**RO-E & RO-E+ SPECIFICATION**

**PART 1 – GENERAL**

1.1 Work Included:

a. CONDAIR RO-E / RO-E+ reverse osmosis treatment system as indicated on drawing[s] and as indicated on schedule[s].
b. Equipment start-up and project inspection by qualified factory trained representative.

1.2 Quality Assurance:

a. Certifications: C-UL US Listed.
b. ISO 9001-2008.
c. Products shall be supported with a warranty that ensures the product will be free from defects in materials and workmanship for a period of two years after installation or 30 months from manufacturer's ship date, whichever is earlier.

1.3 Related Sections:

a. 23 01 00 Mechanical General
b. 23[ ] Piping Installation
c. 23[ ] Control System

1.4 Submittals:

a. Submit product data under provisions of Section 23 01 00. Include product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes. Include rated capacities, 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.
e. Submit wiring diagrams including power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
f. 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 SYSTEM – CONDAIR RO-E(+)**

**PART 2 – PRODUCTS**

2.1 The CONDAIR RO-E / RO-E+ packaged reverse osmosis water treatment system produces treated water for use with humidification systems and other general applications. 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. Reverse osmosis assembly to be fully factory built and tested. The system is configured to operate best on softened and dechlorinated water.

2.2 Except as otherwise indicated, provide RO 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 manufacturer).

2.3 Acceptable Manufacturers: Subject to compliance with requirements, provide the product indicated on drawings/specifications or a comparable product by one of the following:

a. Condair Inc.
b. Condair Ltd.

2.4 Unit[s] shall be complete with:

a. One or more reverse osmosis membranes with stainless steel housing.
b. Opaque pressurized storage (1-3 bar) tank, equipped with pressure relief valve.
c. RO pump with pressure sensor that pumps raw water through the RO membrane at a pressure of 8-12 bar. RO pump is directly mounted on their electric motor.
d. 50% hard water recovery rate, 70% softened water recovery rate.
e. 95-98% salt rejection rate.
f. Single power supply connection with mains power cable.
g. Enclosed cabinet, powder painted steel construction with removable cover.
h. Inlet solenoid valve.
i. Components made of corrosion resistant material if exposed to water.
j. Motor over-temperature switch.
k. Check valve to protect RO membrane.
l. Pressure rated hosing.
m. Control panel in a segregated IP rated electrical cabinet. Connection available for control wiring.
n. Internal interconnected piping, plumbing and connection fittings fully assembled on delivery.
o. Internal sampling tap to test the permeate water quality.
p. Pump pressure gauge for displaying the pump pressure at the inlet of the (first) membrane.
q. Capable of integration with CONDAIR RS & DL integrated controller.
r. Logic block standard with throttle valve to control the recirculate and drain water.

s. Water conductivity and temperature sensor for permeate water standard with RO-E+ systems and an optional accessory for RO-E systems.

2.5 Accessories:

2.5.1 Install accessories in accordance with manufacturer's recommendations.

2.5.2 Optional RO-E(+) unit accessories include:

a. Control unit: The CONDAIR RO-A control unit is equipped with a touch panel to operate the control software, an operation status LED to display normal operations, warnings, and error status. Only available on a **stand-alone system**.
b. Water softener: The water softener reduces the water hardness to 0 - 1 °dh (0 - 1.8°Fh, 0 - 18 ppm)
c. Single filter: The single filter contains a 5 µm filter.
d. External water tank: 53, 76, 121, 166, 321, 450 litre RO water tank.
e. Pressure tank safety valve: External safety valve set with mounting and connection material for reverse osmosis pressure tanks.
f. Sampling tap for installation in the supply water pipe.
g. Shut-off valve for installation in the supply water pipe to shut off the water supply.
h. Pressure reducing valve to reduce inlet water pressures >6bar.

2.6 Options:

2.6.1 Install options in accordance with manufacturer's recommendations. Unless otherwise specified, options will be installed on-site.

2.6.2 Condair RO-E(+) options include:

a. Outlet permeate valve: for controlling permeate outlet volume.
b. Drain valve: for controlling the draining and flushing of the internal water systems. The drain valve is installed as standard in the Condair RO-E+ systems by the manufacturer.
c. Volume flow measurement: sensor for measuring the permeate volume flow. The sensor is installed on the outlet line of the membrane(s). Can facilitate membrane permeate tracking to predict aging and replacement.
d. Permeate conductivity measurement: sensor for measuring the permeate conductivity. RO-E+ systems measure conductivity as standard and is installed by the manufacturer.
e. Permeate temperature measurement: sensor for measuring the permeate water temperature to maintain hygienic operation. RO-E+ systems measure conductivity as standard and is installed by the manufacturer.
f. Concentrate valve and conductivity adjustment: Concentrate valve for draining the membrane(s) and conductivity adjustment consisting of a throttle valve and a check valve. Option is standard with the RO-E+ and is installed by the manufacturer.

g. Leakage monitoring: The option includes a monitoring control board and one floor sensor.
h. Remote operating and fault indication: The remote operating and fault indication board has 4 potential-free relay contacts for remote signaling; unit on, unit producing, maintenance due, error present.

**PART 3 – EXECUTION**

3.1 Examination:

a. Examine roughing-in for piping systems to verify actual locations of piping connections before reverse osmosis installation.
b. If preparation is the responsibility of another installer, notify the engineer of deviations from the manufacturer's recommended installation tolerances and conditions.
c. Do not proceed with installation until substrates have been properly prepared and deviations are corrected.
d. Commencement of installation constitutes acceptance of conditions.

3.2 Installation:

a. Install RO water treatment and accessories per manufacturers' instructions.
b. Install with required clearance for service and maintenance.
c. Install with shut of valve and pressure reducer (if water supply pressure >6 bar) upstream from unit. Pipe disconnector also required by some local regulations. Adhere to all local and national installation regulations.
d. Recommend installation with softener and pre-filtration.

3.3 Commissioning, Testing, and Adjusting:

a. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections.
b. Test Results: Reported in writing to the engineer.

    i. Leak Test: After installation, charge the system and test for leaks. Repair leaks and retest until no leaks exist.
    ii. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation. Remediate any malfunctioning units and retest.
    iii. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 Training:

a. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain humidifiers.

i. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
ii. Review data in maintenance manuals.
iii. Schedule training with Owner, through the engineer, with at least seven days advance notice.

3.5 Protection and Cleaning:

a. Protect humidification system components from damage until the date of substantial completion.
b. Repair or replace damaged components that cannot be repaired.
c. Remove temporary protective coverings and excess materials.