The real time shall be maintained without re-setting in the event of a power failure lasting a minimum of 24 hours. Lightning protection shall be provided for all field controllers. All equipment shall be grounded to a local grounding rod strictly in accordance with the manufacturer's printed instructions.

B.16.4 *Pump Set*

The Contractor shall provide a second class water booster pump set as a supply for the irrigation. Booster pump set to be as per Section B.15. Irrigation to be metered and water meter to be interfaced to the BMS system. Pump also to be connected to BMS system.

B.16.5 *Screen Filter*

The irrigation system shall be provided with the required amounts of automatic self-cleaning filters. These filters shall be specifically suitable for use with organic contaminants. Cleaning shall be effected by a hydraulically powered suction scanner, automatically activated when the differential pressure across the filter reaches an adjustable level, nominally 5 psi.

The screen shall be stainless steel 316 with 75-micron mesh size. The filter body and internal parts including flanges shall be stainless steel. Flushing line to be connected to the nearest surface water drainage, if it is not possible, connection has to be made to a soak pit. The capacity of each filter shall be minimum 100gpm at 2.5 psi maximum pressure loss. The screen area shall not be less than 90 square inches.

The control system shall feature a fail-safe timer to prevent continuous flushing due to malfunction. Filter should not flush when the irrigation system or pumps are not working.

All the filters shall have isolation valves in the suction as well as delivery side for easy maintenance. The controller for the filters shall be equipped with timer and pressure differential control unit. Pressure gauges shall be connected to suction and delivery side of each filter, pressure switches to be mounted in the electric control panel in an isolated compartment.

B.17 Hot Water Production

B.17.1 *Calorifiers*

The domestic hot water storage calorifiers shall be of the unvented type. The Calorifiers must be strictly in accordance to BS853-1 or equivalent. They must meet with all current health and safety regulations. The unvented systems shall have the hot water storage vessel connected to the domestic water pressure booster pump sets via a back flow prevention device. All unvented calorifiers must be fitted with a pressure relief valve complying with BS EN 1491. The hot water storage calorifiers shall comply with the mandatory Pressure Equipment Directive (97/23/EC). If not applicable, they shall comply with the Sound Engineering Practice requirement of the same directive. All storage calorifiers shall be stainless steel AISI 316 construction. The calorifiers shall be vertically mounted having a cylindrical vessel. The base of the storage calorifiers shall be of the convex type and the vessel shall be supported on feet. A drain point shall be provided at the lowest point of the vessel for regular flush-downs. Brass valves shall be installed on the respective calorifier drain.

The material of the heat exchangers shall be of Stainless steel AISI 316 Ti with free floating turbualtor rods for increased performance and self-cleaning effect. The heat exchangers shall be of good welding quality done with - Automatic inert gas (front and back) welding for exact seams with constant grain. Structure, free of oxidation pockets and highly resistant to corrosion. All calorifiers are to be provided with a sufficiently sized electrical heating battery which is normally off.

All calorifiers shall be insulated. Insulation shall be made of Polyester Fiber Fleece minimum 80 mm thick, all connection openings shall be precise laser cut to reduce heat loss; the material shall be flame retardant to DIN 4102-1 class 2. The insulation shall be enclosed in a Poly propylene outer sheeting of 1.2 mm which shall have aluminum closure strip which shall allow quick opening.

Apart from the above mentioned items the following accessories shall be also included:

Anodes:

The storage tank shall be equipped with non-sacrificial titanium electric anodes. This anode with its titanium oxide element remains permanently intact and should have an unlimited lifespan. It shall not require replacement or maintenance. Once the wires are connected correctly, the green light should indicate that effective corrosion protection is activated. (A red light indicates that flow of current is not providing protection.)

Control Panel

Each high-capacity water heater shall be equipped with an efficient, easy to operate control system to ensure control and performance monitoring of hot water output at all times. The control system shall constantly provide the operator with information about the system's operational status. The control panel shall be with touch screen display and manage the complete Hot water-system, including pumps, valves, heat exchanger for hot-water, pressure transmitter and all other inputs and outputs shall be connected with the controller. The complete visualisation of the system shall be displayed on a touch control panel and shall guarantee a clear overview of the hot water system. The temperature control shall be via the BMS to guarantee flow temperatures above 60°C and the minimum temperature of all return legs of not less than 55°C. An alarm shall be triggered if the power transmission drops below the operating value due to fouling.

This microprocessor-based control system shall facilitate a large number of specific and specialised applications and provide an optimum and reliable supply of freshly heated potable water.

Pumps, valves, sensors: The microprocessor control unit shall process information received from the temperature sensors and calculates the hot water flow rate required to meet the immediate demand. The Pumps and valves shall be controlled accordingly.

Exact temperature control: The operator shall be able to set the hot water output and the primary circuit temperatures on the front panel of the microprocessor control unit. Continuous monitoring of the output and input temperatures on the secondary and primary circuit shall guarantees exact hot water control under all operating conditions.

Performance logging: The microprocessor control unit shall constantly monitors the operating parameters of the water heater and store them in memory for upload to building management systems (BMS) via USB or Ethernet. Approximately 12 month of operation shall be stored in memory, depending on the sampling rate set by the operator.

Legionella cycle controller: Weekly electronic timer for the legionella Cycle, to periodically raise the temperature of the hot water in the storage tank to 65°C for short periods.

The Building Management System (BMS) shall provide full supervisory control and monitoring of the DHW production plant, including set-point adjustment, time scheduling, and fault reporting. The BMS shall modulate the primary supply from the heat pump to maintain the required temperature in the calorifiers.

Anti-Vacuum valve:

The calorifiers must have wafer type anti-vacuum valves to protect against any accidental partial vacuum when the whole volume of water in the domestic cold water system cools down.

Expansion relief valve:

An expansion relief valve must be fitted on the incoming cold water supply. Isolation valves must not be fitted between this valve and the calorifiers.

Expansion Vessel:

The unvented system must be provided and fitted with an expansion vessel to accommodate the expansion of the whole volume of water during the heating cycle.

Remote control

Controller to be connected to main BMS system

B.17.2 *Recirculation pumps*

Hot water recirculation pumps are to be mounted on the return of the hot water side and shall be of stainless steel material. Contractor to ensure the proper installation of thermostatic balancing valves within the hot water system and ensure that all necessary accessories are included into the installation for a hydronic balanced system.

Hot water recirculation pumps are to be in a duty and standby manner and shift the duty every 24 hour. The set is to be complete with manifolds, non-return valves, isolation valves, strainers, pressure switch and all necessary valves. Pump to be complete with integrated control panel for on/off and choosing. Pump to be interface with BMS system for monitoring.

Pump to be complete with nine control functions being three proportion pressure curve, three constant pressure curves and three constant speeds which can assist in the commissioning phase.

B.18 Water Meter

Water meters shall be included with plant equipment as where indicated within the schematics. The material to be provided as indicated in the Brand List by the Client.

Water meters shall be WRAS and MID approved ultrasonic, smart type, water meters with no moving parts. These meters shall be specifically designed for industrial applications and shall be inserted into the pipeline and not clamp on type. The meters shall be complete with high level protocol output, and suitable for connection to the proposed BMS system. The high level protocol should be industry standard (e.g. BACNet IP) and should be compatible to the BMS controllers selected. The meter shall meter cold water consumption.

The following technical specifications shall apply:

- Measuring Accuracy: Class 2 or 3 as per EN 1434
- Mounting: within the pipe run
- Connections: Threaded with couplings
- Humidity: <93% without condensation
- Mechanical Class: M1 according to 2004/22/EG EC directive
- Electrical Class: E1 according to 2004/22/EG EC directive
- Precision class: ISO 4065 rev.2014, Accuracy class 2
- Maximum working Pressure: 16 Bar
- Pressure drop: 0.16 bar
- Liquid temperature:0°C to 50°C
- Display: In-built into the unit
- Battery: Up to 15 years battery life
- Wired communication: Bacnet IP / MODBUS RTU / M-BUS
- Wireless: M-Bus
- Mounting orientation: any
- Electronic Unit:
- Housing degree: IP68
- Ambient temperature: -25 to +55°C
- Sensors type PT500 or PT100 as per EN 60751
- Sensor material Brass