SECTION 238413.16 - WETTED-ELEMENT HUMIDIFIERS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section Includes:

Wetted-element humidifiers.

* + - 1. DEFINITIONS

Retain term that remains after this Section has been edited for a project.

* + - * 1. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.
			1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: For each type of product. Include rated capacities, operating characteristics, furnished specialties, and accessories.
				5. Shop Drawings: Detail fabrication and installation of humidifiers. Include piping details, plans, elevations, sections, details of components, manifolds, and attachments to other work.

Include diagrams for power, signal, and control wiring.

Retain "Coordination Drawings" paragraph below for situations where limited space necessitates maximum utilization for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Coordinate paragraph with other Sections specifying products listed below. Preparation of coordination drawings requires the participation of each trade involved in installations within the limited space.

* + - * 1. Coordination Drawings: Detail humidifiers and adjacent equipment. Show support locations, type of support, weight on each support, required clearances, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

Structural members to which humidifiers will be attached.

Size and location of initial access modules.

Retain "Seismic Qualification Data" paragraph below if required by seismic criteria applicable to Project. Coordinate with Section 230548 "Vibration and Seismic Controls for HVAC" and Section 260548 "Vibration and Seismic Controls for Electrical Systems." See ASCE/SEI 7 for certification requirements for equipment and components.

* + - * 1. Seismic Qualification Data: Certificates, for humidifiers, accessories, and components from manufacturer.

Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

Retain "Field quality-control reports" paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control reports.
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For humidifiers to include in operation and maintenance manuals.
			2. COORDINATION
				1. Coordinate location and installation of humidifiers with manifolds in ducts and air-handling units or occupied space. Revise locations and elevations to suit field conditions and to ensure proper humidifier operation.
1. PRODUCTS

Manufacturers and products listed in SpecAgent and Masterworks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. PERFORMANCE REQUIREMENTS
				1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
				2. Comply with AHRI 640.

Not all manufacturers offer each UL 900 class. Coordinate with retained manufacturers.

* + - * 1. Comply with UL 900, **[Class I] [or] [Class II]**.
				2. Comply with **<Insert standard>**.

Retain "Seismic Performance" paragraph below with "Seismic Qualification Data" paragraph in "Informational Submittals" Article for projects requiring seismic design. Delete paragraph if performance requirements are indicated on Drawings. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Coordinate requirements with Structural Engineer.

* + - * 1. Seismic Performance: Wetted-element humidifiers shall withstand the effects of earthquake motions determined according to **[ASCE/SEI 7] <Insert requirement>**.

Retain first subparagraph below to define the term "withstand" as it applies to this Project. Definition varies with type of building and occupancy and is critical to valid certification. Option is used for essential facilities where equipment must operate immediately after an earthquake.

The term "withstand" means the "unit will remain in place without separation of any parts when subjected to the seismic forces specified**[ and the unit will be fully operational after the seismic event]**."

For life-safety components required to function after an earthquake (such as fire-sprinkler systems, components that contain hazardous content, and storage racks in structures open to the public), the Component Importance Factor is 1.5. For other components, the Component Importance Factor is 1.0 unless the structure is in Seismic Use Group III and component is necessary for continued operation of facility or failure of component could impair continued operation of facility, in which case the Component Importance Factor is 1.5.

Component Importance Factor: **[1.5] [1.0]**.

See ASCE/SEI 7, Coefficients for Architectural Component Table and Seismic Coefficients for Mechanical and Electrical Components Table for requirements to be inserted in subparagraph below.

**<Insert requirements for Component Amplification Factor and Component Response Modification Factor>**.

If Project has more than one type or size of humidifier, delete "Capacities and Characteristics" paragraph below and schedule humidifiers on Drawings.

* + - * 1. Capacities and Characteristics:

Humidification Rate: **<Insert lb/h>**.

Entering Dry-Bulb Air Temperature: **<Insert deg F>**.

Entering Wet-Bulb Air Temperature: **<Insert deg F>**.

Leaving Dry-Bulb Air Temperature: **<Insert deg F>**.

Leaving Wet-Bulb Air Temperature: **<Insert deg F>**.

Duct/Plenum Height: **<Insert inches>**.

Duct/Plenum Width: **<Insert inches>**.

Number of Media Control Stages: **<Insert number>**.

Maximum Absorption Distance: **<Insert inches>**.

Cooling Efficiency Required: **<Insert number>** percent.

Media Water Pump:

Number of Pumps: **<Insert number>**.

Motor Horsepower (Each): **<Insert hp>**.

Drain Pump:

Number of Pumps: **<Insert number>**.

Motor Horsepower: **<Insert hp>**.

Electrical Characteristics: Single point of connection.

Volts: **<Insert number>** V.

Phase: **[Single] [Three]** phase.

Hertz: **<Insert number>** Hz.

Full-Load Amperes: **<Insert number>** A.

Minimum Circuit Ampacity: **<Insert number>** A

Maximum Overcurrent Protection: **<Insert number>** A.

In "Water Type" paragraph below, retain water type that will be provided to the humidifier. Most manufacturers recommend water purity better than tap water or softened water for use with wetted-element humidifiers. Coordinate with retained manufacturers. Sustainable design systems require compliance with requirements in ASHRAE 62.1, Section 5.12 - "Humidifiers and Water-Spray Systems," which sets requirements for the quality of water serving humidifiers.

* + - * 1. Water Type: Suitable for use with **[tap] [softened] [reverse osmosis] [deionized]** water.
			1. WETTED-ELEMENT HUMIDIFIER MANUFACTURERS
				1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

DRI-STEEM Humidifier Company.

Neptronic; National Environmental Products, Inc.

Nortec Industries Inc.

Approved equivalent.

* + - 1. WETTED-ELEMENT HUMIDIFIERS

Retain one of "Piping and Fittings, ASTM A269" or "Piping and Fittings, ASTM B88" paragraphs below. Retain material desired. Coordinate material type with manufacturers and purity of water used. Type 316 stainless-steel piping is typically used with reverse osmosis and deionized water. Not all manufacturers offer each type of stainless-steel piping listed below or publish the type of stainless-steel they offer. Coordinate with retained manufacturers. If specific type of stainless steel is not desired, retaining first option in first paragraph below will allow for the most manufacturers to comply. Copper pipe is generally only used with tap water. Most manufacturers recommend water with a higher purity than tap water be used.

* + - * 1. Piping and Fittings, ASTM A269: **[Stainless-steel] [Stainless-steel, type 304] [Stainless-steel, type 316]** pipe and fittings.
				2. Piping and Fittings, ASTM B88: type L copper pipe and wrought-copper fittings with brazed joints.
				3. Media Water Pump:

**[Stainless-steel] [Bronze]** pump body and **[single] [variable]**-speed motor.

Not all manufacturers provide each option. Stainless-steel pumps are recommended for use with reverse osmosis or deionized water. Coordinate with retained manufacturers.

**[One pump] [One solenoid valve] [One pump or solenoid valve]** for each media stage.

* + - * 1. Drain Pump: **[Stainless-steel] [Bronze]** pump body and single-speed motor.
				2. Media:

Inorganic and inflammable.

* + - * 1. Reservoir, Header, and Frame:

Stainless steel.

Reservoir designed, so it drains and dries completely.

Not all manufacturers offer mist eliminators. Coordinate with retained manufacturers.

* + - * 1. Mist Eliminator: Mounted to a stainless-steel frame with removable panels.

Retain desired water treatment subparagraphs in "Water Treatment" paragraph below. Not all manufacturers offer each type of water treatment listed below. Coordinate with retained manufacturers.

* + - * 1. Water Treatment:

Ultraviolet disinfection system.

Silver-ion antibacterial cartridge.

**[5-micron] <Insert value>** pre-filter.

In "Control Panel" paragraph below, not all options may be available from all manufacturers. Coordinate with retained manufacturers.

* + - * 1. Control Panel:

NEMA 250, **[type 3R] [type 4X] <Insert type>**, to comply with environmental conditions at installed location.

Material: **[Galvanized] [Powder-coated] [Stainless]** steel **<Insert material>**.

Coordinate "Controls" paragraph below for either zoned pumping or for a single pump with multiple zoned solenoid valves. Coordinate retained options with "Media Water Pump" paragraph above. Coordinate with retained manufacturers.

* + - * 1. Controls:

**[Cycle] [Vary speed of]** motor **[and] [sequence solenoid valve stages]** to satisfy humidistat.

Multilevel probe and supply solenoid to maintain tank water level.

Not all manufacturers offer conductivity controls. Coordinate with retained manufacturers.

Conductivity drain controls manage the total dissolved solids concentration in the reservoir.

Retain one of two subparagraphs in "Building Automation System Interface" subparagraph below. Not all manufacturers offer building automation system interface. Manufacturers that do offer building automation system interfaces do not offer each communication protocol. Coordinate communication protocol with retained manufacturers.

Building Automation System Interface:

For Each Control Zone, Provide Points for the Following:

Start/stop.

Status indication.

**<Insert other points>**.

Full Communication Interface: **[Modbus] [BACnet] <Insert interface type>**.

* + - * 1. Accessories:

Do not retain subparagraphs below if humidistats, humidity sensors, or airflow switches are specified in Division 23 control Sections.

A humidistat is a device that senses and controls directly. A humidity sensor is a device that senses only, with control being accomplished via DDC system. In first two subparagraphs below, retain the humidistat options for self-contained control. Retain sensor options for control via DDC system. Not all manufacturers offer each accessory. Coordinate with retained manufacturers.

**[Humidistat] [Humidity Sensor]**: **[Wall] [Return duct]** mounted.

High-Limit **[Humidistat] [Humidity Sensor]**: Supply duct mounted.

Airflow switch prevents humidifier operation without airflow.

1. EXECUTION
	* + 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. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. INSTALLATION

Sustainable design systems require compliance with requirements in ASHRAE 62.1. ASHRAE 62.1, Section 5.12 - "Humidifiers and Water-Spray Systems," limits obstructions downstream from humidifiers.

* + - * 1. Install humidifiers with required clearance for service and maintenance.**[ Maintain path, downstream from humidifiers, clear of obstructions as required by ASHRAE 62.1.]**
				2. Seal all duct and plenum penetrations with flange.
				3. Install humidifier manifolds in metal ducts and casings constructed according to SMACNA's "HVAC Duct Construction Standards, Metal and Flexible."
				4. Install **[galvanized] [stainless]**-steel drain pan under each manifold.

Retain option in first subparagraph below to comply with sustainable design systems or if required by Project requirements or authorities having jurisdiction.

Construct drain pans with connection for drain; insulated**[ and complying with ASHRAE 62.1]**.

Connect to condensate trap and drainage piping.

Extend drain pan upstream and downstream from manifold a minimum distance recommended by manufacturer but not less than that required by ASHRAE 62.1.

* + - * 1. Equipment Mounting:

Retain one of two subparagraphs below. Retain first for projects in seismic areas; retain second for projects not in seismic areas. Indicate vibration isolation and seismic-control device type and minimum deflection in supported equipment schedule on Drawings.

Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

* + - * 1. Install all manufacturer-furnished accessories in accordance with manufacturer's written installation instructions.
			1. PIPING CONNECTIONS

Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

Install piping adjacent to humidifiers to allow service and maintenance.

* + - * 1. Install devices and piping specialties furnished by manufacturer but not factory mounted.
			1. ELECTRICAL CONNECTIONS
				1. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
				2. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
				3. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

Retain one of first two subparagraphs below. First subparagraph cross-references to Section 260553 "Identification for Electrical Systems" and should be retained for consistent electrical identification. Second subparagraph is an abbreviated version of the product specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs as layers of black with engraved white letters at least 1/2-inch high.

Locate nameplate where easily visible.

* + - 1. CONTROL CONNECTIONS
				1. Install control and electrical power wiring to field-mounted control devices.
				2. Connect control wiring between humidity sensors, high-limit humidity sensors, and **[DDC control system] <Insert system description>**.
				3. Connect control wiring between humidistats and controlled devices.
				4. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."
			2. FIELD QUALITY CONTROL

Retain "Testing Agency," "Manufacturer's Field Service," or "Perform the following tests and inspections" paragraphs below to identify who shall perform tests and inspections. If retaining second option in "Testing Agency" paragraph or if retaining "Manufacturer's Field Service" or "Perform the following tests and inspections" paragraphs, retain "Field quality-control reports" paragraph in "Informational Submittals" Article.

Retain "Manufacturer's Field Service" paragraph below to require a factory-authorized service representative to perform tests and inspections.

* + - * 1. Manufacturer's Field Service: Engage a Company Field Advisor per OGS Spec Section 014216 to test and inspect components, assemblies, and equipment installations, including connections.

Retain "Perform the following tests and inspections" paragraph below to require Contractor to perform tests and inspections.

* + - * 1. Perform the following tests and inspections**[ with the Company Field Advisor per OGS Spec Section 014216]**:

Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

* + - * 1. Humidifier will be considered defective if it does not pass tests and inspections.
				2. Prepare test and inspection reports.
			1. DEMONSTRATION
				1. **[Engage a Company Field Advisor per OGS Spec Section 014216 to train] [Train]** Director’s Representative Facility’s maintenance personnel to adjust, operate, and maintain humidifiers.

END OF SECTION 238413.16