1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For humidifiers, grids and coolers to include in operation and maintenance manuals.

B. Northwestern University Maintenance Requirement Forms, see Division 01.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and

1. Tank and cover: Minimum 14-gauge, 304-stainless steel with Heli-arc welded seams.
2. Removable cover with ¼" screws (M6).
3. Easily accessible cleanout plate.
4. Steam outlet on top of tank configured to connect to hose, pipe, or flange connection.
5. Tubular copper heat exchanger and header with nickel coating.

E. Mounting:

1. Humidifier shall be mounted on a pair of trapeze hangers with factory-provided threaded steel rods, hardware, and predrilled angle irons for smaller models, and on painted H-legs for larger models.

F. Water requirements: The humidifier shall be capable of generating steam from tap, softened, or DI/RO water.

G. Drain: An electric operated drain valve shall be mounted on the humidifier assembly to allow tank to drain automatically at the end of a humidification season.

H. Steam trap and strainer: Humidifier shall include a float/thermostatic steam trap and steam supply line strainer.

I. Humidifier Options

1. Fabrication options:

a. Tank and cover shall be 316 stainless steel with Heli-arc welded seams.
b.

a. Factory assembled and tested with the humidifier installed to provide complete weather protection and to operate within the following temperature limits: -40 to 120 °F (-40 to 50 °C).

b. Humidifier and outdoor enclosure shall be shipped as one unit.

c. Frame construction: 5" (127 mm), 12-gauge, G-90 galvanized steel formed frame, suitably reinforced and braced to permit loading, shipping, unloading and rigging to the unit destination without damage to external or internal components. The base frame shall be corrosion resistant without painting or further coating.

d. Housing construction: 16-gauge, G-90 galvanized steel panels fabricated into self-framing, double standing seam-type construction. All joints shall be caulked weather-tight with a silicone sealant. All interior surfaces shall be insulated with 1" (25 mm), 2.2 lbs/sq ft (10.8 kg/m^2) rigid, noncombustible glass fiber insulation. No exposed insulation shall

3) Web interface shall have password-protected secure access.
4) Web interface shall be compatible with standard Internet browsers.
5) Web interface shall connect directly to a personal computer or through a system network via Ethernet cable.

a) Automatic cable configuration shall allow straight-through or crossover cables.

b. Interoperable with any Modbus® network
c. Fully modulating (0% to100%) control of humidifier outputs
d. PID control capability with field-adjustable settings
e. Water level control for softened or hard water:

1) Automatic refill, low water cutoff, field-adjustable skimmer bleed-off functions and automatic drain-down of humidifier. System shall consist of:

a) A water level sensing unit comprised of three metallic probes screwed into a threaded probe head. Probe head shall incorporate probe isolation chamber to eliminate short-circuiting between probes caused by mineral coating of probe head. Probe head shall be mounted on the humidifier assembly.
b) A slow opening solenoid operated fill valve factory mounted on the humidifier assembly
c) End-of-season drain automatically drains humidifier tank after a user-defined period of system inactivity.

f. Temperature sensor: A factory mounted sensor, with a temperature range of -40 to 248

2) Dew point set point, actual conditions in the space (from dew point transmitter), dew point offset
3) Relative humidity (RH) duct high limit set point (switch) and actual conditions
4) Relative humidity (RH) duct high limit set point, actual conditions (from transmitter), high limit span, and high limit offset
5) Total system demand in % of humidifier capacity
6) Total system output in lbs/hour (kg/h)
7) Drain/flush duration
8) End-of-season drain status (on standard water systems and if ordered as a DI water option) and hours humidifier is idle before end of season draining occurs
9) Window glass surface temperature (in % RH offset application using sensor ordered as an option) with programmable offset
10) Air temperature or other auxiliary temperature monitoring with programmable offset (using sensor ordered as an option)
11) System alarms and system messages, current and previous
12) Adjustable water skim duration
13) Programmable outputs for remote signaling of alarms and/or messages, device activation (such as a fan), or for signaling tank heating and/or steam production
14) System diagnostics that include:

a) Test outputs function to verify component operation
b) Test humidifier function, by simulating demand to validate performance
c) Data collection of RH, air temperature, water use, energy use, alarms, and service messages for viewing from the keypad/display or Web interface

15) Service notification scheduling
16) Password-protected system parameters
17) Keypad/display or Web interface displays in English, French, or German languages
18) Numerical units displayed in inch-pound or SI units

K. Humidifier Control Options

1. Interoperability using BACnet®
2. Multiple humidifier tank control. Vapor-logic shall be programmed and configured at the factory to control multiple humidifier tanks. Controller functions shall include all Vapor-logic functions listed above plus:

a. The controller shall control up to 16 humidifier tanks.
b. Automatic run-time balancing. The controller shall assign duty to all humidifier tanks in the multi-tank group such that each humidifier accrues approximately the same hours of duty, thereby ensuring equal wear across all humidifiers in the multi-tank group.
c. One humidifier tank shall be capable of being controlled as a redundant tank.
d. One Vapor-logic keypad/display shall be included with each multi-tank group.

3.

a. System shall provide for continuous control of water level and will

VDC. Operating temperature range: -4 to 140 °F (-20 to 60 °C). (Vapor-logic only)

c.

4. Package shall include a centrifugal boiler blow off condensate cooler.

5. High water shut off shall be factory furnished. High water cut off shall be factory furnished. High water cut off shall include an electronic probe mounted in the top of the unit connected to an (air) (electric) operated power to open spring to close ball valve. In the event of high water, ball valve will close.

J. ADDITIONAL MAKE UP WATER FEEDING OPTIONS (CHOOSE)

1. FEED WATER CONDENSATE PUMP WITH RECIEVER:

a.

(36 kPa). Pump shall have a 2-

G. Equipment Mounting:

1. Install steam generators on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in [Section 03 3000 "Cast-in-Place Concrete."] [Section 03 3053 "Miscellaneous Cast -in-Place Concrete."]
2. Comply with requirements for vibration isolation devices specified in Section 23 0550 "Vibration Isolation."

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

1. Install piping adjacent to humidifiers to allow service and maintenance.
2. Install shutoff valve, strainer, backflow preventer, and union in humidifier makeup line.

B. Install electrical devices and piping specialties furnished by manufacturer but not factory mounted.

C.

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