SECTION 238400 - HUMIDITY CONTROL EQUIPMENT

This Section includes wetted media humidifiers or evaporative coolers usually found in air handling units or equipment and packaged sprayed coil dehumidifiers including spray pumps, intended for central air handling units. This section also includes humidifiers using steam or electricity for heat source.

Manufacturers found in SpecAgent for this Section were identified as representative and not as an endorsement for meeting the requirements of this specification.

This Section includes performance, proprietary, and descriptive type specifications. Edit to avoid conflicting requirements.

This Section includes the term Architect/Engineer. "Architect" is used in AIA contract documents; "Engineer" is used in EJCDC contract documents. Retain appropriate term.

See the Drawing Coordination Considerations for information needed to coordinate this specification Section with the Drawings.

1. GENERAL
   * + 1. SUMMARY
          1. Section Includes:

Evaporative humidifiers.

Evaporative pan humidifiers.

Steam injection humidifiers.

Electrode steam humidifiers.

Steam heated, heat exchanger type humidifiers.

Electrically heated, immersion type humidifiers.

Sprayed coil dehumidifiers.

* + - * 1. Related Sections:

Section 221100 - Facility Water Distribution: Execution requirements for cold water supply to units specified by this section.

Section 230513 - Common Motor Requirements for HVAC Equipment: Product requirements for pump motors for placement by this section.

Section 230529 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for supports for steam grid humidifiers for placement by this section.

Section 230700 - HVAC Insulation: Execution requirements for insulating humidifier casings specified by this section.

Section 230900 - Instrumentation and Control for HVAC: Product requirements for control components used by humidity control equipment.

Section 230923 - Direct-Digital Control System for HVAC: Product requirements for control components used by humidity control equipment.

Section 230953 - Pneumatic and Electric Control System for HVAC: Product requirements for pneumatic control components used by humidity control equipment.

Section 230993 - Sequence of Operations for HVAC Controls: Sequences of operation for humidity control equipment.

Section 232113 - Hydronic Piping: Execution requirements for connection of chilled water and hot water to units specified by this section.

Section 232213 - Steam and Condensate Heating Piping: Execution requirements for connection of steam supply and steam condensate return piping to units specified by this section.

Section 232300 - Refrigerant Piping: Execution requirements for connection of refrigerant piping to units specified by this section.

Section 232500 - HVAC Water Treatment: Product and execution requirements for chemical treatment equipment.

Section 233100 - HVAC Ducts and Casings: Execution requirements for ducts specified by this section.

Execution requirements for electrical connections to units specified by this section.

* + - 1. REFERENCES

List reference standards included within text of this section. Edit the following for Project conditions.

* + - * 1. Air-Conditioning and Refrigeration Institute:

ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.

ARI 610 - Central System Humidifiers for Residential Applications.

ARI 630 - Selection, Installation, Servicing of Humidifiers.

* + - * 1. National Electrical Manufacturers Association:

NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

* + - * 1. Sheet Metal and Air Conditioning Contractors:

SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

* + - * 1. Underwriters Laboratories Inc.:

UL 900 - Air Filter Units.

* + - 1. SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

* + - * 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. Section 013300 - Submittal Procedures: Submittal procedures.
        5. Product Data: Submit catalog sheets indicating general assembly, dimensions, weights, materials, and certified performance ratings duct and service connections, electric nameplate data and wiring diagrams.
        6. Manufacturer's Installation Instructions: Submit assembly and setting operations.
        7. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
      1. CLOSEOUT SUBMITTALS
         1. Section 017716 - Contract Closeouts: Closeout procedures.
         2. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, maintenance and repair data, including instructions for lubrication, filter replacement, cleaning and spare parts lists.
      2. QUALITY ASSURANCE

Include the following paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain one copy of each document on site.
      1. QUALIFICATIONS
         1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' **[documented]** experience
         2. Installer: Company specializing in performing Work of this section with minimum three years' **[documented]** experience **[approved by manufacturer]**.
      2. PRE-INSTALLATION MEETINGS
         1. Section 013000 - Administrative Requirements: Pre-installation meeting.
         2. Convene minimum **[one]** <\_\_\_\_\_\_\_\_> week prior to commencing work of this section.
      3. DELIVERY, STORAGE, AND HANDLING
         1. Section 016500 - Materials and Equipment: Product storage and handling requirements.
         2. Accept units on site in factory packing. Inspect for damage.
      4. FIELD MEASUREMENTS
         1. Verify field measurements prior to fabrication.
      5. WARRANTY

This article extends warranty period beyond one year. Extended warranties increase construction costs and Owner enforcement responsibilities. Specify warranties with caution.

* + - * 1. Section 017716 - Contract Closeout: Product warranties and product bonds.
        2. Furnish **[five]** <\_\_\_\_\_\_\_\_>-year manufacturer's warranty for **[units] [pumps]**.
      1. MAINTENANCE SERVICE
         1. Section 017716 - Contract Closeout: Requirements for maintenance service.

Evaluate need for maintenance and emergency service based Project requirements. If desired, retain the following paragraphs.

* + - * 1. Furnish service and maintenance of humidifier for **[one]** <\_\_\_\_\_\_\_\_> year from Date of Substantial Completion.
        2. Examine unit components **[weekly] [semi-monthly] [monthly] [bi-monthly]**. Clean, adjust, and lubricate equipment.
        3. Include systematic examination, adjustment, and lubrication of unit, and controls checkout and adjustments. Repair or replace parts in accordance with manufacturer's operating and maintenance data. Use parts produced by manufacturer of original equipment.
        4. Perform work without removing units from service during building normal occupied hours.
        5. Provide emergency call back service **[at all hours] [during working hours]** for this maintenance period.
        6. Maintain locally, near Place of the Work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, without unreasonable loss of time.
        7. Perform maintenance work using competent and qualified personnel under supervision **[and in direct employ]** of manufacturer or original installer.
        8. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of **[Director’s Representative.]** <\_\_\_\_\_\_\_\_.>
      1. EXTRA MATERIALS
         1. Spare parts and maintenance products.
         2. Furnish **[one]** <\_\_\_\_\_\_\_\_> set of **[filter media]** for evaporative humidifiers.
         3. Furnish **[two]** <\_\_\_\_\_\_\_\_> humidifier cylinders for steam grid humidifiers.
         4. Furnish **[two]** <\_\_\_\_\_\_\_\_> **[spray nozzles]** <\_\_\_\_\_\_\_\_> for sprayed coil dehumidifiers.

1. PRODUCTS
   * + 1. EVAPORATIVE HUMIDIFIERS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9748) Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

AIRCARE

Condair

Vornado

Approved equivalent.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Product Description: Factory assembled accordance with ARI 610 “Central System Humidifiers for Residential Applications” consisting of casing, tank, filters, and spray pumps, water and drain connections.
        2. Casing:

Assembly: Galvanized steel, minimum 0.0635 inch, reinforced and braced with galvanized steel angles, cadmium plated cap screws. Furnish with gasket and flange pipe penetrations, inspection panels, access doors, and other openings in casing.

Connection: 1-1/2 inch flanges on inlet and outlet with 1/4 x 1 inch adhesive backed neoprene gasket.

Doors: **[20 x 36 inch] [14 x 19 inch] [12 x 16 inch] [10 x 10 inch]** quick opening access door on one side with 1/4 inch thick Plexiglas inspection window.

Finish: Two coats of **[zinc chromate, iron oxide, phenolic resin]** <\_\_\_\_\_\_\_\_> paint applied after assembly.

* + - * 1. Drain Tank:

Tank: Welded **[black] [stainless]** steel **[4 inches] [12 inches]** deep, **[0.1345 inch] [3/16 inch] [, finished inside and out with zinc chromate, iron oxide phenolic resin paint]** and coated inside with asphalt coating.

Connections: **[3/4 inch] [1 inch]** adjustable float valve assembly with brass rod and **[brass] [polystyrene]** float; **[2 inch] [3 inch] [1-1/2 inch]** drain and overflow with removable copper suction screen.

Fabrication: Lap and weld corners watertight. Weld fittings and piping supports to tank.

* + - * 1. Filters: Filters: **[Two rows of neoprene coated filter mats in removable frames.] [Impregnated cellulose flute bonded with acrylic adhesive.] [UL 900 Class II fire rating, fiberglass flute bonded with inorganic, non-crystalline filters.]**
        2. Piping: 1-1/2 inch PVC.
        3. Pumps:

Spray Assembly: Moisture resistant motor with built-in overload protection, brass impeller and cut-off blade, in galvanized well.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Spray Pump:

Type: Horizontal shaft, Single stage, close coupled, radially split casing, for 125 psig maximum working pressure.

Case: Cast iron with gage ports, drain plug, flanged suction and discharge.

Impeller: Bronze, fully enclosed, keyed to motor shaft extension.

Shaft: Stainless steel.

Seal: Carbon rotating against stationary ceramic seat.

* + - * 1. Capacity:

Use the following paragraph for one or more identical units. Use schedule when specifying units with different capacity.

Air Flow: <\_\_\_\_\_\_\_\_> cfm.

Air Pressure Drop: Maximum <\_\_\_\_\_\_\_\_> inch wg.

Saturation Efficiency: Minimum <\_\_\_\_\_\_\_\_> percent.

Overall Height: <\_\_\_\_\_\_\_\_> inch.

Overall Width: <\_\_\_\_\_\_\_\_> inch.

Face Velocity: <\_\_\_\_\_\_\_\_> fpm.

Spray Pump:

Flow: <**\_\_\_\_\_\_\_\_**> gpm

Head: <**\_\_\_\_\_\_\_\_**> ft.

* + - * 1. Electrical Characteristics and Components:

Select one or more of the following subparagraphs appropriate to equipment requirements.

Electrical Characteristics:

**[<\_\_\_\_\_\_\_\_>hp.] [<\_\_\_\_\_\_\_\_> rated load amperes.]**

<\_\_\_\_\_\_\_\_> volts, **[single] [three]** phase, 60 Hz.

<\_\_\_\_\_\_\_\_> amperes maximum **[fuse size] [circuit breaker size] [overcurrent protection]**.

<\_\_\_\_\_\_\_\_> minimum circuit ampacity.

<\_\_\_\_\_\_\_\_> percent minimum power factor at rated load.

Motors: In accordance with Section 230513.

Disconnect Switch: Factory mount **[in control panel] [on equipment]**.

* + - 1. EVAPORATIVE PAN HUMIDIFIERS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9748) Subject to compliance with requirements, **[provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

AIRECARE

Condair

Vordano

Approved equivalent.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Units: ARI 610 “Central System Humidifiers for Residential Applications”; evaporative pan with **[stand,] [cabinet enclosure,]** humidistat, heating coil, pre-wired except for humidistat, for use with **[heating hot water.] [domestic hot water.] [steam.] [electronic heating elements.]**
        2. Components:

Pan, Cover, Screws and Bolts: Stainless steel **[.] [With duct collar.]**

Overflow and Drainage Fittings: Copper or Brass.

Float Valve Mechanism: Stainless steel or brass with 1/4 inch fill connection.

Coil: 7/8 inch OD copper.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Coil: Shielded electric immersion heating element with safety cutout switch (set at 225 degrees F to disconnect electric heating element on low water level in pan.

Blower Fan: Forward curved fan, direct driven by fused, fractional hp motor.

Floor Stand: Extruded aluminum.

Cabinet Enclosure: **[Galvanized sheet metal with [baked enamel] [prime coated] finish.] [Molded fiberglass.]**

Control: Humidistat cycles blower fan **[and opens inlet solenoid valve] [and energizes electric heating element]**.

Flush Cycle: Timers allow one to four flushes each day of three to 120 minutes duration by [shutting off power to heating element and] opening drain valve.

* + - * 1. Accessories:

Humidistats: **[Wall mounted, reverse acting, for 24-volt circuit.] [Refer to Section 230900.]**

* + - * 1. Capacity:

Use the following paragraph for one or more identical units. Use schedule when specifying units with different capacity.

Evaporation capacity: <\_\_\_\_\_\_\_\_> lbs/hr.

Coil water temperature: <\_\_\_\_\_\_\_\_> degrees F.

Coil steam temperature: <\_\_\_\_\_\_\_\_> degrees F.

Electrical heat input: <\_\_\_\_\_\_\_\_> kW.

* + - * 1. Electrical Characteristics and Components:

Select one or more of the following subparagraphs appropriate to equipment requirements.

Electrical Characteristics: In accordance with Section 260503 and the following:

**[<\_\_\_\_\_\_\_\_>hp.] [<\_\_\_\_\_\_\_\_> rated load amperes.]**

<\_\_\_\_\_\_\_\_> volts, [single] [three] phase, 60 Hz.

<\_\_\_\_\_\_\_\_> amperes maximum [fuse size] [circuit breaker size] [overcurrent protection].

<\_\_\_\_\_\_\_\_> minimum circuit ampacity.

<\_\_\_\_\_\_\_\_> percent minimum power factor at rated load.

Motors: In accordance with Section 230513.

Disconnect Switch: Factory mount **[in control panel] [on equipment]**.

* + - 1. STEAM INJECTION HUMIDIFIERS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=12844) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Armstrong International, Inc.

[Carel USA, LLC](http://www.specagent.com/Lookup?uid=123457068603).

[DRI-STEEM Humidifier Company](http://www.specagent.com/Lookup?uid=123457068604).

[Hygromatik; Spirax Sarco](http://www.specagent.com/Lookup?uid=123457068606).

[Neptronic; National Environmental Products, Inc](http://www.specagent.com/Lookup?uid=123457068609).

[Nortec Industries Inc](http://www.specagent.com/Lookup?uid=123457068607).

[Pure Humidifier Company](http://www.specagent.com/Lookup?uid=123457068608).

Or equal.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Product Description: Steam separator type in accordance with ARI 610 “Central System Humidifiers for Residential Applications” receiving steam at supply pressure and providing separation ahead of control valve, discharging through internal drying and silencing chambers, and distribution manifold at atmospheric pressure.
        2. Separator: Humidifier removes condensate from steam by means of stainless steel separator, for purpose of providing condensate-free steam.

Insulation of injection tube is optional.

* + - * 1. Injection Tube: Steam injected into air system through round stainless steel steam jacketed injection tube to assure condensate-free vapor. Steam emission ports precision punched and of size and number to provide constant and uniform distribution of steam over entire width of duct. [Insulated with 1/2 inch glass fiber insulation, surrounded with 24 gage 24 gauge stainless steel.]

Injection Tube Type: **[Single Tube.] [Multiple tube.] [Mini-multiple tube.]**

* + - * 1. Control Valve: Furnish normally closed **[pneumatic] [electric]** operated modulating control valve.

Use the following paragraph for area type humidifier.

* + - * 1. Fan: Electrically powered fan to add auxiliary air movement to emitted steam.
        2. Automatic Temperature Controls: Refer to Section **[230900] [230923] [230953]**. **[Refer to Section 230993 for humidifier sequence of operation.]** <\_\_\_\_\_\_\_\_>.
        3. Control Components: Furnish humidifier with the following:

**[Pneumatic] [Electric]** modulating space humidistat.

Air flow proving switch.

**[Pneumatic] [Electric]** duct high limit humidistat.

**[Pneumatic] [Electric]** temperature switch to prevent cold start-up of humidifier.

Usually float and thermostatic trap is used with steam pressure below 15 psig and inverted bucket trap is used with steam pressure above 16 psig.

* + - * 1. Accessories:

**[One] [Two]** float and thermostatic trap**[s]**.

**[One] [Two]** inverted bucket trap**[s]**.

Steam supply piping strainer.

Plate to seal duct at opening of manifold.

* + - * 1. Capacity:

Use the following paragraph for one or more identical units. Use schedule when specifying units with different capacity.

Area Served: <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_>.

Output Capacity: <\_\_\_\_\_\_\_\_> lbs/hr.

Inlet steam pressure: <\_\_\_\_\_\_\_\_> psi.

Manifold Length: <\_\_\_\_\_\_\_\_> feet.

Duct Size: <\_\_\_\_\_\_\_\_> inch x <\_\_\_\_\_\_\_\_> inch.

* + - * 1. Electrical Characteristics and Components:

Select one or more of the following subparagraphs appropriate to equipment requirements.

Electrical Characteristics: In accordance with Section 260503 and the following:

**[<\_\_\_\_\_\_\_\_>hp.] [<\_\_\_\_\_\_\_\_> rated load amperes.]**

<\_\_\_\_\_\_\_\_> volts, **[single] [three]** phase, 60 Hz.

* + - 1. ELECTRODE STEAM HUMIDIFIERS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9748) Subject to compliance with requirements, **[provide products by the following]** **[provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

Condair

Honeywell

Vornado

Approved equivalent.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Product Description: Humidifier: **[ARI 610]** self-contained, disposable cylinder, microprocessor controlled electrode steam generating unit.
        2. Cylinders: [Disposable] [Cleanable], polypropylene plastic with field adjustable [stainless] steel electrodes.
        3. Plumbing Components and Valve Bodies: Plastic, linked by flexible rubber hosing. Incorporate water fill with 1 inch air gap and integral air gap on drain. Fill solenoid valve incorporating built-in strainer, pressure reducing and flow regulating orifice.
        4. Cabinet: Steel, 0.058 inches with enamel finish, with hinged and lockable access door.
        5. Electric Service: Unit protected by internal fusing on line voltage leads and automatic emergency drain trigger. Incorporate electrical terminals for installation of humidistat, duct high-limit humidistat, interlock to fan or air flow switch.
        6. Control: Fully modulating control with gradual 0 to 100 percent capacity. Maximum capacity field adjustable for 0 to 100 percent. High water probe to prevent overfilling. Multiple cylinder humidifiers with duplicate internal control circuitry to allow each cylinder to be independently controlled.
        7. Drain Cycle: Field adjustable with drain duration range of 2 to 128 seconds and drain interval [range of 0.25 to 16 hours] [automatically cycled from conductivity], with one drain valve for each generator.
        8. Steam Distributor: Stainless steel steam dispersion tube suitable for insertion in duct with condensate separator and return leg to remove condensate from distributor and **[return to humidifier fill] [pipe to drain]**. Steam hose from generator to dispersion tube 1-1/2 inch diameter reinforced rubber.
        9. Display: Digital, providing select monitoring of unit amperage draw, percentage demand from humidistat, steam output, and manually set capacity adjustment. Lamps to indicate full cylinder.
        10. Humidistat: **[Wall] [Duct] [Cabinet]** mounted, solid state electronic sensor, 24 volt.
        11. Capacity:

Use the following paragraph for one or more identical units. Use schedule when specifying units with different capacity.

Capacity: <\_\_\_\_\_\_\_\_> lbs/hr.

Orifice Size: <\_\_\_\_\_\_\_\_> inches.

* + - * 1. Electrical Characteristics and Components:

Select one or more of the following subparagraphs appropriate to equipment requirements.

Electrical Characteristics:

**[<\_\_\_\_\_\_\_\_>hp.] [<\_\_\_\_\_\_\_\_> rated load amperes.]**

<\_\_\_\_\_\_\_\_> volts, **[single] [three]** phase, 60 Hz.

<\_\_\_\_\_\_\_\_> amperes maximum **[fuse size] [circuit breaker size] [overcurrent protection]**.

<\_\_\_\_\_\_\_\_> minimum circuit ampacity.

<\_\_\_\_\_\_\_\_> percent minimum power factor at rated load.

Motors: In accordance with Section 230513.

Disconnect Switch: Factory mount **[in control panel] [on equipment]**.

* + - 1. STEAM HEATED, HEAT EXCHANGER TYPE HUMIDIFIERS

In this article, list manufacturers acceptable for this Project.

* + - * 1. Manufacturers: Subject to compliance with requirements, **[provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

Armstrong International, Inc.

DRI-STEEM Humidifier Company.

Neptronic; National Environmental Products, Inc.

Pure Humidifier Company.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Product Description: Steam heated type isolating heating medium from humidifying medium.

When humidifier is used with deionized water, demineralized water, or reverse osmosis water edit specification to include stainless steel fill valves and floats.

* + - * 1. Medium: **[Standard Water] [Deionized Water] [Demineralized Water] [Reverse Osmosis Water]**.
        2. Evaporating Reservoir: Constructed of type 304 stainless steel with welded joints. Gasket sealed cover capable of operating pressures of 19 inches water column.
        3. Heat Exchanger: Constructed of **[copper tubes and headers with electroless nickel plating] [type 304 stainless steel tubes and headers with welded joints]**. Removable from humidifier without disturbing cover or injection tubes.
        4. Adjustable Surface Water Flusher: To drain away portion of water upon each refill cycle. Flusher height adjustable for minimal water waste and efficient flushing.
        5. Water Fill Valve: **[Brass] [Stainless steel]** body, solenoid operated block style water fill valve with internal strainer factory mounted. Bottom fill system to prevent collapse of steam head during fill cycle. Located to allow minimum water gap of 1-1/2 inches.
        6. Injection Tubes:

Single tube.

Steam hose kit consisting of 2 - **[1-1/2] [2]** <\_\_\_\_\_\_\_\_> inch by **[10]** <\_\_\_\_\_\_\_\_> foot long hoses, injection tube, support rod, hose clamps, and duct plate.

Factory fabricated multiple tube.

* + - * 1. Humidifier Controls: NEMA 250 “Enclosures for Electrical Equipment (1000 Volts Maximum)” Type 12 control cabinet **[shipped loose] [factory mounted]**. Furnish with the following features:

Factory wired control valve interlock.

Water level control module.

Fused control circuit transformer.

Numbered terminal block.

Main power fuse.

Factory mounted, solid state control module for the following functions:

Automatic refilling.

Low water cutoff.

High water cutoff.

Surface water flushing.

Safety switch interlock functions.

Flush mode with [manual reset to resume humidification.] [automatic drain system.]

Furnish the following visual indications:

Safety switch interruption.

Power.

Fill.

Heat ready.

Drain.

Water level controlled through sensor mounted on reservoir. Control system continues to maintain humidity during fill cycle.

* + - * 1. Steam Control Valve: Normally closed **[pneumatic] [electric]** operated modulating control valve.
        2. Automatic Temperature Controls: Refer to Section **[230900] [230923] [230953]**. **[Refer to Section 230993 for humidifier sequence of operation.]** <\_\_\_\_\_\_\_\_>.
        3. Control Components: Furnish humidifier with the following:

**[Pneumatic] [Electric]** modulating space humidistat.

**[Pneumatic] [Electric]** high limit duct humidistat.

Air proving switch.

Usually float and thermostatic trap is used with steam pressure below 15 psig (103 kPa) and inverted bucket trap is used with steam pressure above 16 psig (110 kPa).

* + - * 1. Accessories:

**[Float and thermostatic] [Inverted bucket]** type steam trap.

Steam supply strainer.

Teflon coated heat exchanger.

Wall brackets for support of humidifier heat exchanger.

Automatic timed drain system with motor operated drain valve with brass body, factory installed.

Automatic seasonal end-of-use drain.

Duct plate to seal completely at duct opening.

Condensate cooling system to provide cold water mixing of drain water.

* + - * 1. Capacity:

Use the following paragraph for one or more identical units. Use schedule when specifying units with different capacity.

Area Served: <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_>.

Air Quantity: <\_\_\_\_\_\_\_\_> cfm.

Output Capacity: <\_\_\_\_\_\_\_\_> lbs/hr.

Inlet Steam Pressure: <\_\_\_\_\_\_\_\_> psi.

Manifold Length: <\_\_\_\_\_\_\_\_> feet.

Duct Size: <\_\_\_\_\_\_\_\_> inch x <\_\_\_\_\_\_\_\_> inch.

* + - 1. ELECTRICALLY HEATED, IMMERSION TYPE HUMIDIFIER

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9748) Subject to compliance with requirements, **[provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

Carel Industries

Condair

Honeywell

Approved equivalent.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Product Description: Self-contained humidifier with reservoir, injection tube, and controls.

When humidifier is used with deionized water, demineralized water, or reverse osmosis water edit specification to include stainless steel fill valves and floats.

* + - * 1. Medium: **[Standard Water] [Deionized Water] [Demineralized Water] [Reverse Osmosis Water]**.
        2. Evaporating Reservoir: Constructed of type 304 stainless steel with welded joints. Gasket sealed cover capable of operating pressures of 19 inches water column.
        3. Removable cover and front access panel for easy cleaning.

Use the following paragraph for cabinet type humidifier.

* + - * 1. Cabinet: Reservoir contained within cabinet constructed of 18 gage steel with baked enamel finish. Cabinet floor serves as drain pan with connections for drain piping.
        2. Adjustable Surface Water Flusher: To drain away portion of water upon each refill cycle. Flusher height adjustable for minimal water waste and efficient flushing.
        3. Water Fill Valve: **[Brass] [Stainless steel]** body, solenoid operated block style water fill valve with internal strainer factory mounted. Bottom fill system to prevent collapse of steam head during fill cycle. Located to allow minimum water gap of 1-1/2 inches.
        4. Immersion heaters: Incoloy clad type. Threaded into front of unit.
        5. Over Temperature Protection: Manual reset over temperature switch factory installed on humidifier reservoir.
        6. Injection Tubes: Constructed of Type 304 round stainless steel steam jacketed injection tubes with emission openings to uniform distribution of steam over entire width of duct. Furnish duct plate for sealing of duct opening.
        7. Humidifier Controls: NEMA 250 “Enclosures for Electrical Equipment (1000 Volts Maximum)” Type 12 control cabinet **[shipped loose] [factory mounted]**. Furnish with the following features:

Factory wired control valve interlock.

Water level control module.

Fused control circuit transformer.

Numbered terminal block.

Main power fuse.

Factory mounted, solid state control module for the following functions:

Automatic refilling.

Low water cutoff.

High water cutoff.

Surface water flushing.

Safety switch interlock functions.

Flush mode with **[manual reset to resume humidification.] [automatic drain system.]**

Furnish the following visual indications:

Safety switch interruption.

Power.

Fill.

Heat ready.

Drain.

Water level controlled through sensor mounted on reservoir. Control system continues to maintain humidity during fill cycle.

* + - * 1. Automatic Temperature Controls: Refer to Section **[230900] [230923] [230953]**. **[Refer to Section 230993 for humidifier sequence of operation.]** <\_\_\_\_\_\_\_\_>.
        2. Control Components: Furnish humidifier with the following:

**[Pneumatic] [Electric]** modulating space humidistat.

**[Pneumatic] [Electric]** high limit duct humidistat.

Air proving switch.

* + - * 1. Accessories: Furnish humidifier with the following:

Automatic timed drain system with motor operated drain valve with brass body, factory installed.

Insulation: 1 inch thick glass fiber insulation with aluminum foil facing covering entire unit except front face.

SCR Modulating Control: 0 to 100 percent modulation of humidifier output. Factory mounted and wired in control cabinet.

Timed cycle modulation: Factory mounted and wired in control panel.

Steam hose kit consisting of 2 - [**1-1/2**] [**2**] <**\_\_\_\_\_\_\_\_**> inch by [**10**] <**\_\_\_\_\_\_\_\_**> foot long hoses, injection tube, support rod, hose clamps, and duct plate.

Wall brackets for support of humidifier heat exchanger.

Automatic seasonal end-of-use humidifier drain.

Auto-selector: Furnish factory mounted and wired dual input, single output auto-selector for single modulating output signal to humidifier control cabinet. Auto-selector allows use of modulating space humidistat and modulating duct high limit humidistat to control critical variable air volume air handling systems. System automatically determines which of two modulating signals is dominant and slowly reduces humidifier output capacity preventing oversaturating of air stream.

Condensate cooling system to provide cold water mixing of drain water.

* + - * 1. Capacity:

Use the following paragraph for one or more identical units. Use schedule when specifying units with different capacity.

Area Served: <**\_\_\_\_\_\_\_\_**>.

Air Quantity: <**\_\_\_\_\_\_\_\_**> cfm.

Output Capacity: <**\_\_\_\_\_\_\_\_**> lbs/hr.

Manifold Length: <**\_\_\_\_\_\_\_\_**> feet.

Duct Size: <**\_\_\_\_\_\_\_\_**> inch x <**\_\_\_\_\_\_\_\_**> inch.

* + - * 1. Electrical Characteristics and Components:

Select one or more of the following subparagraphs appropriate to equipment requirements.

Electrical Characteristics:

**[<\_\_\_\_\_\_\_\_>hp.] [<\_\_\_\_\_\_\_\_> rated load amperes.]**

<\_\_\_\_\_\_\_\_> volts, **[single] [three]** phase, 60 Hz.

<\_\_\_\_\_\_\_\_> amperes maximum **[fuse size] [circuit breaker size] [overcurrent protection]**.

<\_\_\_\_\_\_\_\_> minimum circuit ampacity.

<\_\_\_\_\_\_\_\_> percent minimum power factor at rated load.

Motors: In accordance with Section 230513.

Disconnect Switch: Factory mount **[in control panel] [on equipment]**.

* + - 1. SPRAYED COIL DEHUMIDIFIERS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9748) Subject to compliance with requirements, **[provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]**:

Air Systems, Inc.

Carrier

Honeywell

Approved equivalent.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Product Description: Factory assembled consisting of casing, tank, spray headers, nozzles, **[spray pumps,]** water and drain connections, and cooling coils.
        2. Casing:

Assembly: Galvanized steel, minimum 0.0635 inch, reinforced and braced with galvanized steel angles with cadmium plated cap screws.

Connection: 1-1/2 inch flanges on inlet and outlet with 1/4 x 1 inch adhesive backed neoprene gasket.

Doors: **[20 x 36 inch] [14 x 19 inch]** quick opening access door on one side with inch thick Plexiglas inspection window.

Finish: Two coats of **[zinc chromate, iron oxide, phenolic resin]** <\_\_\_\_\_\_\_\_> paint applied after assembly.

Removable Inlet Screen: Galvanized expanded metal on inlet side of dehumidifier.

Gasket and flange pipe penetrations, inspection panels, access doors, and other openings in casing.

* + - * 1. Drain Tank:

Tank: Welded **[black] [stainless]** steel, 12 inches deep, **[0.1345 inch] [3/16 inch]. [Finished inside and out with zinc chromate, iron oxide, phenolic resin paint] [prime coated]** and coated inside with **[1/8 inch asphalt mastic] [3/32 inch epoxy] [glass fiber reinforced plastic]** coating.

Connections: **[3/4 inch] [1 inch]** adjustable float valve assembly with brass rod and **[brass] [polystyrene]** float; **[2 inch] [3 inch] [1-1/2 inch]** drain and overflow with removable copper suction screen.

Fabrication: Lap and weld corners watertight. Weld fittings and piping supports to tank.

External Spray Piping: **[1-1/4 inch galvanized steel] [1-1/2 inch PVC]** piping.

Spray Nozzles: Bronze, self-cleaning.

* + - * 1. Cooling Coils:

Coil: **[ARI 410,]** copper tube, copper fin construction individually mounted on steel angle rails.

Eliminators: **[Galvanized steel,] [Type 304 stainless steel,] [PVC]** mounted over drain pan.

* + - * 1. Spray Pumps:

Type: **[Vertical] [Horizontal]** shaft, single stage, close coupled, radially split casing, for 125 psi maximum working pressure.

Case: Cast iron, with gage ports, drain plug, flanged suction and discharge.

Impeller: Bronze, fully enclosed, keyed to motor shaft extension.

Shaft: Stainless steel.

Seal: Carbon rotating against stationary ceramic seat.

* + - * 1. Capacity:

Use the following paragraph for one or more identical units. Use schedule when specifying units with different capacity.

Evaporation Performance:

Air Flow: <**\_\_\_\_\_\_\_\_**> cfm.

Air Pressure Drop: Maximum <**\_\_\_\_\_\_\_\_**> inch wg.

Saturation Efficiency: Minimum <**\_\_\_\_\_\_\_\_**> percent.

Operating Static Pressure: **[3 inch wg negative] [3 inch wg positive] [6 inch wg positive]** <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_>.

Water Cooling Coil:

Size: <\_\_\_\_\_\_\_\_>.

Rows: <\_\_\_\_\_\_\_\_>.

Capacity: <\_\_\_\_\_\_\_\_> Btuh.

Entering Air Temperature:

<\_\_\_\_\_\_\_\_> degrees F dry bulb.

<\_\_\_\_\_\_\_\_> degrees F wet bulb.

Leaving Air Temperature:

<\_\_\_\_\_\_\_\_> degrees F dry bulb.

<\_\_\_\_\_\_\_\_> degrees F wet bulb.

Chilled Water:

Flow Rate: <\_\_\_\_\_\_\_\_> gpm.

Water Pressure Drop: <\_\_\_\_\_\_\_\_> ft.

Entering Water Temperature: <\_\_\_\_\_\_\_\_> degrees F.

Leaving Water Temperature: <\_\_\_\_\_\_\_\_> degrees F.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Refrigerant Cooling Coil:

Size: <\_\_\_\_\_\_\_\_>.

Rows: <\_\_\_\_\_\_\_\_>.

Capacity: <\_\_\_\_\_\_\_\_> Btuh.

Entering Air Temperature:

<\_\_\_\_\_\_\_\_> degrees F dry bulb.

<\_\_\_\_\_\_\_\_> degrees F wet bulb.

Leaving Air Temperature:

<\_\_\_\_\_\_\_\_> degrees F dry bulb.

<\_\_\_\_\_\_\_\_> degrees F wet bulb.

Refrigerant: **[R-22]** <\_\_\_\_\_\_\_\_>.

Saturated Suction Temperature: <\_\_\_\_\_\_\_\_> degrees F.

Spray Pumps:

Flow: <\_\_\_\_\_\_\_\_> gpm.

Head: <\_\_\_\_\_\_\_\_> ft.

* + - * 1. Electrical Characteristics and Components:

Select one or more of the following subparagraphs appropriate to equipment requirements.

Electrical Characteristics:

**[<\_\_\_\_\_\_\_\_>hp.] [<\_\_\_\_\_\_\_\_> rated load amperes.]**

<\_\_\_\_\_\_\_\_> volts, **[single] [three]** phase, 60 Hz.

<\_\_\_\_\_\_\_\_> amperes maximum **[fuse size] [circuit breaker size] [overcurrent protection]**.

<\_\_\_\_\_\_\_\_> minimum circuit ampacity.

<\_\_\_\_\_\_\_\_> percent minimum power factor at rated load.

Motors: In accordance with Section 230513.

Disconnect Switch: Factory mount **[in control panel] [on equipment]**.

1. EXECUTION
   * + 1. EXAMINATION
          1. Verify ductwork is ready for installation.
          2. Verify piping rough-ins are correct size and at correct location.
          3. Verify power wiring is correct voltage and at correct location.
       2. PREPARATION
          1. Contact manufacturer to review installation procedures for field installed accessories.
       3. INSTALLATION - EVAPORATIVE HUMIDIFIERS
          1. Install in accordance with ARI 630 “Selection, Installation, Servicing of Humidifiers”.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Install loose equipment furnished by manufacturer.
        2. Connect evaporative pan humidifier to hot water supply. Install **[gate]** <\_\_\_\_\_\_\_\_> valve and solenoid valve on heating water supply piping, and **[globe]** <\_\_\_\_\_\_\_\_> valve on heating water return piping. Refer to Section 232113.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Connect evaporative pan humidifier to steam supply piping. Install **[gate]** <\_\_\_\_\_\_\_\_> valve and **[solenoid] [control valve]** valve on steam supply piping and **[thermostatic]** <\_\_\_\_\_\_\_\_> steam trap on condensate return piping. Refer to Section 232213.
        2. Install drain piping from units from overflow and manual drain with valve to floor drain. Refer to Section 232113.
        3. Install evaporative pan humidifier piping with unions or flanges for easy removal of pan for servicing.
        4. Connect evaporative pan humidifier to ducts. Keep duct runs minimum length and slope back to humidifier. Refer to Section 233100.
        5. Place evaporative humidifiers on 2 inch thick rigid insulation board same size as unit tank. Flash and counterflash with 0.0396 inch galvanized steel on entering and leaving sides.
        6. Connect evaporative and evaporative pan humidifiers to domestic cold water supply. Install gate valve [and pressure reducing valve] on water supply piping. Install 3/4 inch hose bibb accessible from interior. Refer to Section 221100.
        7. Bolt evaporative humidifier pumps directly to tank fitting. Insulate external spray piping. Refer to Section 230700.
        8. Install evaporative humidifiers with globe valve and solenoid valve in 1/2 inch bleed piping from drain. Refer to Section 232113.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Provide 1/2 inch bleed piping from spray pump discharge to nearest floor drain complete with globe valve set to pass 1/2 gph of spray water per 1000 cfm of air flow. Locate bleed piping above flood level of drain tank. Refer to Section 232113.
        2. Install evaporative humidifiers with low water cut-off in drain pan to stop spray pump.
        3. Provide control wiring for field installed accessories.
      1. INSTALLATION - STEAM HUMIDIFIERS
         1. Install in accordance with ARI 630 “Selection, Installation, Servicing of Humidifiers”.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Install loose equipment furnished by manufacturer.
        2. Install galvanized steel rods to support distribution manifolds of steam grid humidifier and mount in air system plenums.
        3. Install **[galvanized steel rods] [wall bracket]** to support humidifier **[heat exchanger] [components]** <\_\_\_\_\_\_\_\_>.
        4. Make connections to equipment with unions or flanges.
        5. Connect steam humidifiers to steam supply and to steam condensate return piping. Install gate valve, inlet strainer, and control valve on steam supply piping. Install strainer, **[inverted bucket] [float and thermostatic]** steam trap, and gate valve on steam condensate return piping. Refer to Section 232213.
        6. Connect humidifiers to domestic water and to drain piping. Install shutoff valve and strainer on domestic water piping. Install drain piping with trap of depth recommended by manufacturer. Refer to Section 221100.
        7. Provide control wiring for field installed accessories.
      1. INSTALLATION - ELECTRIC HUMIDIFIERS
         1. Install in accordance with ARI 630 “Selection, Installation, Servicing of Humidifiers”.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Install loose equipment furnished by manufacturer.
        2. Install galvanized steel rods to support distribution manifolds of humidifier and mount in air system plenums.
        3. Install **[galvanized steel rods] [wall bracket]** to support humidifier **[components]** <\_\_\_\_\_\_\_\_>.
        4. Make connections to equipment with unions or flanges.
        5. Connect humidifiers to domestic water and to drain piping. Install shutoff valve and strainer on domestic water piping. Install drain piping with trap of depth recommended by manufacturer. Refer to Section 221100.
        6. Provide control wiring for field installed accessories.
      1. INSTALLATION - SPRAYED COIL DEHUMIDIFIER
         1. Install loose equipment furnished by manufacturer.
         2. Install sprayed coil dehumidifier in ducts or casings in accordance with SMACNA “ HVAC Duct Construction Standards, Metal and Flexible. Refer to Section 233100.
         3. Insulate exterior of evaporative and sprayed coil dehumidifiers as specified for ductwork. Refer to Section 230700.
         4. Place sprayed coil dehumidifiers on 2 inch thick rigid insulation board same size as unit tank. Flash and counterflash with 0.0396 inch galvanized steel on entering and leaving sides.
         5. Connect sprayed coil dehumidifiers to domestic cold water supply. Install gate valve **[and pressure reducing valve]** on water supply piping. Install 3/4 inch hose bibb accessible from interior. Refer to Section 221100.
         6. Install sprayed coil dehumidifier with shut-off valves for individual spray header isolation and balancing. **[Arrange to allow step control of sprays.]**
         7. Bolt sprayed coil dehumidifier pumps directly to tank fitting. Insulate external spray piping. Refer to Section 230700.
         8. Install sprayed coil dehumidifiers with globe valve and solenoid valve in 1/2 inch bleed piping from drain. Refer to Section 232113.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Provide 1/2 inch bleed piping from spray pump discharge to nearest floor drain complete with globe valve set to pass 1/2 gph of spray water per 1000 cfm of air flow. Locate bleed piping above flood level of drain tank. Refer to Section 232113.
        2. Install sprayed coil dehumidifiers with low water cut-off in drain pan to stop spray pump.
        3. Connect sprayed coil dehumidifier coil to chilled water piping system. Refer to Section 232113.
        4. Connect sprayed coil dehumidifier coil to refrigerant piping system. Refer to Section 232300.
        5. Provide control wiring for field installed accessories.
      1. MANUFACTURER'S FIELD SERVICES
         1. Furnish initial start-up and shutdown during first year of operation, including routine servicing and checkout.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Furnish services of a Company Field Advisor per OGS Spec Section 014216 for minimum of **[one]** <\_\_\_\_\_\_\_\_> days to start equipment according to manufacturer's instructions and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements.
      1. DEMONSTRATION
         1. Demonstrate operation and maintenance procedures.
         2. Furnish services of a Company Field Advisor per OGS Spec Section 014216for **[4]** <\_\_\_\_\_\_\_\_> hours to instruct Director’s Representative's personnel in operation and maintenance of units. Schedule training with Director’s Representative, provide at least 7 days notice to **[Director’s Representative]** <\_\_\_\_\_\_\_\_> of training date.
      2. SCHEDULES

Include schedule when more than one unit is required. Complete in conjunction with identification method used on Drawings or include schedule on Drawings. No units of measurement are indicated; these add to schedule legend or include within each insert.

Consider the following examples when developing Project schedule.

* + - * 1. Evaporative Humidifiers Schedule:

EH-1:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Air Flow Rate: <\_\_\_\_\_\_\_\_>.

Air Pressure Drop: <\_\_\_\_\_\_\_\_>.

Saturation Efficiency: <\_\_\_\_\_\_\_\_>.

Overall Height: <\_\_\_\_\_\_\_\_>.

Overall Width: <\_\_\_\_\_\_\_\_>.

Face Velocity: <\_\_\_\_\_\_\_\_>.

Spray Pump:

Flow Rate: <**\_\_\_\_\_\_\_\_**>.

Head: <**\_\_\_\_\_\_\_\_**>.

Voltage/Phase: <**\_\_\_\_\_\_\_\_**>/<**\_\_\_\_\_\_\_\_**>.

EH-1:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Air Flow Rate: <\_\_\_\_\_\_\_\_>.

Air Pressure Drop: <\_\_\_\_\_\_\_\_>.

Saturation Efficiency: <\_\_\_\_\_\_\_\_>.

Overall Height: <\_\_\_\_\_\_\_\_>.

Overall Width: <\_\_\_\_\_\_\_\_>.

Face Velocity: <\_\_\_\_\_\_\_\_>.

Spray Pump:

Flow Rate: <**\_\_\_\_\_\_\_\_**>.

Head: <**\_\_\_\_\_\_\_\_**>.

Voltage/Phase: <**\_\_\_\_\_\_\_\_**>/<**\_\_\_\_\_\_\_\_**>.

* + - * 1. Evaporative Pan Humidifiers Schedule:

EPH-1:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Evaporation Capacity: <\_\_\_\_\_\_\_\_>.

Coil Water Temperature: <\_\_\_\_\_\_\_\_>.

Coil Steam Temperature: <\_\_\_\_\_\_\_\_>.

kW Input: <\_\_\_\_\_\_\_\_>.

Voltage/Phase: <\_\_\_\_\_\_\_\_>/<\_\_\_\_\_\_\_\_>.

EPH-2:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Evaporation Capacity: <\_\_\_\_\_\_\_\_>.

Coil Water Temperature: <\_\_\_\_\_\_\_\_>.

Coil Steam Temperature: <\_\_\_\_\_\_\_\_>.

kW Input: <\_\_\_\_\_\_\_\_>.

Voltage/Phase: <\_\_\_\_\_\_\_\_>/<\_\_\_\_\_\_\_\_>.

* + - * 1. Steam Injection Humidifiers Schedule:

SIH-1:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Area Served: <\_\_\_\_\_\_\_\_>.

Output Capacity: <\_\_\_\_\_\_\_\_>.

Inlet Steam Pressure: <\_\_\_\_\_\_\_\_>.

Manifold Length: <\_\_\_\_\_\_\_\_>.

Duct Size: <\_\_\_\_\_\_\_\_>.

SIH-2:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Area Served: <\_\_\_\_\_\_\_\_>.

Output Capacity: <\_\_\_\_\_\_\_\_>.

Inlet Steam Pressure: <\_\_\_\_\_\_\_\_>.

Manifold Length: <\_\_\_\_\_\_\_\_>.

Duct Size: <\_\_\_\_\_\_\_\_>.

* + - * 1. Electrode Steam Humidifiers Schedule:

ESH-1:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Area Served: <\_\_\_\_\_\_\_\_>.

Output Capacity: <\_\_\_\_\_\_\_\_>.

Orifice Size: <\_\_\_\_\_\_\_\_>.

kW Input: <\_\_\_\_\_\_\_\_>.

Voltage/Phase: <\_\_\_\_\_\_\_\_>/<\_\_\_\_\_\_\_\_>.

ESH-2:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Area Served: <\_\_\_\_\_\_\_\_>.

Output Capacity: <\_\_\_\_\_\_\_\_>.

Orifice Size: <\_\_\_\_\_\_\_\_>.

kW Input: <\_\_\_\_\_\_\_\_>.

Voltage/Phase: <\_\_\_\_\_\_\_\_>/<\_\_\_\_\_\_\_\_>.

* + - * 1. Steam Heated, Heat Exchanger Type Humidifiers Schedule:

EXH-1:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Area Served: <\_\_\_\_\_\_\_\_>.

Output Capacity: <\_\_\_\_\_\_\_\_>.

Inlet Steam Pressure: <\_\_\_\_\_\_\_\_>.

Manifold Length: <\_\_\_\_\_\_\_\_>.

Duct Size: <\_\_\_\_\_\_\_\_>.

EXH-2:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Area Served: <\_\_\_\_\_\_\_\_>.

Output Capacity: <\_\_\_\_\_\_\_\_>.

Inlet Steam Pressure: <\_\_\_\_\_\_\_\_>.

Manifold Length: <\_\_\_\_\_\_\_\_>.

Duct Size: <\_\_\_\_\_\_\_\_>.

* + - * 1. Electrically Heated, Immersion Type Humidifiers Schedule:

EIH-1:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Area Served: <\_\_\_\_\_\_\_\_>.

Output Capacity: <\_\_\_\_\_\_\_\_>.

Manifold Length: <\_\_\_\_\_\_\_\_>.

Duct Size: <\_\_\_\_\_\_\_\_>.

kW Input: <\_\_\_\_\_\_\_\_>.

Voltage/Phase: <\_\_\_\_\_\_\_\_>/<\_\_\_\_\_\_\_\_>.

EIH-2:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Area Served: <\_\_\_\_\_\_\_\_>.

Output Capacity: <\_\_\_\_\_\_\_\_>.

Manifold Length: <\_\_\_\_\_\_\_\_>.

Duct Size: <\_\_\_\_\_\_\_\_>.

kW Input: <\_\_\_\_\_\_\_\_>.

Voltage/Phase: <\_\_\_\_\_\_\_\_>/<\_\_\_\_\_\_\_\_>.

* + - * 1. Sprayed Coil Dehumidifiers Schedule:

SCD-1:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Evaporation Performance: <\_\_\_\_\_\_\_\_>.

Air Flow Rate: <\_\_\_\_\_\_\_\_>.

Maximum Air Pressure Drop: <\_\_\_\_\_\_\_\_>.

Minimum Saturation Efficiency: <\_\_\_\_\_\_\_\_>.

Operating Static Pressure: <\_\_\_\_\_\_\_\_>.

Water Cooling Coil:

Size: <\_\_\_\_\_\_\_\_>.

Rows: <\_\_\_\_\_\_\_\_>.

Capacity: <\_\_\_\_\_\_\_\_>.

Entering Dry Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Entering Wet Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Leaving Dry Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Leaving Wet Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Chilled Water:

Flow Rate: <\_\_\_\_\_\_\_\_>.

Water Pressure Drop: <\_\_\_\_\_\_\_\_>.

Entering Water Temperature: <\_\_\_\_\_\_\_\_>.

Leaving Water Temperature: <\_\_\_\_\_\_\_\_>.

Refrigerant Cooling Coil:

Size: <\_\_\_\_\_\_\_\_>.

Rows: <\_\_\_\_\_\_\_\_>.

Capacity: <\_\_\_\_\_\_\_\_>.

Entering Dry Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Entering Wet Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Leaving Dry Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Leaving Wet Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Refrigerant: <\_\_\_\_\_\_\_\_>.

Saturated Suction Temperature: <\_\_\_\_\_\_\_\_>.

Spray Pumps:

Flow: <\_\_\_\_\_\_\_\_>.

Head: <\_\_\_\_\_\_\_\_>.

Motor Power: <\_\_\_\_\_\_\_\_>.

Motor Voltage/Phase: <\_\_\_\_\_\_\_\_>/<\_\_\_\_\_\_\_\_>.

SCD-2:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: <\_\_\_\_\_\_\_\_>.

Evaporation Performance: <\_\_\_\_\_\_\_\_>.

Air Flow Rate: <\_\_\_\_\_\_\_\_>.

Maximum Air Pressure Drop: <\_\_\_\_\_\_\_\_>.

Minimum Saturation Efficiency: <\_\_\_\_\_\_\_\_>.

Operating Static Pressure: <\_\_\_\_\_\_\_\_>.

Water Cooling Coil:

Size: <\_\_\_\_\_\_\_\_>.

Rows: <\_\_\_\_\_\_\_\_>.

Capacity: <\_\_\_\_\_\_\_\_>.

Entering Dry Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Entering Wet Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Leaving Dry Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Leaving Wet Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Chilled Water:

Flow Rate: <\_\_\_\_\_\_\_\_>.

Water Pressure Drop: <\_\_\_\_\_\_\_\_>.

Entering Water Temperature: <\_\_\_\_\_\_\_\_>.

Leaving Water Temperature: <\_\_\_\_\_\_\_\_>.

Refrigerant Cooling Coil:

Size: <\_\_\_\_\_\_\_\_>.

Rows: <\_\_\_\_\_\_\_\_>.

Capacity: <\_\_\_\_\_\_\_\_>.

Entering Dry Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Entering Wet Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Leaving Dry Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Leaving Wet Bulb Air Temperature: <\_\_\_\_\_\_\_\_>.

Refrigerant: <\_\_\_\_\_\_\_\_>.

Saturated Suction Temperature: <\_\_\_\_\_\_\_\_>.

Spray Pumps:

Flow: <\_\_\_\_\_\_\_\_>.

Head: <\_\_\_\_\_\_\_\_>.

Motor Power: <\_\_\_\_\_\_\_\_>.

Motor Voltage/Phase: <\_\_\_\_\_\_\_\_>/<\_\_\_\_\_\_\_\_>.

END OF SECTION 238400