Request for Quotation (RFQ)

For Pumps

Contents

1. Scope of work

1.1 Supplying of Cold (Domestic) water **variable speed motor driven (VSD) pump set**, single/multi stage centrifugal pumps with axial suction port, radial discharge port and horizontal shaft set and all accessories as shown on the drawing and as specified. **Dry running protection**, strainer, pressure gauges, flexible connections, rubber isolator, control panel, electrical power connection, control cables to control panel, jointing according to drawings, specifications and manufacturer recommendations. As per below quantity :-

1.2 Supplying of Irrigation pump set, single/multi stage centrifugal pumps with axial suction port, radial discharge port and horizontal shaft set and all accessories as shown on the drawing and as specified. **Dry running protection**, strainer, pressure gauges, flexible connections, rubber isolator, control panel, electrical power connection, control cables to control panel, jointing according to drawings, specifications and manufacturer recommendation. As per below quantity :-

S.N	Item	Description	Qyt.	Remarks
1	Domestic water pump	Water pump set contains 2 pumps with 12 L/S at 50 m head each.	1 set	
2	Irrigation pump	Irrigation water pump set contains 2 pumps with 5 L/S at 55 m head each.	1 set	

Attachment 1 specifications

SECTION 15440
PLUMBING PUMPS

PART - 1 GENERAL

1.01 SECTION INCLUDES

A. The Work under this Section shall include all labor, materials, and equipment required to furnish and install the pumps and accessories in the location and quantities shown on the drawings and as specified in this section.

B. Contractor shall submit power/control wiring diagrams for all pumps control panels and shall prepare shop drawings for all control panels details and method of installations according to the Egyptian code, IEC standard, manufacturer recommendations and submit to the engineer/consultant for approval.

C. Drawings shall include full details for control panels such as sequence of operation (duty and standby pumps) rating of circuit breakers, protection devices, motor protection relay offers protection to thermal overload, earth fault, phase failure, unbalance and incomplete phase sequence No. of start/hour, over temperature of winding & bearing protection, excessive starting time/locked rotor. (Including the electronic & the variable frequency drive), soft start, soft stop, wires/cables, ect…. And shall submit to the engineer/consultant for approval.

1.02 REFERENCES

A. HI - Hydraulic Institute Standards

Data Book - Hydraulic Institute for Engineering.

B. ASPE - American Society of Plumbing Engineers

Data Book - Fundamentals of Plumbing Design, Volume 1 (1983-84), Chapter 11 "Pumps".

C. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.

Handbook - 1983 Equipment Volume, Chapter 31 "Centrifugal Pumps".

D. UL - Underwriters Laboratories, Inc.

UL 778	Motor Operated Water Pumps.

E. ASTM - American Society of Testing and Materials

ASTM A 36	Structural Steel.
ASTM A 48	Gray Iron Castings.
ASTM A 53	Specification for Pipe, Steel, Black and Hot□Dipped, Zinc□Coated (Galvanized), Welded and Seamless.
ASTM A 108	Steel Bars, Carbon, Cold Finished, Standard Quality.

ASTM A 276	Stainless Steel Bars and Shapes.
ASTM A 297	Steel Castings, Iron-Chromium, Iron-Chromium-Nickel, Heat-Resistant, for General Applications.
ASTM A 536	Ductile Iron Castings.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's pump specifications, installation and start-up instructions, and current accurate pump characteristic performance curves with selection points clearly indicated.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.

C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to plumbing pumps. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

D. Certificate of Compliance.

E. Maintenance Data: Submit maintenance data for each type of pump, control, and accessory; including "trouble-shooting" maintenance guide.

1.04 TRANSPORTATION, HANDLING AND STORAGE

A. Deliver pumps, hardware and accessories in manufacturers original new, protective packing.

B. Handle pumps and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged pumps or components; replace with new.

C. Store pumps and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

D. Comply with manufacturer's written rigging and installation instructions for unloading plumbing pumps, and moving them to final location.

1.05 WARRANTY

A. All pumping assemblies and components including pumps, motors, controls, etc. shall be guaranteed by the system manufacturer in writing for a period of minimum 2 years from date of substantial completion against defective materials and workmanship, including motor burn-out.

Water pressure booster system as a whole shall be also guaranteed in writing by the manufacturer for a period of 2 years from the date of substantial completion against any defects in design, materials, construction or workmanship.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of pumps with characteristics, sizes, and capacities required, whose products have been in

satisfactory use in similar service for not less than 5 years, and shall be subject to approval of the Engineer.

B. Design, manufacture and install pumps in accordance with HI and UL Standards.

C. Provide electric motors and components which are listed and labeled by UL and comply with NEMA Standards.

D. Provide pumps whose performance, under indicated operating conditions, are certified by the pump manufacturer.

E. Single Source Responsibility: All the components and accessories shall be product of single manufacturer.

1.07 PRODUCT HANDLING

Deliver all hardware in manufacturer original protective packing.

PART - 2 PRODUCTS

2.01 GENERAL

A. Statistically and dynamically balance rotating parts.

B. Construction shall permit complete servicing without breaking piping or motor connections.

C. Pumps shall operate at maximum speed of 1750 r/min unless specified otherwise.

D. Pump connections shall be flanged.

E. Pumps shall be provided with pressure gauges at suction and discharge sides.

F. Pumps shall be selected to operate with non-overloading characteristics.

G. The characteristic curve of a centrifugal pump shall be stable, the head shall increase with decrease in delivery until maximum head reached at zero flow which shall not exceed the discharge pressure at rated duty by more than 25%.

2.02 SUBMERSIBLE DRAINAGE PUMPS

A. Furnish and install pumps with sealing flanges, guides, mounting plates, supports, lifting chains and hooks, switches, control boxes, discharge piping, etc. as may be required for complete and operating systems.

B. Duplex submersible drainage pumps shall be of type and capacity as shown on the drawings.

C. A separate mounting plate shall be furnished with each pump, including guide rack support and discharge elbow. All parts shall be coated with tar base epoxy paint.

D. Provide a double door access frame of fabricated cast iron coated inside and outside with tar base epoxy paint. Frame shall support guide rails and junction box. Covers shall be provided with lifting handle and hold-open latch. Pump

discharge shall be through the frame.

E. Provide and install control panel with NEMA 3 weatherproof enclosure for final connection by electrical contractor. A circuit breaker and magnetic starter shall be provided for each pump along with alternating relay, interlock relay, switches, run lights, alarm bell, NEMA 4 junction with mounting bracket.

F. Provide and install sealed float type mercury switches. Float switches shall control:

1. Pump(s) On

2. Pump(s) Off

3. High water alarm.

2.03 WATER PUMPS (POTABLE AND NON-POTABLE WATER VARIABLE SPEED DRIVE)

A. Furnish and install a factory-fabricated and tested automatic water pressure booster system consisting of variable frequency drive (VFD), centrifugal pumps, power and control panels, instrumentation and operation. Package type booster pumping system shall be of type capacity as shown on the drawings. Package type booster pumping systems shall consist of one duty/ standby as mentioned in drawings and shall be installed where shown on the drawings.

B. Pumps: Provide centrifugal, multi stage, horizontal type pumps with mechanical shaft seals. Mount each pump on vibration isolator and connect them with reinforced flexible pipe connection on discharge line.

Provide temperature probe and eccentric purge valve immediately upstream of each PRV. Pump capacities shall be shown on the drawings.

C. Motors: Lead and lag pumps shall be driven by a drip-proof shaft motor, capacity and power ratings as shown on the drawings. Each pump motor shall meet NEMA standards and operate within the available service factor at any point on the pump capacity-head curve.

D. Variable frequency drive (VFD): Furnish complete variable frequency drive(s) as specified herein for the equipment designated on the drawing schedules or control sequences with variable speed controls. Each VFD, with all standard and optional features, shall be factory packaged in a UL rated and listed enclosure most appropriate for each application and location, completely assembled and tested by the manufacturer in an ISO9001 facility. The variable frequency drives shall convert three-phase, 50 Hz utility power to proportionally variable voltage and frequency, three-phase, AC power using the latest isolated gate bipolar transistor (IGBT) technology for step-less motor speed control of one or more three-phase induction motors. Drives shall include integral manual disconnecting means and shall provide means of overload and overcurrent self-protection and motor protection. Input voltage shall be as specified in the schedule.

1. The VFD power input stage shall convert three-phase AC line power to a fixed DC bus voltage. This will be accomplished with a solid state three-phase full-wave diode rectifier with metal oxide varistor (MOV) three-phase protection.

2. The VFD output power shall vary frequency to the motor from 0 to 50 Hz with resultant motor speed varying at the motor nameplate rated speed, with output voltage variation from zero to motor rated voltage for optimum volts per hertz (V/Hz) ratio for fan and pump loads. The output must be a voltage source type generating a sine coded PWM waveform utilizing an asynchronous carrier frequency (output transistor switching frequency is to be independent of drive output frequency). This carrier frequency shall be adjustable to minimize harmonically induced noise or vibration.
3. The VFD shall include a door interlocked, Pad-lockable, input power disconnect switch that will disconnect all input power from the drive and all internally mounted options.
4. Application: Drives shall be capable of controlling and set up for either variable or constant torque loads, as follows.
   a. Variable torque: loads such as centrifugal pumps.
5. Service Conditions and Performance Ratings: All VFD's shall be designed to operate continuously within the following conditions:
   a. Ambient Conditions:
      - Ambient temperature, 0-40^{o}C (32 to 104^{o}F).
      - 0 to 95% relative humidity, non-condensing.
      - Elevation to 1,000 meters (3,300 feet) without de-rating.
   b. Input Ratings:
      - AC line voltage variation, -10% to +10% of nominal,
      - AC line frequency variation: 48-63 Hz.
      - Input AC Voltage Unbalance: Not exceeding **3** percent.
      - Displacement power factor shall not be less than 0.95 throughout the speed range.
   c. Output Ratings:
      - Minimum Efficiency: 97 percent at full load. (The input current rating of the VFD shall be no more than 3% greater than the output current rating.) VFD's with lower efficiencies (higher input current ratings) require the upstream wiring, protection devices, and source transformers to be oversized per NEC 430.120 and are not acceptable. Input and output current ratings must be shown on the VFD nameplate.
      - Minimum Short-Circuit Current (Withstand) Rating: The base VFD shall be UL listed for 100 KAIC without the need for input fuses.
      - Continuous Output Current: 100% of the nominal FLA rating
      - Overload Capability: minimum short term of 110% of the nominal FLA rating for 60 seconds every 10 minutes; minimum peak overload of 130% of the nominal FLA rating for 2 seconds per minute.
   d. Adjustments: The VFD shall include the following minimum adjustments inside the enclosure:
      - Maximum speed limit: adjustable 50-200% base speed.
      - Minimum speed limit: adjustable 0-50% base speed.

- Acceleration time, adjustable 0.1 to 1800 seconds.
- Deceleration time, adjustable 0.1 to 1800 seconds with override circuit to prevent nuisance trips if decal time is set too short.
- Current Regulation limit, adjustable 0-130%.
- Output Carrier Frequency: Field selectable between 1 to 12 kHz.in maximum increments of 4 kHz. See Start- Up Service requirements in Part 3.

e. Protective Features: The VFD shall include the following protective features:

- Protection against input transient voltage spikes (phase to phase and phase to ground).
- Separate overload protection for each motor controlled.
- Protection against input power under voltage, over voltage, and phase loss (input and output).
- Protection against output current overload and over current.
- Protection against over temperature within the VFD enclosure.
- Protection against over voltage on the DC bus.
- DC bus discharge circuit for protection of service personnel.
- Insensitive to incoming power phase sequence.
- Output Ground Fault protection
- Output Short Circuit protection
- Microprocessor fault
- Motor Over-temperature
- Motor Stall protection shall be programmable to provide a warning or stop the drive after the motor has operated above a programmed torque level for a programmed time limit.
- Under-load / loss-of-load (broken drive belt or coupling): The drive shall be programmable to signal the loss-of-load condition via a keypad warning, Form-C relay output, and / or over the serial communications bus. The loss-of-load condition sensing algorithm shall include a programmable time delay that will allow for motor acceleration from zero speed without signaling a false loss-of-load condition.
- Critical frequency lockout ranges, with a minimum of 3 selectable, adjustable dead-bands. The lockout range must be fully adjustable, from 0 to full speed.

f. Line Conditioning and Filtering: Include internal mounted components to mitigate harmonic distortion, provide protection from input transients and reduce EMI/RFI emissions as required for each application. At a minimum, drives shall include the following:

- The VFD shall have internal 5% impedance reactors to reduce the harmonics to the power line and to add protection from AC line transients.

- The 5% impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors.
- VFD's with only one DC reactor shall add an AC line reactor.

- EMI / RFI filters. All VFD's shall include EMI/RFI filters. The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product standard IEC/EN 61800-3 for the First Environment restricted level with up to 100 feet of motor cable. No Exceptions. Certified test reports shall be provided with the submittals confirming compliance to IEC/EN 61800-3, First Environment.

g. Control Features: The VFD shall include the following control features:

- The control pad shall include a backlit LCD multi-line display in plain English. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable). All VFD faults shall be displayed in English words.
- The following display/control parameters shall be located on the front of the enclosure:
  - Hand/Off/Auto selector to start and stop the motor. In the auto position, the drive shall start/stop from a remote contact closure. In the auto position, motor speed shall be determined by the follower signal. In the manual position, motor speed shall be determined by manual adjustment.
  - Power on indication that the VFD is being supplied by the power line.
  - Fault indication that the VFD has tripped on a fault condition.
  - Display shall indicate load parameters such as motor speed (RPM or percent), output frequency/voltage, running load amps, motor torque, motor power (kW), DC bus voltage, motor status, fault or alarming status.
- A set of form C, dry contacts to indicate when the VFD is in the run mode.
- A set of form C, dry contacts to indicate when the VFD is in the fault mode. This fault output shall be hard-wired to BAS independently of Serial Communications interface so it can be monitored even network connection has failed.
- Terminations for safety interlocks such as freeze and smoke shut-down.
- For a fault condition other than a ground fault, short circuit or internal fault, an auto restart function shall provide up to 6 programmable restart attempts. The time delay before restart attempts shall be a minimum of 30 seconds. This function permits automatic restarting after the drive controller detects a fault, provided that the other operating functions are correct, a run command is present, and the fault has disappeared. This shall be a function that is field selectable.
- Run permissive circuit - There shall be a run permissive circuit for valve control. Regardless of the source of a run command.

- Speed Reference Input: Shall accept both a manual speed signal and a 0-10 VDC speed reference analog input signal from the Building Automation System (BAS).
- Feedback Signal: Provide 0-5 VDC or 0-20 mA analog output signal to indicate actual operating speed of VFD. Output signal shall be fed into the BAS.
- BAS Serial Communications Interface: VFD manufacturer shall include factory-installed hardware and software to enable the BAS primarily to monitor and display VFD feedback, status, alarms and energy usage, and secondarily to allow but not be fully dependent on BAS control commands.
- Communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel /decal time adjustments, and lock and unlock the keypad.

E. Sequence of Operation:

1. Underground water tanks are filled from SARAI Mega project water network.
2. At normal case (case of domestic consumption), working pump will be operate to satisfy the desired pressure and flow quantities.
3. Systems equipped with a "no-flow" shutdown will stop when the pump controller determines there has been a "no-flow" condition for a continuous 2 minute period.
4. At emergency case (case of fire), the stand-by pump will be started to satisfy desired pressure and demand quantities.
5. The stand-by pump will be closed once the emergency case terminated.
6. Pumps shall be controlled by pressure switches, pumps shall run in alternate sequence and shall stop with low water level in the tank.
7. The alarm shall be initiated if water level reach's H.H level.
8. The system can also be manually operated.

F. Controls:

1. Power and Control Panel: Furnish a single enclosure power and control panel, NEMA 1, hinged door, lockable for booster pump system. Enclosure shall be steel and furnished with oven-baked enamel. The panel shall include for each pump a fused disconnect switch with external operating handle, starter with 3-leg overload protection, running light and multiple position motor control switch and discharge pressure gauge. It shall also house all control components and include 380 volt control transformer with control power switch, indicating lights, including time relays, audio-visual alarm system, suction pressure gauge and other necessary controls. All of the above shall be factory internally pre-wired and tested in accordance with the provisions of the National Electrical Code. Panel shall have the UL listings or equivalent mark for industrial control panels.
2. Control panels shall incorporate hand-off-automatic selector switches, magnetic starters with thermal overload protectors on all legs, circuit breakers, control transformer, necessary relays and a green pilot light for each motor. An automatic

alternator changes main pump sequence every 24 hours to equalize pump operating time.

3. Pressure and temperature sensing control package shall include a thermal sensing device. If the pump casing temperature rises to an undesirable level during very low flows, this device activates a purge valve to relieve the system of heated water.
4. Control includes or in combination thereof:
    a. Lead Pump Failure: Starts lag pump upon loss of discharge pressure and sounds optional alarm and/or lights indicator light on panel. Manual reset.
    b. Low Suction Pressure Shut-Off: Stops all pumps upon loss of suction pressure. Indicator light panel. Optional audible alarm. Manual reset.
    c. High System Pressure Shut-Off: Instantaneously shuts off pump when pressure in system reaches predetermined point. Indicator light on panel. Manual reset.
    d. No flow shut-off to turn off all pumps at no flow condition. Automatically turns lead pump back on when system pressure drops a minimum of 10 psi and maintains operation for a minimum of 2 minutes.
    e. Low liquid level shut-off to shut-off all pumps at low level in pump suction reservoir, with weather-proof level switch.

G. Factory Pre-Fabrication

1. The entire booster system shall be factory pre-fabricated on a common structural steel stand with all interconnecting piping and wiring completed and operationally tested prior to shipment. Complete package shall include isolation valves on the suction and discharge of each pump. Galvanized steel suction and discharge pipe manifolds, as well as copper tubing with shut-off cocks for gauges and pressure switches, will be furnished assembled. The only field connections required will be the system suction and discharge and power connection at the control panel.
2. All like parts of same type pumps fabricated by the same manufacturer shall be interchangeable.
3. Whenever possible, the pump shall be manufactured such that it shall be possible to disassemble the rotor assembly with minimum disassembly of other parts such as suction and discharge nozzles, bearing supports, etc., being left in place.
4. All castings shall be clean without defect. Casting repairs shall be done only after agreement is reached between the Consultant and the Contractor.
5. All foundry and machine work shall be in accordance with good practice for the class of work involved.
6. All parts shall conform to the required dimensions and shall be free from defects that will prevent proper functioning of the pump.
7. Assembly of parts shall be well fitted and smoothly operating.
8. All internal parts, such as impeller, requiring surface treatment shall be sprayed with PVC epoxy primer in accordance with pump manufacturer's standard practice.
9. Pump sets shall be assembled as completely as possible as a unit including base

plate, driver, couplings and guards, lubrication, seal flush, etc., as the requirement allows. Seal flush systems shall be equipped with appropriate controls-strainers and filters as recommended by the manufacturer.

10. Pump exterior shall be sprayed with PVC epoxy primer and shall be painted to meet specific application requirements in accordance with pump manufacturer's standard practice.

H. Materials

1. A. Pump casing shall be:
   a. Frerritic ductile iron casting conforming to ASTM A395M.

2. Pump shaft shall be:
   a. Stainless steel conforming to ASTM A276, Type 316 L.
3. Wearing Rings shall be:
   a. Replaceable bronze case wearing rings.
4. Impeller and impeller seal ring shall be:
   a. Stainless steel casting conforming to ASTM A743M.
5. Coupling
   a. Flexible coupling with safety guards.
6. G. Bearings
   a. Ball or roller bearings.
   b. Select for 2 years minimum service life at maximum load condition or, rated for minimum life of 10 000 hour, whichever is greater.
   c. Pre-lubricated, grease, water or oil-lubricated bearings shall be used according to application requirements.
7. Mechanical Seal shall be:
   a. Suitable for specific application.
8. Base plate shall be:
   a. Stainless steel as per AISI 316.
9. All other pump parts shall be made from material compatible with pump's basic material and suitable for the liquid being pumped.
10. Tubing and pipe shall conform to ASTM A53M or A120, and in any case, shall be suitable for the service under consideration.

2.04 ALTERNATIVE ITEM: WATER PUMPS (POTABLE AND NON-POTABLE WATER BOOSTER SYSTEM)

A. Furnish and install a factory-fabricated and tested automatic water pressure booster system consisting of diaphragm type pressure tank, centrifugal pumps, suction and discharge headers power and control panels, instrumentation and operation. Package type booster pumping system shall be constant speed discharging constant pressure factory assembled, tested and assembled at factory of capacity as shown on the drawings. Package type booster pumping systems shall consist of duty/ standby as mentioned in drawings and shall be installed

where shown on the drawings.

B. Pumps: Provide centrifugal, multi stage, inline-suction horizontal type pumps with mechanical shaft seals and stainless steel impellers shaft. Mount each pump on vibration isolator and connect them with reinforced flexible pipe connection on discharge line.

Provide temperature probe and eccentric purge valve immediately upstream of each PRV. Pump capacities shall be shown on the drawings.

C. Motors: Lead and lag pumps shall be driven by a drip-proof shaft motor, capacity and power ratings as shown on the drawings. Each pump motor shall meet NEMA standards and operate within the available service factor at any point on the pump capacity-head curve.

D. Pressure Tank: Provide factory pre-charged diaphragm type pressure tank of required size with replaceable flexible membrane. Construct in accordance with ASME Code and provide ASME stamp of pressure as indicated in drawings.

E. Method of Operation: The lead pump operates. When the demand exceeds the capacity of the lead pump, the second pump starts automatically and when the demand exceeds the capacity of both pumps, (in case of 3 pumps system where required, when the demand exceeds the capacity of two pumps, the third pump will start automatically). All pumps shall continue to operate until demand decreases to a point within the capacity of the lead pump. The controls are programmed to alternate the 1-lead pump every 24 hours to equalize each pump operating time.

F. Controls

1. Power and Control Panel: Furnish a single enclosure power and control panel, NEMA 1, hinged door, lockable for booster pump system. Enclosure shall be steel and furnished with an oven-baked enamel. The panel shall include for each pump a fused disconnect switch with external operating handle, starter with 3-leg overload protection, running light and multiple position motor control switch and discharge pressure gauge. It shall also house all control components and include 380 volt control transformer with control power switch, indicating lights, including time relays, audio-visual alarm system, suction pressure gauge and other necessary controls. All of the above shall be factory internally pre-wired and tested in accordance with the provisions of the National Electrical Code. Panel shall have the UL listings or equivalent mark for industrial control panels.
2. Control panels shall incorporate hand-off-automatic selector switches, magnetic starters with thermal overload protectors on all legs, circuit breakers, control transformer, necessary relays and a green pilot light for each motor. An automatic alternator changes main pump sequence every 24 hours to equalize pump operating time.
3. Pressure and temperature sensing control package shall include a thermal sensing device. If the pump casing temperature rises to an undesirable level during very low flows, this device activates a purge valve to relieve the system of heated water.
4. Control includes or in combination thereof:

a. Lead Pump Failure: Starts lag pump upon loss of discharge pressure and sounds optional alarm and/or lights indicator light on panel. Manual reset.

b. Low Suction Pressure Shut-Off: Stops all pumps upon loss of suction pressure. Indicator light panel. Optional audible alarm. Manual reset.

c. High System Pressure Shut-Off: Instantaneously shuts off pump when pressure in system reaches predetermined point. Indicator light on panel. Manual reset.

d. No flow shut-off to turn off all pumps at no flow condition. Automatically turns lead pump back on when system pressure drops a minimum of 10 psi and maintains operation for a minimum of 2 minutes.

e. Low liquid level shut-off to shut-off all pumps at low level in pump suction reservoir, with weather-proof level switch.

G. Factory Pre-Fabrication

1. The entire booster system shall be package with factory assemble and tested, adjusted, shipped to site as integral unit, consisting of pumps, valves and stainless steel with control panel assembled on fabricated steel piping base with structural steel frame work. The factory assembled requirements shall be as per the following standard (UL listed, CE, TUV). Complete package shall include isolation valves on the suction and discharge of each pump. Galvanized steel suction and discharge pipe manifolds, as well as copper tubing with shut-off cocks for gauges and pressure switches, will be furnished assembled. The only field connections required will be the system suction and discharge and power connection at the control panel.
2. All like parts of same type pumps fabricated by the same manufacturer shall be interchangeable.
3. Whenever possible, the pump shall be manufactured such that it shall be possible to disassemble the rotor assembly with minimum disassembly of other parts such as suction and discharge nozzles, bearing supports, etc., being left in place.
4. All castings shall be clean without defect. Casting repairs shall be done only after agreement is reached between the Consultant and the Contractor.
5. All foundry and machine work shall be in accordance with good practice for the class of work involved.
6. All parts shall conform to the required dimensions and shall be free from defects that will prevent proper functioning of the pump.
7. Assembly of parts shall be well fitted and smoothly operating.
8. All internal parts, such as impeller, requiring surface treatment shall be sprayed with PVC epoxy primer in accordance with pump manufacturer's standard practice.
9. Pump sets shall be assembled as completely as possible as a unit including base plate, driver, couplings and guards, lubrication, seal flush, etc., as the requirement allows. Seal flush systems shall be equipped with appropriate controls-strainers and filters as recommended by the manufacturer.
10. Pump exterior shall be sprayed with PVC epoxy primer and shall be painted to meet specific application requirements in accordance with pump manufacturer's

standard practice.

H. Materials

1. A. Pump casing shall be:
   a. Frerritic ductile iron casting conforming to ASTM A395M.
2. Pump shaft shall be:
   a. Stainless steel conforming to ASTM A276, Type 316 L.
3. Wearing Rings shall be:
   a. Replaceable bronze case wearing rings.
4. Impeller and impeller seal ring shall be:
   a. Stainless steel casting conforming to ASTM A743M.
5. Coupling
   a. Flexible coupling with safety guards.
6. G. Bearings
   a. Ball or roller bearings.
   b. Select for 2 years minimum service life at maximum load condition or, rated for minimum life of 10 000 hour, whichever is greater.
   c. Pre-lubricated, grease, water or oil-lubricated bearings shall be used according to application requirements.
7. Mechanical Seal shall be:
   a. Suitable for specific application.
8. Base plate shall be:
   a. Stainless steel as per AISI 316.
9. All other pump parts shall be made from material compatible with pump's basic material and suitable for the liquid being pumped.
10. Tubing and pipe shall conform to ASTM A53M or A120, and in any case, shall be suitable for the service under consideration.

I. SEQUENCE OF OPERATION

SAME AS 2.03

2.05 COLD WATER CIRCULATING PUMPS

A. Pumps: Provide centrifugal, multi stage, inline-suction horizontal type pumps with mechanical shaft seals and stainless steel impellers shaft. Mount each pump on vibration isolator and connect them with reinforced flexible pipe connection on discharge line.

B. Materials

1. Pump casing shall be:
   a. Frerritic ductile iron casting conforming to ASTM A395M.
2. Pump shaft shall be:
   a. Stainless steel conforming to ASTM A276, Type 316 L.
3. Wearing Rings shall be:

a. Replaceable bronze case wearing rings.

4. Impeller and impeller seal ring shall be:
   a. Stainless steel casting conforming to ASTM A743M.
5. Coupling
   a. Flexible coupling with safety guards.
6. G. Bearings
   a. Ball or roller bearings.
   b. Select for 2 years minimum service life at maximum load condition or, rated for minimum life of 10 000 hour, whichever is greater.
   c. Pre-lubricated, grease, water or oil-lubricated bearings shall be used according to application requirements.
7. Mechanical Seal shall be:
   a. Suitable for specific application.
8. Base plate shall be:
   a. Stainless steel as per AISI 316.
9. All other pump parts shall be made from material compatible with pump's basic material and suitable for the liquid being pumped.
10. Tubing and pipe shall conform to ASTM A53M or A120, and in any case, shall be suitable for the service under consideration.

C. Sequence of operation (circulation pumps)
   1. Every circulating pump is on for 12hrs. Per day alternatively.
   2. Each circulating pump is off after 12hrs. Of operation.
   3. Both pumps are off if domestic pumps starts.
   4. In case of one circulating pump failure the other pump will work for 20hrs.only to give the pump a time to rest and close valve will be open manually.

2.06 IRRIGATION PUMPS

Irrigation pump set will be package unit (duty/ standby) as mentioned on drawings. Pump will be same as domestic water pump as mentioned above and with type and capacity as shown in drawings.

2.07 HYPOCHLORITE SYSTEM

A. Complete system shall be provided for feeding calcium hypochlorite solution for disinfection of water systems shall prevent liberation of free chlorine due to mixing of acid with hypochlorite solution.

B. CHEMICALS PUMPS

1. The chemical pumps shall be capable of delivering the solutions required for startup and maintenance in 24 hours with a variation in the actual feed not exceeding 10 percent above or below the set rate. The pumps shall be as simple as practicable to secure reliable service, and shall have parts so arranged as to be

readily accessible for inspection, cleaning, repair, and replacements. Rubber or plastic diaphragms, where used, shall be reinforced with fabric or other material to insure satisfactory service against the pressure indicated. The reciprocation of the diaphragm of plunger of plunger shall be in a straight line.

2. Oscillating cylinders shall not be permitted. Inlet, discharge, and check valves shall be designed to give positive and efficient operation. and to prevent excessive clogging. An indicating device that will permit manual adjustment of the rate of chemical solution feed throughout the pumping range shall be provided. When V-belt drives are used, the drive unit or source of power shall deliver to the pump a shaft speed suitable for the operation of the pump. A stand-by pump shall be provided and shall be piped in parallel with other pumps within the system.

C. ELECTRIC MOTORS

1. Electric motors for chemical pumps shall be suitable for operation on single-phase alternating current. Each motor shall be totally enclosed for operation in a 50 deg C ambient temperature. The motor shall be of sufficient size to operate the chemical pump continuously under the maximum operating conditions without exceeding the rated load of the motor.

D. SOLUTION TANKS

1. Solution tanks shall be made of plastic, or of ceramic materials and shall be sufficient for storing one week supply of solutions.

E. SOLUTION LINES

1. Rubber hose or plastic tubing specially designed to resist the action of chlorine shall be provided to connect solution tanks with pumps or other devices and to conduct the solution to the point of application. Horizontal runs of hose or tubing shall be adequately supported. Shutoff cocks, as required, shall be provided. The chlorine solution shall be introduced into water lines by means of a hard rubber or plastic injection nozzle, or by means of a suitable diffuser tube inserted into the line through a corporation cock.

2. The device for introducing the solution into the water supply line shall be constructed in such a way that any accidental breakage of discharge hose or tubing shall not cause water to escape from the water supply line and shall allow disassembling of the unit without leakage from the line.

F. ACCESSORIES

1. Gauges, connections, solution hose or tubing, strainers, valves, and appurtenances necessary for satisfactory operation shall be furnished. Provision shall be made to prevent siphoning of the solution into the point of application in case of low pressure or partial vacuum in the water supply line and to prevent backflow when the apparatus is not in operation.

2. Each system shall be provided with sight-feed glass for visible inspection to determine whether the solution is being correctly delivered. Sight glass shall be easily removable for cleaning.

3. All parts subject to contact with solution shall be made of materials that will not be corroded by the solution.

2.08 CHEMICAL CONTROL CENTER

A. Water residual chlorine level shall be monitored and controlled from a packaged type chemical control center contained wall-mounted metal cabinet. The chemical control Centre shall operate on single-phase power. Circuit boards and sensors within the control Centre shall be solid-state of the quick disconnect type to allow easy component change. A flow switch shall be provided to deenergize circuits in the event of loss of flow.

B. Chemical feed circuits shall also be deenergized the chlorine and an alarm sounded in the event of high or low chlorine residual. Chlorine residual control shall be adjustable over a range of 0.3 to 3.0 ppm. Residual shall be maintained within +0.2 ppm of control setting adjustable over a range of 7.0 to 8.0 PH and shall be.

C. ALARMS

1. Alarms shall be provided for the following:

High chlorine

Low chlorine

Loss of flow

Chlorine feed

D. INDICATOR LIGHTS

1. Indicator lights shall be provided for the following;

System on

Loss of flow

High chlorine

Low chlorine

Chlorine feed

E. CHLORINE RESIDUAL METERS

1. Separate meters shall be provided for indication chlorine residual. Meters shall be direct reading and shall be visible through a plastic window in the door of the control Centre cabinet.

F. PROBE ASSEMBLY

1. A platinum electrode shall be provided for sensing chlorine residual.

G. SEQUENCE OF OPERATION

1. Dosing pumps are on when domestic lead pump is on.
2. Dosing pumps regulates dosage (ppm) according to domestic water flow measured.
3. Dosing pumps are off when domestic lead pump is off or no-flow condition occurs.

2.09 AUTOMATIC WATER LEVEL CONTROLLER

A. An automatic water level controller shall be supplied, consisting of the following:

1. The make-up valve shall be of the spring and diaphragm type, hydraulically operated, with copper float and brass adjustable vertical float rod, or of the double probe electrode type with stainless steel electrodes and holder supplied within a cylindrical PVC container.
2. A solenoid valve with the necessary relay shall be provided in the control circuit.
3. A high water alarm device, supported over the tank, and provided with a three-pole relay shall actuate the alarm system and close the make-up valve through the solenoid valve in the control circuit.

2.10 FLAT GRATING AND FRAME COVER FOR SUMP PIT:

Flat grating and strengthened frame complying with EN 124:1994 class C250 (Light test load), manufactured from spheroidal graphite cast iron complying with grade 500-7 to ISO 1083. the unit is coated with non-toxic water based black paint.

PART - 3 EXECUTION

3.01 INSTALLATION

A. Examine area and conditions under which pumps are to be installed. Do not proceed with the work until unsatisfactory conditions have corrected in manner acceptable to the Engineer.

B. Installation shall be done in accordance with NFPA 20, the manufacturer's written instructions, and as specified herein.

C. Provide access around the pumps for service as indicated or required, but in no case less than that recommended by the manufacturer.

D. Unless indicated otherwise, install pumps on minimum of 100 mm high concrete base equal or greater than 3 times total weight of pumps and motors, with anchor bolts poured in place.

E. Piping Connection: Refer to the relevant Sections of Division 15 - MECHANICAL. Provide ring, valves, gauges, accessories, supports and flexible connection as shown on the drawings or as required.

F. Electrical Wiring: Refer to the relevant sections of Division 16 - ELECTRICAL for materials and installation. Install electrical devices furnished by the manufacturer but not specified to be factory-mounted. The contractor responsible for the final power connection from the power source (disconnect switch in the pump room) to the fire pump control panel including cables.

3.02 SHOP TESTING

A. Pump performance tests shall be conducted in accordance with Hydraulic Institute test codes as described in HI E35.01, E37.01 and E39.01. In addition, each pump shall be tested at five points of operation from shut-off head to run-out

condition, including the guaranteed pump's performance point.

B. All pumps shall be hydrostatically tested for leaks at 1.5 times the design pressure. There shall be no leakage during the one hour test period.

C. The Contractor shall submit manufacturer's test certificates, including test data to show that pump meets specifications.

3.03 FIELD TESTING

A. Field performance test of all pumps shall be witnessed by the Engineer.

B. Field testing shall be in accordance with following requirements:

1. All pumps shall be tested in accordance with ANSI B73.1 and ANSI B73.2.

C. All tests shall be subject to approval of the Engineer.

3.04 ADJUSTING AND CLEANING

A. Check alignment, and where necessary, realign shafts or motors and pumps within recommended tolerances by manufacturer.

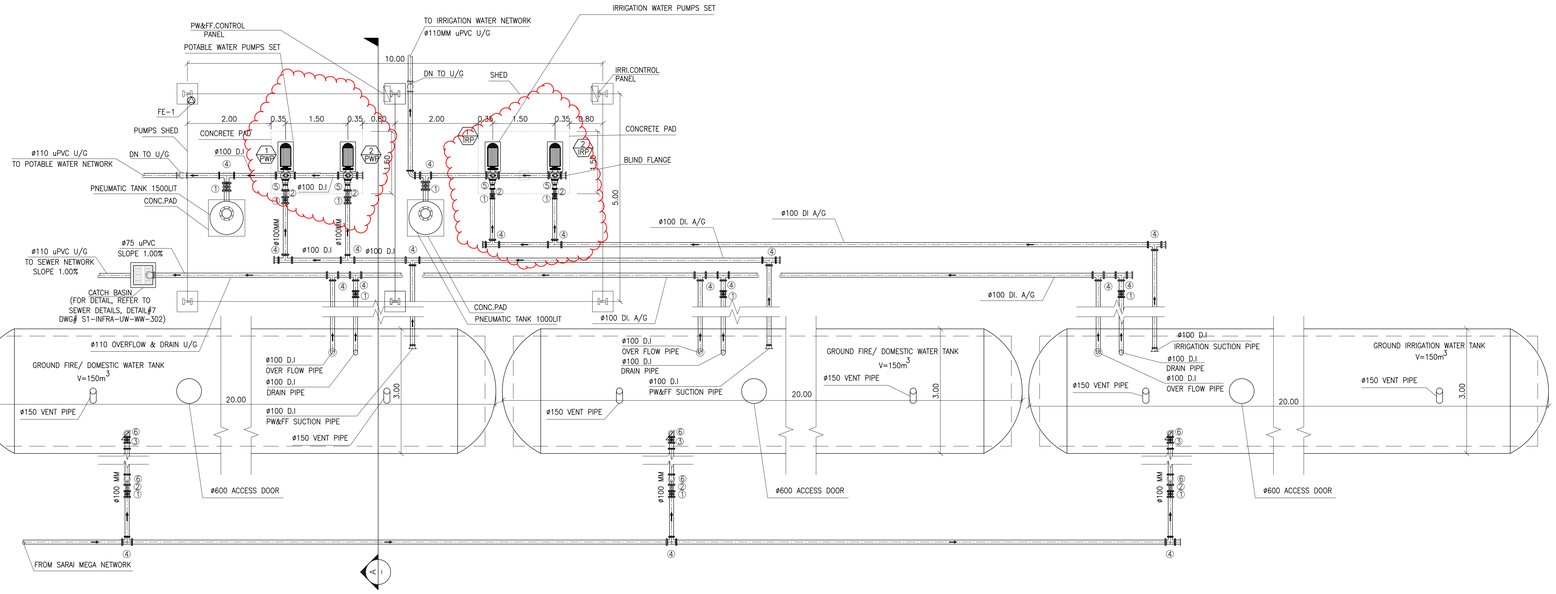
B. Start-Up: Lubricate pumps before start-up. Start-up in accordance with manufacturer's written instructions.

C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

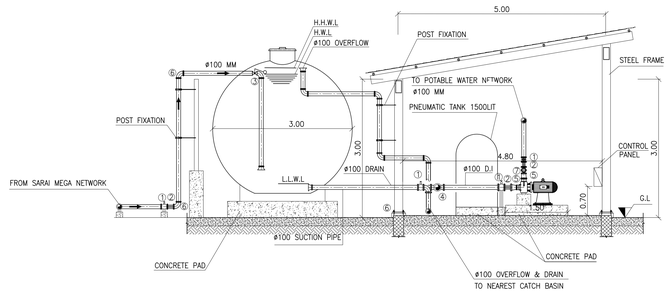
END OF SECTION

Attachment 2 Drawings

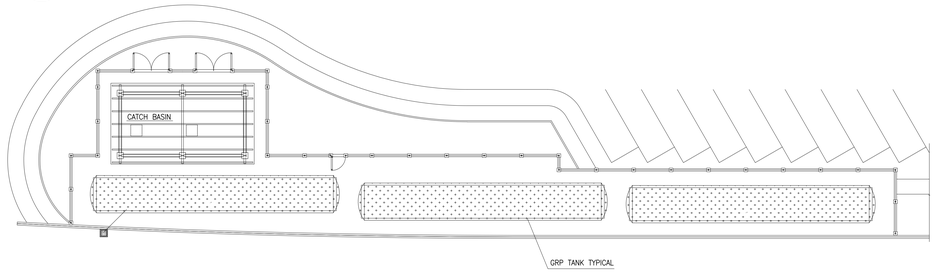
NORTH



1 PLAN



2 SECTION A



3 GRP TANKS AND PUMPS LAYOUT
SEE NOTE# 14.

MECHANICAL WORKS - POTABLE WATER PUMPS

PUMPS SCHEDULE												ELECTRIC REQUIREMENTS (KW)		
TYPE	LOCATION	QTY.			CAPACITY /EACH (L/S)	HEAD (M)	MOTOR							
							KW	PHASE	HZ			CONNECTED	DEMAND	*EMERGENCY
POTABLE WATER PUMP SET (1 PW) (2 PW)	PUMP SHED	2	WORKING	1	12	50	22.0	3	50			1X22.0	1X22.0	1X22.0
			STANDBY	1	12	50	22.0	3	50			1X22.0	1X22.0	1X22.0

* INCASE OF GENERATOR AVAILABLE

MECHANICAL WORKS - IRRIGATION PUMPS

PUMPS SCHEDULE												ELECTRIC REQUIREMENTS (KW)		
TYPE	LOCATION	QTY.			CAPACITY /EACH (L/S)	HEAD (M)	MOTOR							
							KW	PHASE	HZ			CONNECTED	DEMAND	EMERGENCY
IRRIGATION PUMP SET (1 IRP) (2 IRP)	PUMP SHED	2	WORKING	1	5	55	11.0	3	50			1X11.0	1X11.0	–
			STANDBY	1	5	55	11.0	3	50			1X11.0	–	–

ITEM NO	DESCRIPTION
1	GATE VALVE
2	DISMANTLING JOINT
3	FLOAT VALVE
4	TEE
5	REDUCER
6	ELBOW
7	CHECK VALVE

NOTES:

1. READ THIS DRAWING IN CONJUNCTION WITH THE RELATED CIVIL DRAWINGS .
2. POWER SUPPLY TO ALL PUMPS SHALL BE FED FROM THE CONTROL PANEL AS SHOWN ON THIS DRAWING.
3. ALL PIPES AND PIPE FITTINGS IN THE PUMP ROOM SHALL BE OF D.I. EXCEPT OVERFLOW PIPES SHALL BE uPVC.
4. THE EXACT LEVELS/DIMENSION SHALL BE CALCULATED IN SHOP DRAWING AS PER EQUIPMENT & FITTINGS DATA SHEET.
5. TANKS'S PAD SHALL BE EXTEND AT LEAST 300MM BEYOND TANK OUTLINE IN ALL DIRECTION.
6. THE DIMENSIONS OF EQUIPMENT & CONCRETE PADS SHOWN ON THIS DRAWING MAY BE ALTERED AS PER THE MANUFACTURER'S EQUIPMENT.
7. THE CONTRACTOR SHALL VERIFY THE POSITION OF INLET/OUTLET NOZZLES PRIOR TO LAYING THE FEEDING/DRINED PIPELINES
8. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND MATERIAL DATA SHEETS TO THE SUPERVISION ENGINEER FOR APPROVAL PRIOR ANY CONSTRUCTION.
9. THE CONTRACTOR SHALL FOLLOW THE MANUFACTURE'S INSTALLATION INSTRUCTIONS, ANY VARIANCE IN THESE INSTRUCTIONS MUST BE APPROVED BY MANUFACTURE IN WRITING PRIOR TO TANK INSTALLATION
10. CONTRACTOR SHALL SUBMIT CONTROL PANELS DETAILS AND WIRING DIAGRAMS FOR EVERY TYPE OF PUMP MENTIONED IN PUMP SCHEDULE TABLE ACCORDING TO THE MANUFACTURER RECOMMENDATIONS IN SHOP DRAWINGS. DRAWINGS SHALL INCLUDE FULL DETAILS FOR CONTROL PANELS SUCH AS SEQUENCE OF OPERATION (DUTY AND STANDBY PUMPS) RATING OF CIRCUIT BREAKERS, PROTECTION DEVICES, MOTOR PROTECTION RELAY OFFERS PROTECTION TO THERMAL OVERLOAD), EARTH FAULT, PHASE FAILURE, UNBALANCE AND INCOMPLETE PHASE SEQUENCE NO. OF START/HOUR, OVER TEMPERATURE OF WINDING & BEARING PROTECTION, EXCESSIVE STARTING TIME/ LOCKED ROTOR. (INCLUDED THE ELECTRONIC & THE VARIABLE FREQUENCY DRIVE). SOFT START, SOFT STOP, WIRES/CABLES, ETC. AND SHALL BE SUBMITTED TO THE ENGINEER/CONSULTANT FOR APPROVAL.
11. CONTRACTOR SHALL VERIFY EXISTING CONDITION/ UTILITIES BEFORE SHOP DRAWINGS /CONSTRUCTION.
12. FOR STRUCTURE DETAILS PLEASE REFER TO STRUCTURE DRAWINGS.
13. FOR LOCATION OF TANKS AND PUMPS SHED SEE DWG# S1-INFRA-UW-PW-101.
14. FOR FENCE, ARCHITECTURAL, SHED DETAILS REFER TO ARCH. DWGS
15. THE CONTRACTOR SHALL ENSURE THAT THE CONNECTION LEVELS BETWEEN THE GRP TANKS AND PUMPS SATISFIES THE REQUIRED NPSH FOR THE PUMPS.
16. THE CONTRACTOR SHALL STUDY AND REVIEW THE DESIGN CONTAINED IN THE TENDER DOCUMENTS AND IN CASE OF ANY CHANGES OR MODIFICATIONS IN THE SYSTEM, OR PROJECT DATA, THE CONTRACTOR MUST SUBMIT THE DESIGN AND ALL NECESSARY DETAILS AS SPECIFIED IN THE SPECIFICATIONS. IN ADDITION TO THE ABOVE, THE CONTRACTOR MUST SUBMIT DETAILS, SHOP DRAWINGS FOR ALL SUPPLIER/PATENT SYSTEMS OR EQUIPMENT-DEPENDENT ENGINEERING TO THE CLIENT FOR REVIEW AND APPROVAL PRIOR TO UTILIZING SUCH SYSTEMS.

SEQUENCE OF OPERATION (DOMESTIC PUMPS)

1. UNDERGROUND WATER TANKS ARE FILLED FROM SARAI MEGA PROJECT WATER NETWORK IF IT'S AVAILABLE OR WATER TANKER AT EARLY STAGES.
2. PUMPS SHALL BE CONTROLLED BY BOTH PRESSURE AND FLOW SWITCHES.
3. AT NORMAL CASE (CASE OF DOMESTIC CONSUMPTION), THE WORKING PUMP WILL OPERATE TO SATISFY THE DESIRED PRESSURE AND FLOW QUANTITIES.
4. SYSTEMS EQUIPPED WITH A "NO- FLOW" SHUTDOWN WILL STOP WHEN THE PUMP CONTROLLER DETERMINES THERE HAS BEEN A "NO- FLOW" CONDITION FOR A CONTINUOUS 2 MINUTE PERIOD.
5. AT EMERGENCY CASE (CASE OF FIRE), THE STAND-BY PUMP WILL BE STARTED TO SATISFY DESIRED PRESSURE AND DEMAND QUANTITIES.
6. THE STAND-BY PUMP WILL BE CLOSED ONCE THE EMERGENCY CASE TERMINATED
7. PUMPS SHALL BE CONTROLLED BY PRESSURE SWITCHES. PUMPS SHALL RUN IN ALTERNATE SEQUENCE AND SHALL STOP WITH LOW WATER LEVEL IN THE TANK.
8. THE ALARM SHALL BE INITIATED IF WATER LEVEL REACH'S H.H LEVEL OR L.L.W.L .
9. THE SYSTEM CAN ALSO BE MANUALLY OPERATED.

SEQUENCE OF OPERATION (IRRIGATION PUMPS)

1- PUMPS AUTOMATIC SEQUENCE OF OPERATION SHALL BE DERIVED BY TERTIARY IRRIGATION CONTRACTOR.

2- THE SYSTEM CAN ALSO BE MANUALLY OPERATED.

IRRIGATION PUMPS ALARM

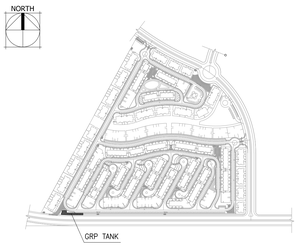
AN ALARM SHALL BE INITIATED AT THE CONTROL PANEL FOR ANY OF THE FOLLOWING EVENTS:

1- IRRIGATION PUMP FAILURE TO START: IF THE DUTY PUMP FAILS TO START, THE STAND-BY PUMP SHALL CUT-IN AUTOMATICALLY.
2- IRRIGATION PUMP FAILURE DURING NORMAL OPERATION.
3- HIGH WATER LEVEL ALARM INSIDE IRRIGATION TANK.
4- LOW WATER LEVEL INSIDE IRRIGATION TANK.

Revisions :

NO.	DESCRIPTION	DATE
0	ISSUED FOR CONSTRUCTION STAGE	01/2019

Remarks/Key Plan :



Project :

SARAI-S1

Owner/Developer :

شركة مدينة نصر للاسكان والتعمير
MADINET NASR HOUSING & DEVELOPMENT

Architectural Detail Design Consultant :

شركة المصادات لاستشارية الهندسية المصرية (مصر كونسلت)
Egyptian Co. For Eng. Consulting Services (Misr Consult)
MISRCONSULT

Structure / MEP / Infrastructure Consultant :

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Egyptian Co. For Eng. Consulting Services (Misr Consult)
MISRCONSULT

Master Plan Consultant :

SITES INTERNATIONAL

Discipline:

☐ Architectural ☐ Structural ☐ Electromech. ☒ Infrastructure ☐ Master Plan

Issued For :

☐ Approval ☐ Permits ☐ Tender ☒ Construction

Building :

POTABLE WATER TANK

Drawing Title :

TEMPORARY WATER & IRRIGATION
GRP TANKS- MECHANICAL DETAILS

Scale Bar :			Scale :
			NTS
Drawn By :	Designed By :	Checked By:	Approved By:
A.FATHY	G.NASR	A.AHMED	M.SOLIMAN
Dwg. No. :		Revision :	Date :
S1-INFRA-AN-PWT-M01		0	JAN. 2019