GUIDE SPECIFICATION

Specifier Notes: This guide specification is written in Construction Specifications Institute (CSI) 3-Part Format in accordance with The CSI Construction Specifications Practice Guide, MasterFormat, SectionFormat, and PageFormat.

Specifier Notes: This Section must be carefully reviewed and edited by the Architect or Engineer to meet the requirements of the Project and local building code. Coordinate this Section with Division 01, other specification sections, and the Drawings. Delete all Specifier Notes after editing this Section. Section numbers and titles are based on MasterFormat 2020 Update.

SECTION 23 82 23

Specifier Notes: This Section covers Systemair's Freshman Series of Unit Ventilators. Consult Systemair for assistance in editing this Section as required for the Project.

The supplier shall provide a Changeair vertical classroom unit ventilator manufactured by Systemair Commercial AHU Ltd. or Systemair MFG Inc. with an up-flow design. An exterior wall-mounted unit will not be permitted.

PART 1. GENERAL

1.1 SECTION INCLUDES

A. Packaged Unit Ventilators

1.2 RELATED REQUIREMENTS

Specifier Notes: Edit the following list of related sections as required for the Project. Limit the list to sections with specific information that the reader might expect to find in this Section but is specified elsewhere.

A. Section 20 05 01 – Mechanical General Requirements
B. Section 23 00 05 – Basic HVAC Requirements
C. Section 23 01 80 – Operation and Maintenance of Decentralized HVAC Equipment
D. Section 23 07 16 – HVAC Equipment Insulation
E. Section 23 07 19 – HVAC Piping Insulation
F. Section 23 08 00 – Commissioning of HVAC
G. Section 23 21 13 – Hydronic Piping
H. Section 23 23 00 – Refrigerant Piping
I. Section 23 31 00 – HVAC Ducts and Casings.

1.3 REFERENCE STANDARDS

Specifier Notes: List reference standards used elsewhere in this Section, complete with designations and titles. Delete reference standards from the following list not used in the edited Section.

A. AHRI 390 – Performance Rating of Single Package Vertical Air-Conditioners and Heat Pumps
B. AHRI 1060 – Performance Rating of Air-to-Air Energy Recovery Ventilators
C. AMCA Publication 211 – Certified Ratings Program Product Rating Manual for Fan Air Performance
D. AMCA Publication 311 – Certified Ratings Program Product Rating Manual for Fan Sound Performance

E. AMCA Publication 511 – Certified Ratings Program Product Rating Manual for Air Control Devices
F. ANSI Z21.47 / CSA 2.3 – Gas-Fired Central Furnaces
G. ASTM E84 – Standard test method for assessing the surface burning characteristics of building products
H. CAN/CSA C22.2, No. 236 – Heating and Cooling Equipment
I. CAN/ULC S102 – Standard Method of Test for Surface Burning Characteristics of building Materials and Assemblies
J. cULus Classified
K. NFPA 70 – National Electrical Code (NEC)
L. SNAP Rule 21 – New listings of safer substitutes and prohibition on the use of certain high-GWP alternatives (December 1, 2016)
M. SNAP Rule 22 – Revised use conditions for hydrocarbon refrigerants as substitutes for household refrigerators and freezers
N. TÜV SÜD – Technical Inspection Association
O. UL94 – Preliminary Screening of Plastics for Fire Performance
P. UL723 – Standard for Test for Surface Burning Characteristics of Building Materials
Q. UL900 – Standard for Safety Air Filter Units
R. UL 1995 – Heating and Cooling Equipment
S. UL 2818 – UL Environment Greenguard Gold Certified

1.4 PREINSTALLATION MEETINGS

Specifier Notes: Edit the Preinstallation Meetings article as required for the Project. Delete article if not required. Options are denoted by brackets

A. Convene preinstallation meeting [1 week] [2 weeks] before start of Work of this Section
B. Require attendance of parties directly affecting Work of this Section, including Contractor, Architect, installer, and manufacturer's representative
C. Review the Following:
    a. Materials
    b. Installation
    c. Adjusting
    d. Protection
    e. Coordination with other Work

1.5 SUBMITTALS

Specifier Notes: Edit the Submittals article as required for the Project. Delete submittals not required.

A. Comply with Division 01
B. Product Data: Submit manufacturer's product data, including installation instructions
C. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details
    a. Wiring Diagrams: Indicate wiring for each item of equipment and interconnections between items of equipment
    b. Include manufacturer's names, model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts
D. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application

E. Operation and Maintenance Data:
    a. Submit manufacturer's operation and maintenance manual; including the following:
        i. Operation, maintenance, adjustment, and cleaning instructions
        ii. Troubleshooting guide
        iii. Parts list
        iv. Electrical wiring diagrams if required
    b. Provide detailed information required for Owner to properly operate and maintain equipment
F. Warranty Documentation: Submit manufacturer's standard warranty

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
    a. Regularly engaged in the manufacturing of unit ventilators for at least 25 years
    b. Factory is an ISO 9001 registered facility
B. Installer's Qualifications:
    a. Regularly engaged in installation of unit ventilators
C. Manufacturer specializing in classroom air-handlers for over 25 years
D. Manufacturer has international presence with multiple production/manufacturing/R&D facilities globally

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery Requirements: Deliver materials to site in manufacturer's original, unopened containers, and packaging, with labels clearly identifying product name and manufacturer
B. Storage and Handling Requirements:
    a. Store and handle materials in accordance with manufacturer's instructions
    b. Keep materials in manufacturer's original, unopened containers, and packaging until installation
    c. Store materials in clean, dry area indoors
    d. Keep materials from freezing
    e. Protect materials during storage, handling, and installation to prevent damage

1.8 LIMITED FACTORY WARRANTY

Specifier Notes: Edit the Limited Factory Warranty article as required for the Project. Options are denoted by brackets.

Warranty Period

Limited 14 month warranty on all parts, and a 3 year warranty on the damper actuator from the date of shipping. If applicable, a 5 year limited warranty will be provided for the gas exchanger portion only. If applicable, VRF components supplier is responsible for the warranty of their components.

Optional:

[Parts and labor warranty available from 1−3 years]

[Limited [2] [5] year warranty on parts only]

PART 2. PRODUCTS

2.1 MANUFACTURERS

Specifier Notes: Edit the Manufacturers article as required for the Project. Options are denoted by brackets.

A. Manufacturer: Systemair Commercial AHU Ltd., 8 Rouse St, Tillsonburg, Ontario, N4G 5W8, Canada. Toll Free 800-263-7081, systemair.net, service@systemair.net
    Systemair MFG Inc., 10048 Industrial Blvd, Lenexa, Kansas, 66215, USA. Toll Free 800-747-1762, systemair.net, service@systemair.net

Specifier Notes: Specify if substitutions will be permitted.

B. Substitutions: [Not permitted] [Comply with Division 01]
Single-source: Provide materials from single manufacturer

2.2 UNIT VENTILATORS

Specifier Notes: Delete options not required. Options are denoted by brackets. Consult Systemair for assistance in determining applicable options for unit ventilators required for the specific application.

A. Single Packaged Vertical Unit
    a. Model: Freshman Series
    b. Non-Compressorized Classroom Unit

B. General
    a. Each Unit or Group of Units: Capable of operating in any mode independently or dependently of other systems
        i. Listed under CSA C22.2, No. 236/UL 1995
        ii. Wiring: NFPA 70
        iii. Performance: As scheduled on the Drawings
        iv. Equipped with a control system
        v. Performs all functions necessary for operation
        vi. Capability: Changes modes with no interruption to system operation
        vii. Capability: Transfers sensible heat between the fresh and stale air streams
        viii. Capability: Operates in winter and summer conditions without imbalance or loss of ventilation capacity greater than specified in design

C. Unit Cabinet
    a. 16-gauge frame supports, all internal metal pans, and components
    b. Seams: Sealed, requiring no caulking in field
    c. Cabinet Doors & Sides
        i. Two fully insulated, full-sized hinged panels: Held closed by two tamper-resistant cam locks on each panel
        ii. Front Doors: Allow access to all internal components
        iii. 18-gauge steel cabinet and panels
        iv. Attached to the frame without visible screws, rivets, or fasteners
        v. Cabinet Paint
            1. Powder coat, baked, enamel-textured finish
            2. Cabinet Color: [Gray] [Sand]
        vi. Insulation within a Single Wall
            1. [Fiberglass Insulation]
                a. Thermally/acoustically insulated with a minimum of 1-inch (25-mm) of thick, flexible, glass wool insulation with a bio-based binder
                b. Insulation has a minimum density of 1.5 pound per cubic foot (24 kilogram per cubic meter)
                c. Airstream surface consists of a tightly bonded, black, mat facing, treated with an EPA-registered antimicrobial agent

d. Protected leading edges
e. cULus classified
f. UL Environment Greenguard Gold Certified per UL 2818
    i. For low VOC requirements of indoor air quality acceptability
    ii. For use in schools and healthcare facilities
g. CDPH compliant with California Section 01350
h. Flame spread index, UL 723: Not over 25
i. Smoke developed index, UL 723: Not over 50
    i. Compliant to 25/50 when tested to ASTM E84, UL 723, and CAN/ULC S102

2. [Non-fibrous Insulation]
    a. Thermally/acoustically insulated with a minimum of 1-inch (25-mm) of thick, fiber-free, low density, foam
    b. High sound absorption
    c. Low thermal conductivity
    d. Excellent emission properties
    e. Microbiological resistance
    f. High fire resistance
    g. Low VOC emission properties
        i. Must meet or exceed ISO 16000 Class A requirements
    h. Tested to ISO 846:2019 (A/B/C)
    i. UL94 V0/HF-1 flame rating
    j. CAN/ULC S102 flame rating
    k. Flame Spread Index, UL 723: Not over 25
        i. Tested to ASTM E84
        ii. Tested to ASTM E662
    l. Smoke Developed Index, UL 723: Not over 50
        i. Tested to ASTM E84
        ii. Tested to ASTM E162
    m. Blowing agents
        i. Low Global Warming Potential (GWP)
        ii. Accepted within the regulations outlined in the EPA SNAP Rule 21 and 22 programs

D. Air Distribution
    a. Duct Collar Supplied with Unit Ventilator
        i. 24-inches x 12-inches duct collar
            1. For connection of ductwork
        ii. Recommended external ducting and ceiling diffusers External Static Pressure (ESP): 0.1-inch−0.5-inches
            1. All external ductwork and diffusers must be correctly sized, fabricated, and supplied by others
    b. Return Grilles
        i. Matching color, standard, punched, return grilles supplied with unit

E. Air Filtration, Air Treatment, and Dampers
    a. Air filters
        i. Mixed Air Filters

1. Two 2-inch [MERV-8] [MERV-13] pleated disposable filters to filter 100 percent of both recirculated and outside fresh air
    a. Factory-equipped with unit ventilator

ii. [Intake Air Filter]
1. One 2-inch MERV 8 Filter for dehumidification coil intake

F. Heating
a. [Hot Water Coil Supplied with Unit Ventilator]
i. Constructed of seamless drawn copper tubes mechanically expanded into die-formed fin collars of aluminum, tempered, corrugated fin stock to ensure the positive bond for optimal heat transfer, and the prevention of electrolytic action
ii. Supplied with a manual air vent, and a drain plug
iii. Sized to provide the required heating capacity as per the schedule
iv. Supply and return connections stubbed out the top of the unit on the left side with [0.75-inch] [1-inch] nominal tubing
v. Hot Water Freeze Protection
1. [Freeze sensor “Snap Disc” Factory-equipped with Unit Ventilator]
    a. Prevents hot water from freezing due to an abnormal drop in discharge air temperature
2. [“Auto Reset Capillary” Factory-equipped with Unit Ventilator]
    a. Prevents the hot water from freezing due to an abnormal drop in discharge air temperature
3. [“Manual Reset Capillary” Factory-equipped with Unit Ventilator]
    a. Prevents the hot water from freezing due to an abnormal drop in discharge air temperature
4. [“Discharge Air Sensor” (Only with Factory Controls) Factory-equipped with Unit Ventilator]
    a. Prevents the hot water from freezing due to an abnormal drop in discharge air temperature

vi. Water Control Valves and Piping Components
1. [Control valve(s) supplied and installed by others]
2. [The manufacturer supplies and installs a “Two-Way Modulating” spring return control valve, an isolation valve, a positive shut-off manual circuit balancing valve, and a wye strainer]
3. [The manufacturer supplies and installs a “Three-Way Modulating” spring return control valve, an isolation valve, a positive shut-off manual circuit balancing valve, and a wye strainer]
4. Optional
    a. [Unions at coil connections]
    b. [Drain tap]
    c. [Automatic circuit balancing valve]
    d. [Stainless steel isolation valve]
    e. [Stainless steel ball and stem on control valve]
    f. [Hygroscopic automatic air vent on the coil]
    g. [Pressure temperature ports (Quantity 2)]
    h. [Blowdown valve with garden hose end, cap, and retainer on wye strainer]
    i. [Insulated hot water piping]
    j. [Not Applicable]

b. Electric Heat Elements
    i. [Two-stage Electric Resistance Heating Factory-equipped with unit]
        1. Two-stage electric resistance heating
            a. Provides the total heating required as per the schedule
            b. Coil energized independently from [a two-stage thermostat] [a unit controller]
    ii. [SCR Control Electric Heating Factory-equipped with Unit Ventilator]
        1. Provides the total heating required as per the schedule
            a. Entire element rack modulated via a 0−10V DC signal to the SCR controller
        2. Electrical Heat Elements Over-heat Protection
            a. High-limit Switch Factory-equipped with Unit Ventilator
                i. Disables electric heat in case of contactor failure
c. [High-efficiency Gas Furnace Factory-equipped with Unit Ventilator]
    i. Residential type furnaces will not be accepted and is not permitted for residential usage
    ii. Changeair GHM9 – Gas Heating Module Supplied with Unit Ventilator
        1. Designed specifically for installation downstream of the unit ventilator for up-flow, indoor applications
        2. Engineered specifically for classroom and light commercial utilization
        3. Heating module: Certified to ANSI Z21.47/CSA 2.3
            a. Heating module: Classified as a high-efficiency, condensing, Category IV, Type FSP furnace with a zero clearance-to-combustibles cabinet
            b. Install module on [the left side] [the right side]
                i. Based on site access and serviceability
    iii. Furnace: Direct-vent/sealed combustion design
        1. Takes all combustion air from outdoors and exhausts the products of combustion back to the outdoors
            a. Provides complete separation from the atmosphere of the occupied space
    iv. Primary heat exchanger: Constructed with tubular stainless steel
        1. Must have a tertiary heat exchanger constructed with stainless steel
        2. Clamshell style heat exchangers and/or ribbon burners will not be accepted
    v. Venting system: [Terminate horizontally through a wall] [Terminate vertically through the roof]
    vi. The GHM9 must achieve a minimum of 93 percent TE
        1. Integrated LED: Provides operation and error Flash Codes that aid technicians for troubleshooting
        2. Gas heating module: Consists of reliable in-shot burners, a two-stage combination gas valve, and a Direct Spark Ignition (DSI) controller
    vii. Certified for use with Natural gas, and be field convertible for Propane:
        1. Voltage for Gas Furnace: 120 volts needed for the gas exchanger
d. [Low-pressure Steam Coil [Factory-equipped] or [Supplied] with Unit Ventilator]
    i. Constructed 0.5-inch OD of seamless drawn copper tubes mechanically expanded into die-formed fin collars of tempered, aluminum fin stock, assuring a positive bond for optimal heat transfer, and the prevention of electrolytic action
    ii. Sized to provide the required heating capacity as per the schedule
        1. Installed in the top plenum

iii. Supply and Return connections: 0.875-inch nominal tubing
    1. Stubbed out the plenum on [the left side] [the right side]

G. Cooling
    a. [Chilled Water Coil Factory-equipped with Unit Ventilator]
        i. Seamless drawn copper tubes mechanically expanded into die-formed fin collars of aluminum, tempered, corrugated fin stock to ensure the positive bond for optimal heat transfer, and the prevention of electrolytic action
        ii. Supplied with a manual air vent, and a drain plug
        iii. Sized to provide the required heating capacity as per the schedule
            1. Stubbed out the top of the unit on the right side with [0.75-inch] [1-inch] nominal tubing
        iv. Chilled Water Freeze Protection
            1. [No Freeze Protection]
            2. [“Freeze Sensor Snap Disc” Factory-equipped with Unit Ventilator]
                a. Prevents hot water from freezing due to an abnormal drop in discharge air temperature
            3. [“Auto Reset Capillary” Factory-equipped with Unit Ventilator]
                a. Prevents the hot water from freezing due to an abnormal drop in discharge air temperature
            4. [“Manual Reset Capillary” Factory-equipped with Unit Ventilator]
                a. Prevents the hot water from freezing due to an abnormal drop in discharge air temperature
        v. Water Control Valves and Piping Components
            1. [The control valve(s) shall be supplied and installed by others]
            2. [The manufacturer supplies and installs a “Two-Way Modulating” spring return control valve, an isolation valve, a positive shut-off manual circuit balancing valve, and wye strainer]
            3. [The manufacturer supplies and installs a “Three-Way Modulating” spring return control valve, an isolation valve, a positive shut-off manual circuit balancing valve, and wye strainer]
            4. Optional
                a. [Unions at coil connections]
                b. [Drain tap]
                c. [Automatic circuit balancing valve]
                d. [Stainless steel isolation valve]
                e. [Stainless steel ball and stem on control valve]
                f. [Hygroscopic automatic air vent on the coil]
                g. [Pressure temperature ports (Quantity 2)]
                h. [Blowdown valve with garden hose end, cap, and retainer on wye strainer]
                i. [Not Applicable]
    b. [Direct Expansion (DX) Coil Factory-equipped with Unit Ventilator]
        i. Constructed with seamless drawn copper tubes mechanically expanded into die-formed fin collars of aluminum, tempered, corrugated fin stock to ensure the positive bond for optimal heat transfer, and prevention of electrolytic action
        ii. Provided into place with condensate drain pan and lines
        iii. Coil: Commercially clean and dehydrated for use with the POE oil-based refrigerants

iv. Connected to the remote condensing unit supplied by others
v. Warranty for air conditioning performance are the responsibility of the mechanical engineer and/or the contractor
1. Refrigerant Connections: stubbed out the top of the unit on the right side

c. [Future Cooling]
i. Coil supports and a drain pan provided with the unit ventilator for future installation of either a [chilled water coil] [DX coil]

H. [Secondary Cooling Coil For Dehumidification Units]
a. [Dehumidification Chilled Water Coil Factory-equipped with the Unit Ventilator]
i. Constructed with seamless drawn copper tubes of seamless drawn copper tubes mechanically expanded into die-formed fin collars of aluminum, tempered, corrugated fin stock to ensure the positive bond for optimal heat transfer, and the prevention of electrolytic action
ii. Dedicated to dehumidify the incoming air only
iii. Supplied with a manual air vent and a drain plug
iv. Terminate with shared supply and return connections: 1-inch nominal tubing
1. Stubbed out the top of the unit on the right side
v. See drawing for the exact position of the connections and information on internal valve components
vi. Dehumidification Unit Control Valves
1. [Two-Way] [Three-Way] ON/OFF Valve
a. Installed and supplied by manufacturer on the outside air dehumidification coil

b. [Dehumidification Direct Expansion (DX) Coil Factory-equipped or Supplied with Unit Ventilator]
i. Constructed with seamless drawn copper tubes of seamless drawn copper tubes mechanically expanded into die-formed fin collars of aluminum, tempered, corrugated fin stock to ensure the positive bond for optimal heat transfer, and prevention of electrolytic action
ii. Dedicated to dehumidify incoming outside air only
iii. Coil: Commercially clean and dehydrated for use with the POE oil-based refrigerants
1. Thermal expansion valve: Factory-installed
2. Sized to match design load, dehumidification capacity required by the mechanical schedule, and effectiveness for the system
iv. Connected to the remote condensing unit supplied by others
v. Primary and secondary DX coil refrigerant connections stubbed out the top of the unit on the right side

I. Drain Pan
a. [Standard Drain Pan]
i. Constructed of stainless steel metal
ii. Front-to-back and side-to-side slope to the primary drain outlet
1. Eliminates any standing water in the pan

b. [Insulated Drain Pan]
i. Constructed of stainless steel metal with closed-cell insulation
ii. Front-to-back and side-to-side slope to the primary drain outlet
1. Eliminates any standing water in the pan

c. [Optional – Condensate Pump]
1. Provided with the unit
2. 0.375-inch OD discharge adapter size

3. Removes condensate from drain pan
4. Mount pump on the rubber feet to dampen the vibrations

J. [Variable Refrigerant Flow (VRF) Integration]
   a. Direct integration possible with customer [LG/Daikin/Mitsubishi/Samsung] VRF components
   b. VRF components: Mounted internally
      i. External installation is not permitted
   c. VRF Coils
      i. [Systemair Standard Coil]
         1. Factory-mounted standard DX coil in unit within evaporator coil section with a condensate drain line, and a Drain pan
         2. Factory-piped to the customer supplied Electronic Expansion Valve (EEV)
            a. Wired with a communication box
         3. Customer must accurately size EEV compatible with the remote condensing unit to ensure intended performance of the VRF system
            a. VRF system: Designed and charged with R410A refrigerant
      ii. [Coil supplied by others, but installed by Systemair]
         1. Customer-supplied-and-Systemair-approved DX coil factory-mounted in unit within evaporator coil section with a condensate drain line, and a drain pan
         2. Factory-piped to the customer supplied (EEV)
            a. Wired with a communication box
         3. Customer must accurately size EEV compatible with the remote condensing unit to ensure intended performance of the VRF system
            a. VRF system: Designed and charged with R410A refrigerant
      iii. [Coil Supplied and Installed by Others]
         1. Coil supports provided in unit within the evaporator coil section with a condensate drain line, and a Drain pan
         2. Customer must provide and pipe DX coil to the EEV and wire with a communication box
            a. VRF system: Designed and charged with R410A refrigerant
      iv. [For Units with the Core/HGRH VRF Coil]
         1. VRF communication box mounted outside on-site
      v. [For Site Voltage – 120V/1/60]
         1. Power feed: Provided on-site to the VRF components
            a. If site-voltage is 120V/1 phase

K. [Energy Recovery Component – If applicable]
   a. [2-Inch Deep Enthalpy Wheel (ERW)]
      i. Insulated G90 galvanized metal cassette frame complete with seals and a drive motor & belt
      ii. Coated with silica gel desiccant: Permanently bonded
      iii. Substrate: Constructed of durable synthetic lightweight polymer
      iv. Coating segments: Washable, desiccant, and will not dissolve nor deliquesce in the presence of water or high humidity
      v. Performance: AHRI 1060 certified and the ERW bears the AHRI 1060 label
         1. Manufacturer Membership is not an acceptable substitute
      vi. Supply and return air volume through the wheel: Balanced, with a maximum of 600 cfm airflow
         1. Supply and relief fans: Integral part of the recovery system
      vii. ERW Filters Factory-equipped with Unit Ventilator

1. Permanent washable electrostatic filters for the filtration of both air streams, the return air from a room, and the outside air to the ERW

b. [Plate Heat Exchanger (Core)]
   i. [Enthalpy Plate Heat Exchanger (Enthalpy Core) Factory-equipped with Unit Ventilator]
      1. No moving parts
      2. Constructed of polymer membrane material
      3. Capable of transferring both heat and humidity from one air stream to another
      4. Sized for a maximum of 450 cfm airflow
      5. Energy recovery core: AHRI 1060 certified
   ii. [Sensible Plate Heat Exchanger (Sensible Core) Factory-equipped with Unit Ventilator]
      1. No moving parts
      2. Constructed of corrosion-resistant aluminum
      3. Sized for a maximum of 450 cfm airflow
   iii. Core Filters Factory-equipped with Unit Ventilator
      1. Permanent washable electrostatic filters for both return and outside air

L. Dampers
   a. [Standard Ventilation (VP)]
      i. Outside Air Dampers
         1. Design: Low-leakage parallel blade
            a. Frame and blades: Constructed of extruded aluminum with an airfoil blade design, zero maintenance, and concealed linkage
            b. 0.375-inch Axles: Aluminum, bolted to the blades and operates on polycarbonate bearings
         2. Damper: Complies with requirements of the AMCA 511 certified rating program, leakage class 1A criteria
         3. Dampers modulated by a Belimo spring return damper actuator
            a. Minimum torque of 18-inch-pound
         4. Provides proportional damper control in response to input of 2−10 VDC
         5. Actuators: Equipped with a brushless DC motor controlled by a microprocessor
         6. Protected from overload at all angles of rotation
   b. [Powered Relief Ventilation (VPS)]
      i. Relief air damper: Pressure-sensitive, does not require an actuator
      ii. Outside Air Dampers: Low-leakage parallel blade design
      iii. Frame and blades: Constructed of extruded aluminum with an airfoil blade design, zero maintenance, and concealed linkage
      iv. 0.375-inch Axles: Aluminum, bolted to the blades and operates on polycarbonate bearings
      v. Damper: Complies with requirements of the AMCA 511 certified rating program, leakage class 1A criteria
      vi. Dampers modulated by a Belimo spring return damper actuator
         1. Minimum torque of 18-inch-pound
      vii. Provides proportional damper control in response to input of 2−10 VDC
      viii. Actuators: Equipped with a brushless DC motor controlled by a microprocessor
      ix. Protected from overload at all angles of rotation
   c. [Face & Bypass Damper Factory-equipped with Unit Ventilator]
      i. Design: Dual-acting, low-leakage parallel blades

ii. Damper modulation: Allows a percentage of mixed air to pass through the face of the coils or bypasses them
iii. Frame and Blades: Constructed of extruded aluminum with an airfoil blade design, zero maintenance, and concealed linkage
iv. 0.375-inch Axles: Aluminum, bolted to the blades and operates on polycarbonate bearings
v. Damper: Complies with requirements of the AMCA 511 certified rating program, leakage class 1A criteria
vi. Dampers modulated by a Belimo spring return damper actuator
    1. Minimum torque of 18-inch-pound
vii. Provides proportional damper control in response to input of 2−10 VDC
viii. Actuators: Equipped with a brushless DC motor controlled by a microprocessor
ix. Protected from overload at all angles of rotation

d. [Energy Recovery Wheel (ERW) Ventilation]
    i. Return Air Damper
        1. Design: Low-leakage parallel blade
        2. Frame and blades: Constructed of extruded aluminum with an airfoil blade design, zero maintenance, and concealed linkage
        3. 0.375-inch Axles: Aluminum, bolted to the blades and operates on polycarbonate bearings
        4. Damper: Complies with requirements of the AMCA 511 certified rating program, leakage class 1A criteria
    ii. Outside Air Damper
        1. Design: Low-leakage parallel blade
        2. Frame and blades: Constructed of extruded aluminum with an airfoil blade design, zero maintenance, and concealed linkage
        3. 0.375-inch Axles: Aluminum, bolted to the blades and operates on polycarbonate bearings
        4. Damper: Complies with requirements of the AMCA 511 certified rating program, leakage class 1A criteria
        5. Designed to eliminate fresh air from entering the unit during unoccupied periods
        6. In the event of “Free Cooling”, the outside air damper will facilitate 100 percent fresh air by tilting the ERW
    iii. Both dampers
        1. Equipped and modulated by a Belimo spring return damper actuator
            a. Minimum torque of 18-inch-pound
        2. Provides proportional damper control in response to input of 2−10 VDC
        3. Actuators: Equipped with a brushless DC motor controlled by a microprocessor
        4. Protected from overload at all angles of rotation
        5. Relief air damper: Pressure-sensitive, does not require an actuator

e. [Outside Air Damper − For Dehumidification Units]
    i. Design: Low-leakage parallel blade
    ii. Frame and blades: Constructed of extruded aluminum with an airfoil blade design, zero maintenance, and concealed linkage
    iii. 0.375-inch Axles: Aluminum, bolted to the blades and operates on polycarbonate bearings

iv. Damper: Complies with requirements of the AMCA 511 certified rating program, leakage class 1A criteria
    1. Equipped and modulated by a Belimo spring return damper actuator
        a. Minimum torque of 18-inch-pound
v. Actuator: Provides ON/OFF two-position damper control
    1. Equipped with a brushless DC motor controlled by a microprocessor
vi. Protected from overload at all angles of rotation

M. Supply And Relief Fans
    a. Supply Fan
        i. Supply Motor and Fan Assembly: Consists [of a single body] [of two-fan bodies] to supply the specified airflow
        ii. Orientation: Allows mixed air to be drawn through both the heating and cooling coils
        iii. Fan body: Double-inlet centrifugal type blower
            1. Both fans driven by one electronically commutated motor (ECM)
                a. Capable of variable speed operation
        iv. EC Motor: Programmable to deliver the specified airflow at the rated ESP
            1. Permanent Split Capacitor motors are not permitted
            2. Provides efficient fan operation
            3. Isolated from supply fans by zinc-plated double wire
            4. Mounting brackets and rubber anti-vibration mounts: Dampens the noise induced by vibrations
            5. Fan Assembly slider sits on felt insulation
    b. [Relief fan – If applicable]
        i. Capable of up to 100 percent relief
        ii. Relief motor fan assembly consists of one fan: Supplies the specified cfm
        iii. Fan body: Double-inlet centrifugal type blower
        iv. EC motor: Programmed to deliver the specified airflow and drives the fan
    c. Motor Speed Controller(s)
        i. [Supply] [Relief] EC motor fan control board
            1. [Analog Signal]
                a. Direct 0−10V DC analog control signal: Allows full-modulated control of the fan output
            2. [Digital Signal]
                a. 24 VAC digital signal for required fan output
    d. For Dehumidification Units – If Applicable
        i. Motor speed controller: Gives site adjustability to the O/A (intake) fan
            1. Uses recessed speed adjustments via a triac based or V/F drive
        ii. Present and adjustable minimum speed adjustment
        iii. Electrical connections: Terminal block capable and accepts up to 16 AWG cable

N. Electrical
    a. General Electrical
        i. Main Power Supply: Connects to unit through a wire raceway direct to either a terminal block or an unfused disconnect (provided by the manufacturer)
        ii. Standard electrical supply voltage: _____ VAC _____ phase 60 Hz
    b. Service Disconnect Supplied with Unit Ventilator
        i. Line Voltage Service Disconnect: Maximum 80 amperes
        ii. Door Switch: Provides control voltage interrupt to disable mechanical components after removal of service panel

iii. Disconnect Switch: Lockable in OFF position

c. All Internal Functions: Fuse-protected by a Time-delay Fuse
    i. Rated properly for amperage load

O. Controls
    a. [Direct Digital Controller (DDC) Controls: Supplied and installed by the Controls Contractor On-site]
        i. Equipment Manufacturer: Prepare the electrical box with all required relays and transformer for the controller to operate
        ii. Controls Contractor: Responsible for all controller wiring interface, programming, sequence of operations, commissioning of controls, and documentation
    b. [Factory-Installed Controls, Controller Supplied by Others]
        i. Single-source Electrical Panel
            1. Required for high-and-low voltage electrical wiring
            2. Fuses, Relays, Wiring, Control Transformer, All Control Connection Points, and Controllers: Located inside the single-source electrical panel
        ii. Controls Contractor: Coordinate with the manufacturer to ensure the physical dimensions of the controller are compatible with a single-source electrical panel
        iii. Fully-programmable, DDC: Supplied to the factory for installation
            1. All Peripheral Devices: Must be preapproved and shipped with the controller
                a. Factory is not responsible for programming, addressing, or sequence of operations
        iv. Factory: Network with the controls supplier to determine wiring connections and the location of peripherals
            1. Factory will not factory test or commission the controller or any external devices
            2. Controls Supplier Responsibility: Coordinate with the manufacturer to determine proper wiring connections, delivering the controller with any external devices within the time schedules set up by the manufacturer, programming of the controls system, testing of the controls system, and site commissioning of the controls system
    c. [BACnet Compatible DDC (Manufacturer's Controller) Supplied and Installed by the Manufacturer]
        i. Native BACnet, fully-programmable, DDC
        ii. Programmed to operate the ventilator and be site-ready to be connected to a BACnet compatible head end
        iii. Controller: Able to run standalone and occupancy determined by an internal weekly and annual schedule
        iv. Room interface: Supplied with the controller to be [wall] [unit] mounted
            1. Senses the temperature in the room and provides an operator interface with limited programming adjustments and over-rides
    d. Optional – Built-in Sensors with the Room Interface
        i. [CO2 Sensor]
        ii. [Occupancy Sensor]
        iii. [Humidity Sensor]
        iv. [Not Applicable]
    e. Optional – Air Quality Monitor Sensors Supplied with the Unit Ventilator
        i. [CO2 Sensor for demand control ventilation: Wall mounted and CO2 Transmitter with Automatic Baseline Correction for Self-Calibration sensor]
        ii. [Occupancy Sensor supplied as an energy savings device]

1. Enables the occupied mode
2. Passive, infrared motion sensor
    a. Mounted remotely in the room space
3. Device detects motion and signals an internal timer to occupy the ventilator
    a. Timer is reset each time motion is detected
4. Once occupancy is no longer detected after a pre-determined period, the thermostat will enter the unoccupied mode

iii. [Not Applicable]

f. [CO Sensor with High-efficiency Gas Unit – If applicable]
    1. Carbon Monoxide Sensor: Available with push-button programming and onboard meter jacks
    2. Sensor: Immediately stops the flow of fuel or prevents ignition when elevated CO levels are detected

g. [Dual Pressure Transducers (DPT) Sensor with ERW Supplied with Unit Ventilator]
    i. Measures the pressure drops for the Intake and Relief sides of the ERW: Ensures accurate airflow in both streams

h. [For Daikin VRF]
    i. Manufacturer: Provides a Distech controller compatible with the Daikin 'W' type controls

P. Accessories

Specifier Notes: Manufacturer to offer a complete range of accessories to complement the appearance of the unit when installed, as well as to assist in airflow and site adjustments for performance and/or penetration limitations. These may include, but are not limited to, louvers, discharge plenums, pipe-chase, shrouds or top duct covers, wall sleeves, rear plenums, and flashing or metal trim. Delete accessories not required. Options are denoted by brackets.

a. [Exterior Louvers]
    i. Exterior Weather-resistant Louver: [2-inches deep] [4-inches deep]
    ii. Constructed of aluminum with a standard powder coat paint [standard finish:] [Mill Finish] [finish from the manufacture's standard color list:] [Bronze] [Gray]
    iii. Lined with 0.5-inch galvanized bird screen mesh
    iv. Size and Design: Matched to the model to provide proper ventilation air intake ensuring no water ingress and room air exhaust

b. [22-gauge Metal Wall Sleeve]
    i. Suited to match the 12-inch deep wall included with the standard louver with appropriate metal dividers to separate intake and exhaust air at standard sill height

c. [Shroud, Plenums, and Pipe Chase]
    i. [Top Duct Cover: 3-sided, non-insulated cosmetic top duct cover included with each unit ventilator]
        1. Constructed of heavy 18-gauge steel with textured powder coat painted finish to match the unit ventilator
        2. Height: [20-inches] [30-inches]
            a. Can be trimmed on-site (by Contractor/Others) to suit specific height requirements
    ii. [Top Plenum: 5-sided, insulated plenum Supplied with each Unit Ventilator]
        1. Constructed of heavy 18-gauge steel with textured powder coat painted finish to match the unit ventilator: Not applicable with high-efficiency gas module

2. Thermally/acoustically insulated with 1-inch thick flexible fiberglass insulation
3. Height: [16-inches] [24-inches]
4. Optional with Top Plenum
    a. [Discharge grilles]
        i. Top plenum has double deflective discharge grilles constructed of corrosion-resistant steel
        ii. Grille: Adjustable vertical, front blades to provide spread and deflection of airflow

iii. [Cover for High-efficiency Gas Module – If applicable]
1. 3-sided, non-insulated gas module shroud included with each gas module
    a. Shroud: Access door on [the left side] [the right side] to match the gas module access side
    b. Shroud Height: 20-inches

iv. [Base]
1. 6-sided, pedestal base included with each unit ventilator
2. Constructed of heavy 16-gauge steel top & bottom pan & structural framing, and 18-gauge sides with textured powder coat paint finished to match cabinet color
3. Height: [6-inches] [8-inches]

v. [Rear Plenum included with unit ventilator]
1. Constructed of heavy 18-gauge steel with 1-inch (25-mm) flange for unit mount and painted in textured powder coat, finished to match cabinet color
2. Factory-insulated with 1-inch (25-mm) acoustic material and includes a full uninsulated back
3. Assemble with field mounting to the unit required
4. Depth: [6-inches] [10-inches] [14-inches]

vi. [6-Inch Pipe Chase Included with Unit Ventilator]
1. Constructed from heavy 18-gauge steel with a textured powder coat paint finished to match cabinet color

Q. Assembly
    a. Factory assembled and wired unit ventilators

R. Source Quality Control
    a. Run test at factory

PART 3. EXECUTION

3.1 EXAMINATION

A. Examine areas to receive unit ventilators
B. Notify architect of conditions that would adversely affect installation or subsequent use
C. Do not begin installation until unacceptable conditions are corrected

3.2 PREPARATION

A. Prepare surfaces where unit ventilators are to be mounted
B. Ensure surfaces are flat, level, plumb, and can support weight of unit ventilators

3.3 INSTALLATION

A. Commissioning, On-site Start-up, and Installation Manuals
    a. Installation: Performed in full accordance with manufacturer's instructions manual, generally accepted practice, and all applicable codes
        i. Improper Installation: May void the warranty
    b. Field Assembled Accessories: Fabricated as mentioned in the instruction manuals and drawings
    c. Storage and Handling: In accordance with the manufacturer's instructions
    d. Filters: Clean or replace prior to turning the building over to the owner
B. On-site Start-up
    a. Manufacturer's Representative: Responsible for overseeing or reviewing the installation at the initial start-up or soon thereafter

3.4 ADJUSTING

A. Adjust unit ventilators for proper operation in accordance with manufacturer's instructions

3.5 DEMONSTRATION

A. Demonstration
    a. Demonstrate that unit ventilators function properly in every respect
    b. Provide hands-on demonstrations of operation of system components and complete system, including user-level program changes and function
    c. Provide instruction and training by factory-trained & certified representative of manufacturer
    d. Manufacturer will provide the owner with _____ sets of installation, operation, and service manuals

3.6 PROTECTION

A. Protect installed unit recovery ventilators from damage during construction

END OF SECTION