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SECTION 230923.14

FLOW INSTRUMENTS

Specifier Notes are hidden. Reveal hidden text to read notes.

\*\* NOTE TO SPECIFIER \*\* This section is based on the products of Ruskin Company, which is located at:

3900 Dr. Greaves Road

Kansas City, Missouri 64030

Tel: (816) 761-7476

Fax: (816) 765-8955

Email: [ruskin@ruskin.com](mailto:ruskin@ruskin.com)

Web: <http://www.ruskin.com>

Ruskin Manufacturing has been the leading manufacturer of dampers and louvers for 50 years. Ruskin has pioneered advanced products for the HVAC Industry and continues to be an industry leader with modern manufacturing equipment, computer-aided design capabilities and an AMCA registered air performance testing laboratory for research and development. All of these are backed by our experienced engineers and professional staff and reflects Ruskin's commitment to high quality product standards.

SECTION 23 09 23, Copyright 2017, Ruskin Company.

1. GENERAL
   1. SECTION INCLUDES
      1. Air Flow and Temperature Measuring Station (AFTMS)
   2. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Edit the following list as required for the project. List other sections with work directly related to the dampers.

* + 1. Section 23 09 00 – Instrumentation and Control for HVAC.
    2. Section 23 31 00 – HVAC Ducts and Casings.
    3. Section 23 33 00 – Dampers.
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + 1. USGBC: U.S. Green Building Council LEED® Rating System.
  1. ACTION SUBMITTALS
     1. Comply with requirements of Section 01 33 00 - Submittal Procedures.
     2. Product Data: Submit manufacturer's product data.
        1. Indicate materials, construction, and dimensions.
        2. Include a copy of the Installation Instructions.
     3. Shop Drawings:
        1. Submit shop drawings indicating materials, construction, dimensions, accessories, and installation details.
     4. Product Schedule: Use same designations indicated on Drawings.

\*\* NOTE TO SPECIFIER \*\* Delete selection samples if not required.

* + 1. Samples: Submit sample of flow instrumentation systems.
  1. INFORMATIONAL SUBMITTALS

\*\* NOTE TO SPECIFIER \*\* Coordinate "Qualification Data" Paragraph below with qualification requirements in Division 01 Section "Quality Requirements" and as may be supplemented in "Quality Assurance" Article.

* + 1. Qualification Data: For manufacturer and Installer.
    2. Product Test Reports: For each type of flow instrument, for tests performed by a qualified testing agency.

\*\* NOTE TO SPECIFIER \*\* Retain "Field quality-control reports" Paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + 1. Field quality-control reports.
    2. Sample Warranties: For manufacturer's warranties.
  1. QUALITY ASSURANCE
     1. Manufacturer Qualifications:
        1. The manufacturer shall have implemented the management of quality objectives, continual improvement, and monitoring of customer satisfaction to assure that customer needs and expectations are met.
        2. Manufacturer shall be International Organization for Standardization (ISO) 9001 accredited.

\*\* NOTE TO SPECIFIER \*\* Insert installer qualifications. Delete if not required.

* + 1. Installer Qualifications:
       1. USGBC LEED Compliance: The Work of this section shall be in accordance with applicable portions of the U.S. Green Building Council’s LEED Green Building Rating System. Refer to Divisions 23 and 26 Sections and other related documents bound herein for purposes of complying with this requirement.
    2. Product Qualifications:
       1. Components shall be U.L. Listed and compliant with Part 15 of the FCC rules and RoHS directive 2002/95/EC.
       2. Third party verified FCC, UL, BTL, AMCA, NIST and ISO 9001.
       3. Tested for compliance with FCC, the EMC Directive’s requirements and shall be certified to carry the CE Mark for European Union Shipments.
  1. DELIVERY, STORAGE, AND HANDLING
     1. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
     2. Storage: Store materials in a dry area indoors, protected from damage and in accordance with manufacturer's instructions.
     3. Handling: Protect materials and finishes during handling and installation to prevent damage.
  2. WARRANTY
     1. Manufacturer shall provide standard limited warranty that product will be free from defects in material and workmanship for a period of 5 years (60 months) from date of delivery to the delivery location.. When notified in writing from the Owner of a manufacturing defect, manufacturer shall promptly correct deficiencies without direct financial cost to the Owner.

1. PRODUCTS
   1. MANUFACTURER
      1. Ruskin Company, 3900 Dr. Greaves Road, Kansas City, Missouri 64030. Phone (816) 761-7476. Fax (816) 765-8955. Web Site http://www.ruskin.com.

\*\* NOTE TO SPECIFIER \*\* Consult Ruskin for assistance in selecting approved equal manufacturer and product for specific applications. Delete substitution provision not required.

* + 1. Substitutions: Not permitted.
    2. Substitution requests for acceptance less than 60 days prior to bid date or products submitted in non-conformance with the requirements of this specification will not be considered.
       1. For any product to be considered for substitution, a written document shall be submitted to the engineer detailing exceptions and compliance, section-by-section with supporting documentation, before an approval will be considered.
       2. Any product submitted as an equal shall comply with all performance capabilities and functional aspects of this specification.
       3. Excluded devices:
          1. Pitot tubes, Pitot arrays, Piezo rings and other differential pressure based devices are not acceptable for lower velocity applications.
          2. Vortex Shedding is not acceptable for lower velocity applications
  1. AIR FLOW AND TEMPERATURE MEASUREMENT STATION (AFTMS)
     1. Basis of Design: TDP05K as manufactured by Ruskin Company.
     2. Acceptable Equal Product:
        1. Johnson Controls AD-1272.
           1. Air flow measurement devices shall use the principle of thermal dispersion and provide one self-heated thermistor and one passive thermistor at each sensing node.
     3. Air Flow and Temperature Measurement Station (AFTMS) with Temperature Output, BACNET network Interface, high and low air flow and temperature alarms as standard. Configuration, scaling, and diagnostic functions shall be performed by means of a password protected, cover mounted set of membrane switches.
        1. General:
           1. Provide one AFTMS for each location provided on the plans, schedules and/or control diagrams to measure the average air flow rate and temperature at each measurement location.
           2. Each AFTMS shall be provided with a primary probe and the correct number of ancillary probes, up to 15 ancillary probes for larger opening for a maximum of 128 sensing locations per AFTMS.

Primary probe will be the interface point to the automation system.

When more than one probe is required an ancillary probe will be connected to the primary probe using non-proprietary twisted pair shielded cable.

Additional ancillary probes are connected in daisy-chain topology from ancillary to ancillary to ancillary using non-proprietary twisted pair shielded cable.

* + - * 1. Air flow measurement shall be field configurable to determine the average Actual or Standard air flow rate.

Actual air flow rate calculations shall have the capability of being corrected for elevations other than sea level.

* + - * 1. Temperature measurement shall be field configurable with positive or negative offset when necessary to match test and balance calibrated average temperature.

\*\* NOTE TO SPECIFIER \*\* The span feature can be used to generate a low-temperature or low-flow alarm by setting the span at an alarm limit. For example: Adjust SPAN such that 20mA is equal to 40F and 4mA or less is set to 32F. The analog output will be 100% above 40F and

Span shall be definable such that zero to 100% can be set to any values within the range of 2 to 20mA

\*\* NOTE TO SPECIFIER \*\* Span Pre-drilled probe enclosures for NEMA1 rated hole plugs as standard. NEMA4 rated cord grips are available from Ruskin as an option. Customer will need to 2 or 4 cord grips per probe plus 2 for the BacNet connection if used on the primary probe. Actual number required is dependent on the wire used, ie. separate power and communication or Ruskin recommended Connect Air Part number W24182P-2306BL. When NEMA4 option is selected, NEMA1 hole plugs will be replaced with NEMA4 rated hole plugs.

* + - 1. Sensor Probes:
         1. Air foil shape sensor probes shall be constructed of anodized, 6063T-6 aluminum alloy.
         2. Sensor probe mounting shall be insertion mount or standoff brackets for face mount on dampers and louvers as scheduled or required.

\*\* NOTE TO SPECIFIER \*\* Optional. Delete mounting hardware material not required.

Mounting hardware shall be galvanized steel.

Mounting hardware shall be aluminum.

Mounting hardware shall be stainless steel.

* + - * 1. Probe internal wiring between the primary board or ancillary board and sensor nodes shall be via Flat Flexible Cables (FFC) with hermetically sealed connections.

Internal wiring connections shall be capable of direct exposure to water without affecting instrument operation.

Probe design shall allow replacement of defective or damaged thermistors in the field when necessary.

Probe shall not be affected by direct or sustained exposure or moisture.

\*\* NOTE TO SPECIFIER \*\* Power and communication are recommended to be run in two separate conduits to avoid interference are NOT REQUIRED when using Ruskin recommended nonproprietary wire, Connect Air part number W24182P-2306BL or Belden 8723 shielded cable. The Connect Air wire has a 2-pair shielded communication wire and a 2-pair 18AWG power wire in one cable and is available from Ruskin as an option.

* + - * 1. Connections between primary and ancillary probes shall be accomplished using twisted pair shielded power and twisted pair shielded communication wiring terminated on phoenix type connector plugs with screw terminal connections.
        2. Each sensor probe shall contain one or up to eight sensing pairs with a maximum capability of 128 sensing pairs per AFTMS.
        3. Probes shall not require matching or adjustments in the field.
        4. Each sensor node shall be individually calibrated at 25 measurement points to AMCA 611-15 air flow procedures using NIST traceable AMCA CERTIFIED calibrated wind tunnels and have an accuracy of ±2% of reading over the entire calibrated air flow range of 0 to 5,000 FPM (25.4 m/s).

Acceptable manufactures shall be members of AMCA.

* + - * 1. AFTMS accuracy is dependent on placement and installed conditions.
        2. The AFTMS accuracy shall be:

Ducts - ±3% of reading when installed in accordance with AMCA figure 5.3.

Non-ducted Outdoor Air intakes – better than or equal to ±5% of reading when installed in accordance with AMCA figure 5.1 or figure 5.4

* + - * 1. Each sensing node shall have a temperature accuracy of ±0.10° F (0.06° C) over an operating range of -20° F to 120° F. (-28.9° C to 60° C) and humidity range of 0 to 99% RH.
        2. The number of independent sensor nodes provided shall be as follows:

Area ft2 [m2] # Sensor Nodes

≤ 0.5 [≤ 0.046] 1

> 0.5 & ≤ 1 [≤ 0.092] 2

> 1 & ≤ 2 [> 0.092 & ≤ 0.185] 4

> 2 & ≤ 4 [> 0.185 & ≤ 0.371] 6

> 4 & ≤ 8 [> 0.371 & ≤ 0.743] 8

> 8 & ≤ 12 [> 0.743 & ≤ 1.11] 12

> 12 & ≤ 14 [> 1.11 & ≤ 1.30] 14

> 14 & ≤ 16 [> 1.30 & ≤ 1.49] 16

> 16 & ≤ 18 [> 1.49 & ≤ 1.67] 18

> 18 & ≤ 20 [> 1.67 & ≤ 1.86] 20

> 20 & ≤ 22 [> 1.86 & ≤ 2.04] 22

> 22 & ≤ 24 [> 2.04 & ≤ 2.23] 24

> 24 & ≤ 26 [> 2.23 & ≤ 2.42] 26

> 26 see 1) below

A total number of up to 128 sensors shall be required for openings greater than the openings listed above such that sensors are placed not more than 13.5 inches apart either horizontally or vertically corresponding to not less than one sensor every 1.26 SqFt.

Higher sensor densities are recommended for larger openings or installation with placement that must be less than recommended distances upstream or downstream from transitions, elbows, take-offs, modulating dampers, fans or blowers.

Maximum 8 sensors per probe and 16 probes per air measurement station with probes installed horizontally or vertically in the opening.

* + - 1. Primary Probe:
         1. Each AFTMS will have one primary probe connected in a daisy chain topology to a maximum number of 15 ancillary probes.
         2. The primary probe shall be the interface point with the automation system via analog or network connections.
         3. The primary probe shall be available with or without a display.

\*\* NOTE TO SPECIFIER \*\* Optional remote display can be used to complete setup and adjustments or to display air flow and temperature in a remote location but is not required for normal operation and can be used with primary probes with or without displays and can duplicate primary probe’s display and functions.

* + - * 1. Primary probe with display shall support tool-free one touch setup through surface membrane label on a hinged weather resistant enclosure with liquid tight construction.

All configuration, scaling, and diagnostic functions shall be performed by means of a password protected, cover mounted set of membrane switches.

* + - * 1. Primary probe with display shall include a 16x2 character alphanumeric backlit LCD display.

\*\* NOTE TO SPECIFIER \*\* Optional. Ruskin recommends the REMOTE DISPLAY OPTION for NEMA4 outside installations such that the user interface can be mounted in a remote location for enhanced ease of setup.Delete if not required.

* + - * 1. Remote display shall duplicate all features and functions of the primary probe’s display.

\*\* NOTE TO SPECIFIER \*\* Wireless option between the remote display and primary probe allows the display to be powered with 24VAC from a separate source and will duplicate all the features available on the primary display without any wires between the air measurement station and the remote display. Distances up to 100Feet away or more are possible depending on the environment where installed. (In an office environment it works between floors and more than 300FEET away.) Delete network connection not required.

Remote display shall be wired as another ancillary device on the probe network.

Remote display shall be wireless communication between the primary and remote display.

* + - * 1. The AFTMS shall be capable of determining the air flow rate and temperature average of all connected sensor nodes in an array for a single location.
        2. Through the BacNet interface the AFTMS shall be capable of providing a high and/or low air flow and temperature alarm with user-defined set point and dead band. Alarm shall automatically reset. An alarm delay function shall be field defined.
        3. The primary probe shall be capable of identifying a sensor malfunction and will automatically or manually ignore any sensor node that is in a fault condition.
        4. The primary probe shall be capable of automatic K Factor Configuration and include selection that allows for one, two, or three point field adjustment to factory calibration for installations that require adjustment.
        5. The primary probe’s display shall be a 16-character, 2-line, backlit, alpha-numeric, LCD display.

\*\* NOTE TO SPECIFIER \*\* Primary probe is available with or without a display. All setup and configuration functions are duplicated on the remote display. The remote display can be wired to the last ancillary probe or is also available with a wireless interface option.

* + - * 1. The primary probe shall be provided with two field selectable (4-20mA), scalable, isolated and over-current protected analog output signals (AO1=air flow or temperature; AO2 = airflow or temperature), with BACNET MS/TP network connection as standard.

\*\* NOTE TO SPECIFIER \*\* The TDP05k / AD-1272 always includes the BACNET interface in addition to the analog outputs.

* + - * 1. The analog signal capability shall include two output terminals:

Either output or both can be configured for air flow rate and or temperature

High and low Span for each output shall support any portion of the analog output from 2 to 20mA corresponding to temperature or air flow.

* + - * 1. The network communications BACNET MS/TP shall provide: the average air flow rate, temperature, hi and/or low air flow and hi and/or low temperature alarms.
        2. The AFTMS shall not require an on-off power switch to perform reset or reboot functions. Isolation transformers shall not be required.
        3. The AFTMS shall be powered by 24 VAC (12 to 26.4VAC under load) @15 V-A maximum and use a power supply that is over-current and over-voltage protected.
        4. The transmitter shall automatically reset after power disruption, transients and be tolerant of low-voltage or brown-out conditions after disruption is corrected.
        5. Each transmitter shall have an operating temperature range of -25.6° F to 120° F (-32° C to 49° C) and humidity range of 0 to 99% RH.
      1. Listings and Certifications
         1. The AFTMS shall be tested for compliance with FCC, the EMC Directive’s requirements and be certified to carry the CE Mark for European Union Shipments.
  1. SOURCE QUALITY CONTROL
     1. Factory Tests: Factory cycle flow instruments assembly to assure proper operation.

1. EXECUTION
   1. EXAMINATION
      1. Inspect areas to receive flow instruments. Notify the Engineer of conditions that would adversely affect the installation or subsequent utilization of the flow instruments. Do not proceed with installation until unsatisfactory conditions are corrected.
   2. INSTALLATION
      1. Install flow instruments at locations indicated on the drawings and in accordance with manufacturer's installation instructions.

\*\* NOTE TO SPECIFIER \*\* BACNET interface may require field configuration to match / work as part of an installed network provided by others when product is NOT the only device on the BACNET network. Delete if not required.

* + 1. Verify network interface and modification to BACNET system to integrate flow instruments.

END OF SECTION