

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Nortec HP Series high pressure adiabatic in-duct 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-DUCT SYSTEM – NORTEC MODEL HPRO (VFD)

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

- A. The Nortec HPRO with Variable Frequency Drive (VFD), high pressure nozzle humidifier

system is configured to operate on Reverse Osmosis (RO) produced from an integral RO system.

- B. Pre-engineered system, for air handler/duct application, uses nozzle technology to directly inject fine mist into the airstream using high pressured filtered water with no compressor required.
- 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 Pumping Station), water treatment system (RO or DI), valve block, distribution medium, grid manifold assembly, controls, and all associated devices required for a complete and functioning humidification system (i.e. VFD, slave panels, droplet separator, UV lights).

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

Mounted 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 or 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.** Installed on-site.

F. 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 15 microns or less) at 1,000 psig. Impact pin nozzles are not acceptable. Each nozzle shall include an "anti-drip" valve with an integral spring and ball. 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.

G. Mist Eliminator (Droplet Separator)

Mist eliminator provided to prevent carry over of unevaporated droplets. Media shall meet or exceed UL flammability tests. Media needs to be dual density antimicrobial filter media with downstream tackifier (dry-tack). Filter media shall be rated for use up to 750 fpm. Filter media to be 100% compatible with UV light sterilization. All brackets, mounting structure and supports to be of stainless steel construction.

H. 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.

I. Variable Frequency Drive (VFD)

VFD Control allows for efficient multi-zone controls, and the pump to run at the minimum speed required to maintain outlet pressure, reducing wear and tear on pump, achieving higher efficiency, greater pump life expectancy, and less maintenance.

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 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