and labor works related to well's dismantling and installation.	Lump sum	1500	1	1500
8	Accesses Pipes: PVC, polyvinyl chloride sch. 80 pipes NP 25 bars of 32 mm Diam. Supply, install and test in the well access PVC, pipes sch. 80/1.25 " size threaded and suitable coupling at joints ,These pipes should fixed to the pumping pipes using stainless steel clamps. The price includes suitable couplings and 2*2.5 mm ² level submersible cable (>= 130 meter). The control panel must equipped to connect this water meter cables.	M.L	10	120	1200
9	Gate valves: Supply and assemble gate valve, 3", 2" globe valve for washout and pressure release connections, 16 bar. Price includes" all 3", 2 steel pipes, elbows, dresser, cutting, welding, adding screws, bolts, flanges and accessories that are needed to assemble the valves. The valves could be installed according to specifications mentioned in the Annex .	Num.	600	1	300
10	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, according to the instructions of the supervisor engineer.	Num.	50	1	50
11	Supply, install a screen digital hydrostatic level meter (submersible digital level sensor) with the following characteristics: <ul style="list-style-type: none"> Water Level Measurement: 40m (max.) 	L.S	2500	1	2500

<ul style="list-style-type: none"> • Excitation: 9 to 30 Vdc, reverse polarity protected • Output: 4 to 20 mA DC, 2 wire, short circuit protected • Input Current: 20 mA max • Accuracy: 0.50% FS BFSL (includes linearity, hysteresis and repeatability) • Response Time: 2 ms • Operating Temperature: -10 to 60°C • Proof Pressure: 150% • Burst Pressure: 200% • Wetted Parts: 316 stainless steel • Electrical Connections: Submersible cable terminating in digital leads <p>The price includes all works and materials, as cables, connections, sensor, digital screen that shows the remaining water depth above the sensor. The price includes all wiring necessary to connect the sensor inside the well's hole to the MCB. In addition to that a process meter/controller, should be digital and programmable one, with flush mounted to be installed in the MCB 's door, step response 2sec,6A dual relay.</p>				
Total costs of all materials and works				39850

Costs Summary

Description	Total amount /\$US
All Mechanical and Electrical works for the groundwater well. 14-17/005	
Total in words (includes) –\$US	

Company / Contractor Name: -----

Address: -----

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

Signature and Stamp: -----

Date: -----

General Information well 14-17/005

Location: Ras Attiya, Area

Coordinaste: E= 148757 N= 173917, Z= 122 a.m.s.l

ID Number: 14-17/005

Total Depth: 130 meters

Static Water Level: 107 meters below surface

Pump Setting: 108 below surface

Diameter of Drilling: 10"

Existing Pumping pipes diameter: 6"

Existing Pumping Capacity: 70 m³/hr

Irrigated Area: 150 Dunums

Number of farmers: 50

Average working hours per day in summer: 8

Average working hours per day in winter: 1

Annex:**Mechanical and Electrical Works:**

General Specifications: The contractor should attach in his offer type of turbine and details information on it if either imported as foreign turbine. He should include the manufacturer brand name, performance and testing curves (and due point), full specifications of manufacturing materials and dimensions of the stages, bowels, main shaft, retainers, stabilizers, lockers, etc. . The contractor must submit the turbine original performance/testing curve from the company or from an approved turbines test lab. Before 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). These tests must be reported before start any import and supply orders. Therefore, the contractor must prepare suitable water meter and water level meter to carry on these measures. The contractor will not be paid any money for taking these records and their cost will be considered as undeclared/indirect costs that are already included in the turbine price.

All fittings in this project must meet the standard specification mentioned in the Annex. The contractor should install them wherever the supervisor engineer decides within each project area and not to claim any variation for that. The installation process includes all works such as excavation in all kinds of rocks and soils, welding, shaping, cleaning the site of work and painting.

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, shafts, , retainers, mechanical and electrical control devices, cables, wiring and all accessories and ancillaries to complete the work. All materials have to be new and not renewed in accordance with the specified specifications. The contractor should verify before ordering any equipment or materials, all dimensions mentioned in the following specifications including the well's hole diameter, pump diameter, columns diameter, discharge

head inlet and outlet. 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.

Electric Cable Connection

Splicing of electric cable should be done by a qualified person.

- Use correct electric cable designed for submersible well pumps.
- Peel the coating at the end of the cable and lead line of the motor about 40 mm to expose the copper wire.
- Connect the bare wire about 20 mm long using a crimp link of the appropriate size. Each individual wire should be crimped and insulated individually. Use the waterproof adhesive tape for 3 to 5 layers to wrap the individual connections. The wires should then be bundled together and insulated again using adhesive tape again for 3 to 5 layers ensuring that it is totally waterproof.
- The waterproof adhesive tape should be elongated by pulling in 200% before wrapping it round the wire in spiral advantage method with half of the tape in each round being overlapped. The shrinkage of the tape will fasten and waterproof the connected cable end better.
- The bare copper wire and adhesive tape should be kept clean.

Submersible Turbine Pump and Settings

- Furnish all labor, materials, equipment and incidentals required, install, complete and ready for operation and field test, submersible turbine pump and motor including all details in respect to the setting in the well.
- All necessary and desirable accessory equipment and auxiliaries whether specifically mentioned in this specification *or* not shall be furnished and installed as required for an installation incorporating the highest standards for this type of service. Also included shall be supervisory services during installation and field testing of each unit and instructing the regular operating personnel in the proper care, operation and maintenance of the equipment.

Related Work

- Instrumentation and control work, except as specified herein are included
Instrumentation and controls provided in this section shall adhere to Instrumentation and control specifications
- Mechanical work and appurtenances are included
- Electrical work, except as specified herein, is included

Submittals

- Submit shop drawings and product data. Submittals shall include the following:
 1. Certified dimensional drawings of each item of equipment and auxiliary apparatus to be furnished including: pump supports and anchor bolt plans and details.
 2. Schematic electrical wiring diagram and other data as required for complete pump

installation.

3. Literature and drawings describing the equipment in sufficient detail. including materials of construction, to indicate full conformance with the detail specifications.
4. Total weight of pumping unit as well as weights of individual components

- **Design Data**

1. Manufacturer's certified rating curves, to satisfy the specified design conditions including operating speed , showing pump characteristics of discharge, anticipated field head, brake horsepower, bowl efficiency and guaranteed net positive suction head required (NPSHR). Curves shall show the full recommended range of performance and include shut-off head. This information shall be prepared specifically for the pump proposed. Catalog sheets showing a family of curves will not be acceptable.
2. Calculations for velocity of flow past the motor based on motor proposed and designated well casing shall be submitted. Should such calculations show a velocity below that required by the motor manufacturer for adequate motor cooling a design of an enclosing flow inducer (suction sleeve/shroud) shall be submitted for approval. In any case of the results of calculations the contractor should install a shroud around the motor according to the standards of shrouds installation. Therefore, the contractor should make this step before he submits his offer to import the suitable submersible pump. These decisions will be considered according to the results of the step draw down test.

- **Test Reports**

1. Copies of all test data as described above
2. Tabulated data for the drive motors including rated horsepower, full load rpm, power factor and efficiency curves at $\frac{1}{2}$, $\frac{3}{4}$ and full load, service factor and (Kw) input. including when the pump is at its design point. Submit a certified statement from the motor manufacturer that the motors are capable of continuous operation on the power supply without affecting their design life for bearings or windings
3. A schedule of the date of shop testing and delivery of the equipment to the job site
4. Description of pump factory test procedures and equipment

- **Operation and Maintenance Data**

The maintenance instructions shall include troubleshooting data and full preventative maintenance schedules and complete spare parts lists with ordering information

Complete operating and maintenance instructions shall be furnished for all equipment included under this section.

Reference Standards

A. Design, manufacturing and assembly of elements of the equipment specified herein shall be in accordance with PWA and EU standards.

Quality Assurance

- To assure unity of responsibility, the motors shall be furnished and coordinated by the pump manufacturer. The Contractor and manufacturer shall assume responsibility for the satisfactory installation and operation of the entire pumping system including pump, motor, surface discharge head and controls, as specified herein.
- The equipment specified herein is intended to be standard pumping equipment of proven ability as manufactured by concerns having extensive experience in the

production of such equipment. Units specified herein shall be furnished by a single manufacturer. The equipment furnished shall be designed, constructed and installed to operate satisfactorily when installed as shown on the contractor submittals.

- Pumps shall be manufactured in accordance with the standards specified herein.
- The Contractor shall be fully responsible for the design, arrangement and operation of all connected rotating components, to ensure operation meets all specified conditions.
- The Contractor shall be fully responsible for all elements of the pump installation and pump setting so that the installation meets the requirements as shown on the contractor submittals and as specified herein including depth of setting, discharge column pipe, column check valve, installation of water level instrumentation and surface discharge head assembly.

System Description

The submersible pump, to be installed under this section, is a replacement vertical pump to be set in an existing water supply well.

Delivery, Storage and Handling

- All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the unit and equipment are ready for operation.
- All equipment and parts must be properly protected against any damage during shipment. Store the equipment in accordance with manufacturer's recommendations
- Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.
- The finished surfaces of all exposed flanges shall be protected by wooden or equivalent blank thongs, strongly built and securely bolted thereto.
- Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.
- No shipment shall be made until all required submittals have been approved by the Engineer and shipment approved by the Engineer in writing.

Maintenance

Provide a list of recommended spare parts for 1 year operation of the pump, together with the current price of each item.

Warranty

The equipment shall be warranted for a period of one year from date of substantial completion as defined under the General Conditions, to be free from defects in workmanship, design or material. If the equipment should fail during the warranty period due to a defective part(s), it shall be replaced and the unit(s) restored to service at no additional cost to the Owner.

Pumping Unit Accessories

A. Water Level Monitoring Access Pipe

1. Furnish steel sleeve welded to the surface discharge plate to accept the access pipe for water level measuring equipment and RTD's. The sleeve shall extend through the access plate and be flush with the bottom surface of the plate. The sleeve shall extend 150 mm above the upper surface of the plate and be sized to provide a 9 mm space

- around the pipe within the sleeve.
2. Furnish a 25 mm internal diam sch80 (1.25 inch), 5 mm (0.200 in) wall thickness water level monitoring access pipes. Each pipe shall extend into the well to a depth equal to within 2 m of the installed depth of the top of the pump bowl assembly.
 3. The 32 mm (1.25 in) PVC pipe shall be slotted Schedule 80 flush coupled and threaded
 4. The access pipes shall each have a PVC cap mounted at the top of the PVC pipe. The cap shall be slipped onto the top of the access pipe to permit removal when the instrument is pulled for inspection or service. Do not attach the cap to the pipe with solvent. Cut a slot in the cap to the instrument size and seal around the cable and the slot with silicone rubber sealant to prevent debris from entering the access pipes.

B. Low Level Shut-Off

Wire a data logger with a suspended sensor and solid-state relay for low level shut-off and alarm to be installed under this section, shall be as furnished and as specified in the control panel specifications.

Products

General

- The pumping units shall all be supplied by one manufacturer and shall be complete including pumps, motors, submersible power cable and motor RTDs.
- The pumps, motors, and devices shall be designed and built for 24-hour continuous service at any and all points within the required range of operation, without overheating, without cavitations, and without excessive vibration or strain. All parts shall be so designed and proportioned as to have liberal strength, stability and stiffness and to be especially constructed to meet the Specifications.
- Pump support and surface discharge is to be as shown in the BOQ. Each major piece of equipment shall be furnished with a stainless steel nameplate (with embossed data) securely mounted to the body of the equipment. As a minimum, the nameplate for the pumps shall include the manufacturer's name and model number, serial number, rated flow capacity, head, speed and all other pertinent data. As a minimum, nameplates for motors shall include the manufacturer's name and model number, serial number, KW/horsepower, speed, input voltage, full load amperes, Hz and power and service factors and insulation code.

Conditions of Operation.

- The pump shall be designed for the conditions of service tabulated as follows and shall operate within the system head curves as appended. The pump shall have a rising head capacity curve for stable pump operation from the minimum head operating point to the shut-off head.
1. Depth of turbine 110 m
 2. Pumping pipes (existing) 6"
 3. Static water level 107 m below surface
 4. Dynamic water level during pumping (to be determined during the pumping test/Step Draw Down Test SDDT)

5. Pumping capacity 70 m³/h (according to the results of the SDDT)
6. Hole diameter 10 “

Column Check Valve

The pump column shall be equipped with a stainless steel poppet check valve non-spring return located one column pipe joint above pump discharge

The check valve diameter shall be x-in and constructed of Type 316 stainless steel with disc and bushings of the same material. Fasteners shall be Type 316 stainless steel. The pressure rating of the valve shall be 1.5 times shutoff head (such as to accommodate the maximum pressure of the pump's total dynamic head through its entire performance curve from shut off run out).

Design Data

1. Manufacturer's certified rating curves, to satisfy the specified design conditions including operating speed , showing pump characteristics of discharge, anticipated field head, brake horsepower, bowl efficiency and guaranteed net positive suction head required (NPSHR). Curves shall show the full recommended range of performance and include shut-off head. This information shall be prepared specifically for the pump proposed. Catalog sheets showing a family of curves will not be acceptable.
2. Calculations for velocity of flow past the motor based on motor proposed and designated well casing shall be submitted. Should such calculations show a velocity below that required by the motor manufacturer for adequate motor cooling a design of an enclosing flow inducer (suction sleeve/shroud) shall be submitted for approval

Pump Support And Surface Discharge

- A. Discharge pipe system shall comply with the requirements specified herein
Disk diameter 0.8 m thickness 4 cm cover over discharge pipe
- B. Provide manufacturer's written documentation that all components in contact with water are non toxic and are suitable for use with potable water and meet NSF 61 Certification
- C. The replacement pump shall be installed in the well utilizing the existing supporting means including column pipe, surface discharge assembly and all other accessory equipment unless the replacement or addition of certain equipment is otherwise shown on the Drawings or as specified herein.
- D. The plate shall be adapted (cut or drilled) to accommodate the power cable and access tubes.

Field Testing

- A. After the pump has been completely installed, a test of the equipment shall be conducted by the Contractor under the direction of the Engineer to prove compliance with the requirements set forth for the pump design. An efficiency test of the pump shall also be conducted and the Contractor shall furnish all instruments, meters, gauges and incidentals which may be required for the test.
- B. Pump capacity and pump discharge head shall be recorded at a minimum of 5 capacity points along the curve. One of the capacity points shall be within plus or minus 2 percent of the design capacity as shown on the approved shop drawing submittal of a pump curve. The pump at all times shall be operated at plus or minus 5 percent of the design speed
- C. Upon recording pump discharge and pressure at 5 capacity points, the pump shall be shut

down and the water level recovered within 1-in of static levels. At this time, the pump shall be operated within plus or minus 2 percent of the design capacity for a period of 1 hour. Measurements of pump capacity, discharge head, horsepower input and motor speed shall be made.

- D.** Pump performance shall be computed from field pump test data. After accounting for field test accuracy, the well pump shall be expected to operate within 5 percent of the approved head capacity curve and not more than 2 percent from the approved efficiency curve. Correct any condition to obtain performance equal to these field operating conditions

Fittings Materials Specifications

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

Gate valves none rising stem:

- 13- Body: Cast Iron
- 1- Bonnet: Cast Iron
- 2- Packing Box: Cast Iron
- 3- Disc Cast: Iron
- 4- Hand Wheel: Cast Iron
- 5- Body Seat Ring: Bronze
- 6- Disc Seat Ring: Bronze
- 7- Gland Cast: Iron
- 8- Stem Nut: Bronze
- 9- Stem Bronze
- 10- Bonnet Gasket: steel
- 11- Packing Box Gasket: steel
- 12- Bonnet Bolt & Nut: Steel
- 13- Gland Stud & Nut: Steel
- 14- Packing Box Stud & Nut: Steel
- 15- Top Nut: Steel
- 16- Washer: Steel
- 17- Packing: Graphite Fiber Commercial
- 18- Operating Nut: Cast Iron A 126 Class B

19- Coating: Electro statically applied epoxy inside and outside,

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

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

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

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

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

APainting 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.

Carbon steel line shafts: According to ASTM A576

Irrigation Steel Pipes Welded Black Steel Pipes, [ASTM A53](#) 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 (Grades A)

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