

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Nortec ML Series high pressure adiabatic in-space system[s] as indicated on drawing[s] and as indicated on schedule[s].
- B. Complete and operable humidification system [which meets applicable building codes]
- C. 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. ANSI/NFPA 70 - National Electrical Code.
- D. ARI 640, "Standard for Commercial and Industrial Humidifiers.

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, 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 humidifiers. Include piping details, plans, elevations, sections, details of components, and dispersion tubes. Detail humidifiers and adjacent equipment. Show support locations, type of support, weight on each support, and required clearances.
- 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. Humidifiers 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.

HIGH PRESSURE IN-SPACE SYSTEM – NORTEC MODEL MLP(-RO)

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

- A. The Nortec ML, high pressure nozzle humidifier system is configured to operate on Reverse Osmosis (RO) treated water, produced from an integral RO system.

- B. Pre-engineered system, uses nozzle technology to directly inject fine mist into the surrounding environment using high pressured filtered water with no compressor required. In-space misting units are specialty direct room heads designed to accompany the pumping station and spray into the designated environment/space without obstruction.
- C. Except as otherwise indicated, provide humidifiers 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)
- D. Acceptable Manufacturers: Subject to compliance with requirements, provide the product indicated on drawings/specifications or a comparable product by one of the following:
 - 1. Nortec Humidity Inc.
 - 2. Condaire
 - 3. ML Systems

2.2 HIGH-PRESSURE WATER ATOMIZING HUMIDIFICATION PACKAGE

A. General:

Provide high-pressure water atomizing humidifier of size and capacity as indicated on the schedule. System shall be furnished as a package from the humidifier vendor to include combined distribution skid (High Pressure Pump Station) and water treatment system (RO or DI), distribution heads, controls, and all associated devices required for a complete and functioning humidification system (i.e. zone add-ons, electrical conductivity, CO2 dosing, etc.).

Units shall be complete, factory assembled, and tested; and of sizes, arrangements, capacities, and performance as scheduled and as specified in the schedules shown. Unit's stand-alone use for humidifying air.

- 1. 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.
- 2. All components exposed to water shall be made of corrosion resistant material. All hoses are stainless steel braided or high-pressure hoses.

B. Distribution Skid / HP Pump and Motor:

- 1. Provide high-pressure pump skid assembly, fully factory built and tested. Pump skid shall consist of the following principal components: **water lubricated stainless steel pump assembly**, the high pressure pump is installed on a powder coated steel frame with vibration isolators.
Water lubricated, stainless steel axial piston pump for reduced maintenance. Oil lubricated pumps, which require oil changes, are not acceptable. The service life of the pump shall be approximately 8000 hours. The pump shall carry a 24 month or 8000 hour warranty, whichever comes first. The high pressure pump shall be directly driven by the motor, belt drives or geared transmissions are not acceptable. Direct connection to the drive motor using a resilient shaft coupling with bell housing. Adjustment range minimum and maximum shall be 5% to 100%, respectively. The sound level of the operating pump is less than 75 decibels (dB).
- 2. System shall be automatically drainable upon unit shutdown to ensure no residual water remains in high-pressure piping between pump and nozzles. Integral thermal relief valve shall open if internal pump water temperature exceeds 110°F (43°C).
 Relief valve shall recirculate water to the RO water reservoir and allow fresh water to enter the pump. Provide low pressure gauge, liquid filled, 0 to 100 psig (6.89 bar) and high pressure gauge, liquid filled, 0 to 2000 psig (137.9 bar). **Normal operating pressure shall be 1000 psig (68.95 bar).**

All wetted components throughout distribution skid and humidification system shall be stainless steel. All components exposed to water shall be made of corrosion resistant material. All hoses are stainless steel braided or high-pressure hoses.

3. Low-pressure cut-off switch: Protects pump against cavitation and running dry in the event of a low inlet water pressure, below 36 psig (2.5 bar). Unit will shut down pump module, and must be manually restarted after a fault. Maximum allowable water pressure is 102 psig (7.0 bar).
4. Water Temperature Monitoring and Thermal relief valve: If the water temperature exceeds 86°F (30°C), the system will attempt to cool by starting the water treatment system and filling the tank with cold water. If the water temperature exceeds 104°F (40°C), the pump will stop and start emptying the tank of overheated water and produce new water in the tank. If the water temperature exceeds 122°F (50°C), the pump will stop immediately and the system must be reset.

C. Control Panel:

The main control pane must be mounted and integrated on the main pump station frame, includes a manual on/off/auto switch, fault light indicator, service light 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 change the humidity set point in each section (zone), 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.

D. Controls and Wiring:

Factory-installed microprocessor type to control and monitor unit, communicate to central-control processor, shall operate humidification units and maintain humidity set points. The controller shall be connected to the building DDC control system via MODBUS 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 humidity controls. Control panel shall have terminals for remote control devices.
2. Controls shall be capable of shutting down the humidifier when humidity loads are reduced and the process shall be reversed when there is an increase in humidity loads.

E. Integrated Reverse Osmosis (RO) Water Treatment System:

Humidification vendor shall also be a manufacturer of reverse osmosis systems. The manufacturer shall factory install, its own, RO water treatment system integrated with the distribution skid (combined into one cohesive system pump station).

1. System shall include RO pump, RO membrane, and RO water storage tank. 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.
2. **A non-electric water softener (mechanical only) and carbon filters shall be provided as a pre-treatment to extend the life of the RO Membrane.**

F. 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 vary from 100 – 240 volts, and the frequency varies from 50 to 60 Hertz. Power consumption is 30 Watts. More than 75% UV transmittance is output.

G. High Pressure Distribution Nozzles:

Provide 316 Stainless Steel construction with a 0.008" or 0.005" machined orifice. The median droplet size of the nozzle shall be between 10 micron and 40 micron (95% of droplets at 15 micron) at 1,000 psig. Impact pin nozzles are not acceptable. Each nozzle shall include an "anti-drip" valve with an integral spring and ball, check valve, O-ring, nozzle housing and nozzle tip. This unit shall close at pressures below 102 psig to prevent dripping from the nozzle orifice. Nozzles without "anti-drip" valves are not acceptable. All piping shall be rated for a minimum burst pressure of 6,000 psig.

H. In-Space (Direct Room) Humidification Heads:

The humidification heads - which must consist of high pressure nozzles (see Section G), ergonomic humidification dispersion device (with fan), and high pressure water hosing and/or electrical connection), must also meet the following:

1. Humidification head which integrates a dispersion fan and high pressure nozzles into one single cohesive in-space device.
2. Humidification head shall be capable of dispersing mist in a circular fashion, ensuring 360° of coverage from source of unit.
3. Humidification head shall be capable of dispersing mist in a uni-directional way suitable for ceilings of 12 feet and lower.
4. Powder coated humidification head
5. The humidification head shall include an epoxy treated wire guard
6. Fan motors shall be 24V or 120V, IP44, 900RPM motors
7. Anti-Drip nozzles
8. Nozzle or blinds can be maintained and easily replaceable by using polygrip pliers
9. Stainless steel construction suitable for explosion proof environments (EX labelled) and has no moving parts

I. Modular Zone Add-On:

Provide a modular zone add-on panel from the humidifier manufacturer, with the complete direct room system, to expand the system by an additional four (4) zones. The zone 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. The Zone add-on shall be powered by a 115 volt, 60Hz, power feed. Modular zone 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. The range from the main pumping station to the zone add-on shall be 240 feet, and from the zone add-on to the zone (solenoid) valves shall be 60 feet.

J. Mixed Bed Ion Exchange Resins, CO₂ dosing and Electrical Conductivity (EC) monitoring:

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 CO₂ dosing to the RO tank for increasing the conductivity above 5 µS/cm. 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. 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.

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 $\mu\text{S}/\text{cm}$ 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 $\mu\text{S}/\text{cm}$ - CO_2 shall be added to RO tank - no salts or minerals shall be introduced to the system to raise conductivity.

K. Self-cleaning module/kit of RO Tank (Clean-in-Place):

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.

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. The pumping system shall incorporate pressure monitoring, integrated flow measurement, dosing timer and auto-deaeration. 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. 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.

L. Transfer (Forwarding) Pump:

A forwarding pump shall be included with the system whereby the pump can transfer RO water to other uses outside of the Direct Room Humidification system. Forwarding pump shall be embedded onto the main pumping station. Installed at the factory by the humidification manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install humidifiers per manufacturers' instructions. **Turn-key installation to be provided by Humidifier manufacturer.**
- B. Install with required clearance for service and maintenance.

3.2 ACCESSORIES

- A. Install accessories in accordance with manufacturer's recommendations.

3.3 COMMISSIONING

- A. Start-up and commissioning of humidifier to be performed and completed by the Humidifier manufacturer's field technician.

3.4 FIELD TEST

- A. BactiQuant (BQ) Water Test shall be performed by a BQ Certified manufacturer's technician. The BQ test shall be completed in less than 60 minutes with passed results, indicating a clean hygienic system. If test results shows BQ values higher than 57, the system must be disinfected according to manufacturer's instructions.

3.5 MAINTENANCE:

- A. The Adiabatic high pressure humidification/evaporative cooling system manufacturer must perform a minimum of three (3) maintenance visits, via field technician employed by the humidification manufacturer – one after six months, a second six months after that, and a third one year after that.**

END OF SECTION