

## SECTION 15763 –STEAM HUMIDIFIERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.2 WORK INCLUDED

- A. Steam Humidifiers
  - 1. Furnish and install all steam humidifiers in-duct or in unit, controls, piping, wiring, enclosures, access doors, etc. to make a complete and operational system.
  - 2. All equipment shall be new and shall be of the type, style, size and capacities as scheduled.
  - 3. Refer to drawing schedules and details for humidifier capacities and the minimum number of manifolds.
  - 4. All piping and tubing connections, as well as all interlocking, shall be provided under this Contract.

#### 1.3 RELATED SECTIONS

- A. Examine all drawings and criteria sheets and all other Sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.

#### 1.4 REFERENCES

- A. Applicable provisions of the following Codes and Trade Standard Publications shall apply to the work of this Section, and are hereby incorporated into, and made a part of the Contract Documents.
- B. Material standards shall be as specified or detailed hereinafter and as following:
  - 1. ARI 410 – Forced-Circulation Air-Cooling and Air-Heating Coils.
  - 2. SMACNA – HVAC Duct Construction Standards, Metal and Flexible.
  - 3. NFPA 70 – National Electrical code.

## 1.5 SUBMITTALS

- A. See Section 15050 and general conditions for additional requirements.
- B. Product Data: Provide typical catalog of information including arrangements.
- C. Shop Drawings:
  - 1. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element, access doors and output provided.
  - 2. Indicate mechanical and electrical service locations and requirements.
- D. Manufacturer's Instructions: Indicate installation instructions and recommendations.
- E. Project Record Documents: Record actual locations of components and locations of access doors and access required for access or valving.
- F. Submit all calculations including steam pressure and absorption distance. Include calculations for economizer cycle as well as most severe temperature conditions.
- G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data and parts listings.
- H. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five (5) years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriter's Laboratories Inc. testing firm acceptable to the authority having jurisdiction and suitable for the purpose specified and indicated.

## 1.7 PRODUCT, STORAGE AND HANDLING

- A. Delivery of materials shall be made to the project by the materials supplier in accordance with the instructions to the Contractor.
- B. The Contractor shall provide adequate locked storage space with shelving for the materials, shall be responsible for all items of materials after receipt from the supplier, and shall replace all materials lost or damaged after delivery and receipt.
- C. The Contractor shall furnish the materials supplier with receipts for all materials and accessory items received and shall send copies of these receipts to the Architect.

## PART 2 - PRODUCTS

### 2.1 STEAM HUMIDIFIERS

- A. Acceptable manufacturers subject to compliance with the specifications shall be as follows:
1. Carel – Ultimate Steam
  2. Dri-Steem – Ultra Sorb
  3. Pure Humidifier
- B. Provide steam humidifiers for electronic modulating control, of the direct discharge type using steam for injection into air plenums/ducts for humidification. Humidifiers shall be single or multiple tube(s) as scheduled. Tube length shall match width of ductwork.
- C. Humidifiers shall receive steam at supply pressure (low pressure) and discharge at atmospheric pressure. Humidifiers shall be provided with inlet strainer and external steam traps. Humidifiers shall be constructed as follows:
1. Separating chamber shall be designed to remove all water droplets and all particulate matter larger than (3) microns when humidifier is operating at maximum capacity without objectionable noise.
  2. A stainless steel modulating valve shall be provided. This control valve shall have a minimum turn down ratio:
    - a. 1/2" – 25:1
    - b. 3/4" to 2" – 50:1
  3. Each humidifier shall consist of multiple, vertical steam discharge pipes, supported on horizontal header manifolds, spaced to provide the optimum of steam to air contact while minimizing pressure drop. Each humidifier shall be sized to nominally match the air plenum width and height for maximum contact of the discharging steam to the air passing around the vertical steam discharge pipes.
  4. The vertical steam discharge pipes shall be constructed of all 316 stainless steel, each having a full-length, inverted slot on each side, for steam discharge at 100% air to steam contact. Nozzles and holes are unacceptable as they have less than 15% air to steam contact, which will result in longer evaporation distances and possible wetting.
  5. A full-length stainless steel fishbone shaped baffle shall be used inside the vertical discharge pipe to wick condensate away from the discharge slots and back to the center of the pipe for re-evaporation.
  6. The feeder manifolds shall be constructed of all 316 stainless steel, sized to move the steam in a specific mass-flow speed range, for maximum condensate separation. Final condensate separation shall occur inside the feeder manifolds, after the control valve, with the dried steam then injected directly into the vertical discharge pipes.
  7. The vertical steam discharge pipes and horizontal feeder manifolds shall be coated with a thin, non-toxic insulative coating capable of reducing surface temperature to no more than 120°F during operation, to reduce condensate losses and heat gain to the air stream. The insulative coating shall have an insulating value at 30 mils equal to 8" of R-40 foam. The insulative coating shall have a flame spread and smoke developed

rating of 5 under ASTM E-84 with a cross-hatch adhesion of 100% under ASTM D-3359, acceptable for use in air ducts.

8. The steam humidifier shall be designed with slip fittings for easy assembly and (with the exception of the traps, strainer, valve and actuator) shall be designed for zero maintenance, having no plastic nozzles, collars, o-rings or gaskets. Manufacturer shall be responsible for any maintenance costs (not resulting from mishandling or misuse) required on the distribution manifolds for a period of 5 years.
  9. Provide steam trapping in strict accordance with manufacturer's details and instructions.
- D. In addition provide with each humidifier kettle a temperature safety switch, which prevents operation when the condensate temperature returning from the manifold jacket is too low.
- E. Provide access doors downstream of humidifiers for visual verification of humidifier operation.
- F. Controls in-duct booster type.
1. Contractor shall provide airflow switches to provide means of detecting airflow and/or a failure of airflow in the system, which will shut off supply control valve to prevent steam from entering the steam humidifier.
    - a. Acceptable manufacturers of airflow switches subject to compliance with the specification shall be as follows:
      - 1) McDonnell Model AF1
      - 2) Dwyer, Honeywell
      - 3) Johnson Controls.
  2. ATC Contractor shall provide a duct mounted high limit humidistat to override the sensor control whenever the high limit is reached as well as maintain the high limit set point until main sensor resumes control. The high limit humidistat shall be mounted into the ductwork at least 8'-0" downstream of the humidifier.
  3. Provide a remote wall mounted humidistat to shall modulate and control the humidifier.
- G. Controls in-unit or in-duct type.
1. Contractor shall provide airflow switches to provide means of detecting airflow and/or a failure of airflow in the system, which will shut off supply control valve to prevent steam from entering the steam humidifier.
    - a. Acceptable manufacturers of airflow switches subject to compliance with the specification shall be as follows:
      - 1) McDonnell Model AF1
      - 2) Dwyer, Honeywell
      - 3) Johnson Controls.

2. ATC Contractor shall provide a duct mounted high limit humidistat to override the sensor control whenever the high limit is reached as well as maintain the high limit set point until main sensor resumes control. The high limit humidistat shall be mounted into the ductwork at least 8'-0" downstream of the humidifier.
3. Provide a remote return air humidistat to modulate and control the humidifier.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install equipment exposed to finished area after walls and ceiling are finished and painted. Do not damage equipment.

#### 3.2 IN-DUCT STEAM HUMIDIFIER INSTALLATION

- A. In-duct steam humidifier shall be installed in accordance with manufacturer recommendations, Contract Drawings, and reviewed submittals.
- B. Steam humidifier shall be installed so as to ensure easy accessibility for service or removal and replacement of control valves, shut-off valves, strainers, and humidifiers.
- C. Install access doors so that visual verification of humidifier operation is easily accomplished.
- D. Provide drain from watertight stainless steel (or aluminum) ductwork. Pipe drain to nearest floor drain or slop sink.

#### 3.3 CLEANING

- A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of duct or plenum.

END OF SECTION