MLRO DL / MLRO Specification

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Condair MLRO DL, also referred to as MLRO Series reverse osmosis water treatment system as indicated on drawing[s] and as indicated on schedule[s].

1.2 QUALITY ASSURANCE

A. Certifications, C-UL US Listed.
B. ISO 9001.
C. ANSI/NFPA 70 - National Electrical Code.

1.3 RELATED SECTIONS

A. 23[ ] Mechanical General
B. 23[ ] Piping Installation
C. 23[ ] Control System

1.4 SUBMITTALS

A. Submit product data under provisions of Section 23. Include product description, model, dimensions, connection sizes and precondition requirements. Include rated outputs, operating weights, furnished specialties, and accessories.
B. Submit manufacturer's installation instructions.
C. Submit operation and maintenance data.
D. Submit coordination drawings. Detail fabrication and installation of RO. Include piping details, plans, and adjacent equipment.
E. Submit minimum water quality requirements and water pressure requirements.

1.5 SCHEDULES

A. Refer to information contained in schedule[s] attached to this specification.
B. RO System to be of type, capacity, and arrangement as listed in schedule[s].
C. Include accessories listed in schedule[s] and those accessories required for type of unit.

REVERSE OSMOSIS WATER TREATMENT SYSTEM - CONDAIR MODEL MLRO DL

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. The Condair MLRO DL, reverse osmosis water treatment system is configured to operate on softened and dechlorinated water.
B. Section Includes skid-mounted package including the following components:
    1. Water Softener
    2. Activated Carbon Filter

3. Five (5) Micron Pre-filter
4. Reverse Osmosis Unit
5. Storage Tank
6. Distribution Pump
7. Ultraviolet Sterilizer for Bacteria Control.
8. Instrumentation.
9. Interconnected piping, plumbing and connection fittings.

C. Provide a self-contained, skid-mounted, pre-piped and pre-wired component package to produce Reverse Osmosis (RO) water for humidification purposes. Components and configuration shall be as indicated on the drawings attached to this specification. Provide auxiliary (dry) contacts (normally open or normally closed) for signaling the building automation system.
D. Except as otherwise indicated, provide water treatment systems and ancillary equipment with manufacturer's standard materials and components as indicated by published product information, designed and constructed by manufacturer for complete installation. Site to provide power line, water to the unit and drain (not by humidifier manufacturer) and feedlines to secondary systems.
E. Acceptable Manufacturers: Subject to compliance with requirements, provide the product indicated on drawings/specifications or a comparable product by one of the following:
    1. **Condair Inc. / Condair Ltd.**
    2. **Condair Group AG**
    3. **ML Systems**
F. The pretreatment equipment shall be designed to remove particulates that can affect the operation of the reverse osmosis unit. The pretreatment equipment shall include the following components:
    1. Water Softener and brine tank.
    2. Activated Carbon Filter ML Systems
    3. Five (5) Micron Pre-filter

2.2 REVERSE OSMOSIS WATER TREATMENT PACKAGE

A. General: Provide reverse osmosis water treatment system of size and capacity as indicated on the schedule and delivering this from its holding tank at a pressure of 3 bars. The system uses a membrane separation process in which water molecules can pass through the membrane, while the majority of salts and minerals are retained and thereafter flushed out the drain. System shall be furnished as a package from the humidifier vendor to include combined distribution skid (RO water treatment system), storage tank, additional system hardware, controls, and all associated devices required for a complete and functioning water treatment system.
B. All equipment listed in this specification shall be factory provided by the manufacturer of the RO package (one of the listed manufacturers). The RO system specified herein shall be factory provided as a skid package. The equipment supplier must be able to provide a fully functional system including all water treatment equipment specified, instrumentation and controls, installation, start-up, owner training and the necessary turnover package including Operation and Maintenance manuals and drawings.
C. Units shall be complete, factory assembled, and tested; and of sizes, arrangements, capacities, and performance as scheduled and as specified in the schedules shown. Units stand-alone use for treating water.
D. Units shall be capable and designed for year-round, 24-hours-a-day operation; and requiring only connections of piping, utilities, and remote sensors, and controllers.
E. All components exposed to water shall be made of corrosion resistant material.
F. RO water storage tank shall include sterile breathing filter and low-water level cutout switch. RO Tank shall come with a 0.2 micron filter to restrict bacteria movement. The RO water storage tank shall be completely black and opaque, allowing no light to pass through and thus restricting

bacterial growth due to light. No transparent or semi-transparent (White translucent) or other tanks will be accepted.

G. Distribution skid and storage tank:
    1. Provide reverse osmosis skid assembly, fully factory built and tested. RO skid shall consist of the following principal components: one or more RO membranes, one or two RO pumps that pump raw water through the RO membrane at a pressure of 116-174 psi (8-12 bar) and into the RO water tank, one variable frequency drive (VFD) and one RO water transfer pump, which delivers pressurized RO water to the consumer at 3.5 bars. RO membranes, pumps and storage tanks are installed on a powder coated steel frame.
    2. A variable frequency drive (VFD) will control the RO pump to maintain a constant pressure from the skid. The factory settings of the VFD will deliver 3.5 bars, but adjustments may be made on-site to allow output pressures up to 6 bars.
    3. All components exposed to water are made of corrosion-resistant material. All hoses are steel-reinforced and drinking water-approved.
    4. Low-pressure cut-off switch: A pressure switch just after the inlet filter protects the RO pump from dry running.
    5. Both the transfer and RO pump are directly mounted on their electric motors. Power is supplied to the 3-phase asynchronous motors via a magnet-operated protective motor switch.
    6. The RO water storage tank shall be completely black and opaque, allowing no light to pass through and thus restricting bacterial growth. No transparent or semi-transparent (white-milky/semi-clear) or other tanks will be accepted.

H. Water Softener: The purpose of the water softener is to remove mineral hardness from water. Softening shall be accomplished by an ion exchange process utilizing a high capacity cation exchange resin in the sodium exchange mode. Automatic regeneration shall be accomplished using a salt (brine) solution.
    1. A non-electric water softener (mechanical only) shall be provided as a pre-treatment to extend the life of the RO Membrane.
    2. A dual tank system shall be used to regenerate on-demand, while the other tank acts on standby and immediately switches over during period of regeneration.
    3. The system shall include two tanks. This duplex configuration shall be flexible to operate in alternating or parallel mode depending on installed program disc. In alternating mode, one tank will be on-line during service. In parallel mode, both tanks will be on-line during service. With either mode, during regeneration cycles, one tank shall provide water to service and to the regenerating tank. A water meter shall initiate system regeneration. The water meter shall measure the processed volume and be adjustable. Service flow shall be down-flow and regeneration flow shall be up-flow.
    4. A combination salt storage tank, with cover, and brine well shall be supplied as part of the system. The brine tank shall be large enough to hold salt for at least ten regenerations between refills. The brine tank shall be made of polyethylene or FRP.
    5. The regeneration control valve shall be top mounted (top of media tank), and manufactured from non-corrosive materials. Control valve shall not weigh more than four pounds. Control valve shall provide service and regeneration control for two media tanks. Inlet and outlet ports shall accept a quick connect, double O-ring sealed adapter. Interconnection between tanks shall be made through the regeneration valve with a quick connect adapter. Control valve shall operate using a minimum inlet pressure of 25 psi (1.7 bar). Pressure shall be used to drive all valve functions. No electric hook-up shall be required. Control valve shall incorporate four operational cycles including; service, brine draw, slow rinse, and a combined fast rinse and brine refill. Service cycle shall operate in a down-flow direction. The brine cycle shall flow up-flow, opposite the service flow, providing a countercurrent regeneration. Control valve shall contain a fixed orifice nozzle

and self-adjusting backwash flow control. The control valve will prevent the by-pass of hard water to service during the regeneration cycle.

6. A combination salt storage and brine production tank shall be manufactured of corrosion resistant, plastic. The brine tank shall have a chamber to house the brine valve assembly. The brine float assembly shall allow for adjustable salt settings and shall provide for a shutoff to the brine refill. The brine tank shall include a safety overflow connection to be plumbed to a suitable drain.
7. Provide interconnecting plumbing and instrumentation.

I. Activated Carbon Filter: The purpose of the activated carbon filter is to remove chlorine, chloramines, tastes, and odors from the water. The media shall be a high capacity black granular carbon with rugged grain structure, high density and large surface area for efficient removal of chlorine/chloramine as well as other taste, odor, and color-causing organics. It shall work effectively over a wide pH range.
    1. The system shall include one tank. This simplex system is designed to operate in an up-flow mode. This configuration allows the unit to run in service without the need for a backwash cycle.
    2. The tanks shall be designed for a maximum working pressure of 125 psi (8.6 bar) and hydrostatically tested at 300 psi (20 bar). Tanks shall be made of polyethylene and reinforced with a fiberglass wrapping. Each tank shall include a 2.5 inch (6.35 cm) threaded top opening. Each tank shall be NSF approved. Upper and lower distribution system shall be of a slot design. Distributors will provide even flow of water.
    3. Each system shall include an activated, acid washed carbon. The media shall be between 8 and 16 Mesh in particle size.

J. Control Panel: Mounted on the main pump station frame, includes a manual on/off/auto switch, fault indicator, service indicator, and terminal connection for power and control wiring. Display to show required maintenance 48 hours before service is due. Connection glands for power and control wiring. The control unit which consists of a touch display and a PLC mounted in the IP 65 rated electrical cabinet as well as a power board for the control of the high pressure pump and connection terminals for power supply. From the touch screen, the operator can view the status of the RO system, water levels in the tank, production, adjust alarm limits, view hour counters, view logged alarms. The pump station is electrically wired at the factory and the control panel must be tested at the factory prior to release.

K. Controls and Wiring: Factory-installed microprocessor type to control and monitor unit, communicate to central-control processor. The controller shall be connected to the building BMS control system via MODBUS RTU or TCP/IP, BACnet MS/TP or BACnet IP interface.
    1. The unit shall have a factory wired and unit mounted central, electrical control panel with a single power supply connection. All internal wiring shall be in accordance with the National Electrical Code. Unit shall have a non-fused main power disconnect and control components required for automatic operation based on signals from the humidity controls. Control panel shall have terminals for remote control devices.

L. Ultraviolet Water Disinfection System: The UV light is utilized to disinfect the water as it passes through the system. UV technology ensures a safe supply of water by using a non-intrusive, physical disinfection method. The flow rates of the UV light vary according to different standards. A flow rate of 11.0, 6.0, and 4.0 gallons per minute are recommended by US Public Health, VIQUA Standard, and NSF/EPA, respectively. Voltages shall be 120V, and frequency of 60 Hertz. Power consumption is 30 Watts. More than 75% UV transmittance is output.

M. Mixed Bed Ion Exchange Resins, CO_2 dosing and Electrical Conductivity (EC) monitoring:
    1. Provide in the scope of work a modular add-on package which allows for the connection of one or two mixed bed ion exchange resin tanks (polishers), alarms for high conductivity, and CO_2 dosing to the RO tank for increasing the conductivity up to 5 µS/cm.

2. The modular add-on electrical conductivity (EC) panel shall be added on to the existing pump station and frame. The EC add-on panel will be seamlessly connected to the pump skid, via existing embedded software from the main control panel, no additional or external software will be accepted.
3. The EC add-on panel shall communicate to the primary control panel on the main pump skid via an Ethernet network cable (RJ45, CAT5 or CAT6), no other means of communication will be accepted.

N. The ion exchange resin tanks shall be furnished with the system to "polish" and demineralize the reverse osmosis water even further, producing deionized water. A conductivity of less than 0.1 µS/cm shall be achieved when passing the reverse osmosis water through the mixed bed filter. The mixed bed resin shall contain anion and cations that will aid in demineralizing the water even further. To raise the conductivity above 5 µS/cm - CO2 shall be added to RO tank - no salts or minerals shall be introduced to the system to raise conductivity.

O. Self-cleaning module/kit of RO Tank (Clean-in-Place)
1. Provide alongside the direct room system and main pump assembly a complete means of disinfection and cleaning in place module that periodically adds or doses the RO tank with a disinfection fluid.
2. The modular self-cleaning add-on box shall comprise a self-priming diaphragm pump with direct digital dosing, a power / control box and a bottle of disinfection fluid.
3. The pumping system shall incorporate pressure monitoring, integrated flow measurement, dosing timer and auto de-aeration. The Clean-in-Place add-on panel will be seamlessly connected to the pump skid, via existing embedded software from the main control panel, no additional or external software will be accepted.
4. The add-on self-cleaning module panel shall communicate to the primary control panel on the main pump skid via an Ethernet network cable (RJ45, CAT5 or CAT6), no other means of communication will be accepted.

P. Transfer (Forwarding) Pump
1. A forwarding pump shall be included with the system whereby the pump can transfer RO water to other uses outside of the intended primary humidification equipment.
2. Forwarding pump shall be embedded onto the main pumping station and installed at the factory by the RO water treatment manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION:

1. Examine ducts, air-handling units, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
2. Examine roughing-in for piping systems to verify actual locations of piping connections before humidifier installation.
3. If preparation is the responsibility of another installer, notify Architect of deviations from manufacturer’s recommended installation tolerances and conditions.
4. Do not proceed with installation until substrates have been properly prepared and deviations are corrected.
5. Commencement of installation constitutes acceptance of conditions.

3.2 INSTALLATION:

1. Install components plumb and level, in accordance with approved shop drawings, product installation details and manufacturer’s recommendations.

1. Install humidifiers and components per manufacturers' instructions.
2. Seal humidifier duct penetrations with flange.
3. Install with required clearance for service and maintenance.

3.3 TESTING AND ADJUSTING:

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections.
2. Test Results: Reported in writing to Architect.
    1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
    2. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
    3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 TRAINING:

1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain humidifiers.
    1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
    2. Review data in maintenance manuals.
    3. Schedule training with Owner, through Architect, with at least seven days advance notice.

3.5 PROTECTION AND CLEANING:

1. Protect humidification system components from damage until date of substantial completion.
2. Repair or replace damaged components that cannot be repaired.
3. Remove temporary protective coverings, excess materials.

END OF SECTION