

SECTION 237200 – AIR TO AIR ENERGY RECOVERY EQUIPMENT

PART 1 – GENERAL GUIDE SPECIFICATIONS FOR ENERGY RECOVERY UNIT

1.1 SYSTEM DESCRIPTION

- A. Energy recovery ventilators (ERV) manufactured by Building Performance Equipment, Inc. or engineer and owner approved equal with efficiencies that meet or exceed basis of design equipment. Manufacturer must be able and willing to provide limited life time warranty for 10 years against corrosion of the heat exchanger. Equipment that will need to replace heat exchange cartridges or media will not be accepted without provisions for these extra replacement heat exchange carriages in the original bid price. Only life cycle cost comparison over 20 years will be considered for possible equal consideration. If an ERV has a 4 year projected life span, the cost of 5 ERV core purchase and installations shall be added with an explanation to any base price for accurate price comparison.
- B. Units capable of transferring sensible and latent energy as listed in the equipment schedule. Units shall have a sensible capacity of over 80% thermal effectiveness along with over 30% latent as tested by ARI 1060 in very humid conditions. ERVs shall be thermally efficient enough to precondition outdoor fresh air to within 10°F of room temperature in a single pass with no additional mechanical heating and cooling energy use. Electric resistive heating can be added, but this shall not be part of the 80% thermal effectiveness rating. The overall efficiency of the ERV including all motors, fans, controls and other energy parasitics shall provide a summertime design (95 db & 78 wb) conditions EER of over 30.0. The ECM fan efficiency shall be able to meet a 0.2 Watt/CFM energy efficiency rating when properly sized.
- C. Flat plate heat exchanger to be factory installed in unit with galvanized minimum 22 gauge metal. Continuous TempShield material meeting ASTM E84-01 that meets Flame Spread Classification of 25 and Smoke Developed Classification of 30. The fans will be UL 507 listed Safety Standard for Electric Fans and high efficiency air foil centrifugal fans that can be VFD controlled and will be installed at least 10 duct diameters from the heat exchanger to provide uniform and evenly distributed air flow through the heat exchanger. As a specified option the fans will be field wired and installed with CO2 demand side ventilation controls for optimum ventilation control and reduced air intake during periods of low or no occupancy as per ANSI/ASHRAE Standard 62.1-2016.
- D. Unit is designed to be used as a heat recovery component in a stand-alone configuration from the existing or new dedicated HVAC system as per the engineer of record. Air intakes will be at least 8 feet off the ground and protected with ¼" mesh screen to prevent foreign matter from entering duct work. Exhaust outlets shall also be protected with ¼" mesh screen to prevent foreign matter

from entering duct work. Air filters can be installed as applicable or as needed.

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1.2 QUALITY ASSURANCE

- A. Unit outer wall and duct connections shall be constructed with Galvanized Steel or Stainless Steel as approved by the engineer, and heat exchanger factory installed. The wall insulation shall have a;
 - Flame Spread Index (ASTM E 84): Less than 25
 - Smoke Developed Index (ASTM E 84): Less than 50
 - Fire Rating: Class A/ Class 1
- B. Each heat exchanger shall be guaranteed for limited 10 year warranty life not to become unusable for providing breathable air ventilation due to rust, rot, or corrosion due to condensation or other exposure to liquid water in such use.
- C. Fans and motors shall be high efficiency premium inverter duty ECM motor type and shall allow for field modifying CFM and static pressure within the limits of the manufacturers fan specifications via belt and sheave changes.
- D. All units shall be tested 100% prior to shipment.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Units shall be stored and handled per unit manufacturer's recommendations.

1.4 WARRANTY

- A. Unit shall be free from defects in materials and workmanship under normal use and service for eighteen months after shipment, parts only.
- B. Each Flat Plate Heat Exchanger shall have a minimum 10 year limited life time warranty or is guaranteed for life not to become unusable for providing breathable air ventilation due to rust, rot, or corrosion due to condensation or other exposure to liquid water in such use. Each heat exchanger also is guaranteed for one year against defects in materials or workmanship. Building Performance Equipment, Inc. will at its option, repair or replace the heat exchanger or refund to the purchaser a portion of the purchase price actually paid which is proportional to the expired portion of its expected life. This guarantee does not apply to operation with gases other than breathable air, or with chemically contaminated liquids. No other guarantee is made.
- C. Manufacturers without a minimum 10 year warranty shall supply extra heat exchange cores as needed for the entire unit so the warranty on each core

equals the 10 year warranty. For example, if the proposed core has a warranty of 5 years, then to be considered the manufacturer must supply and store at their expense the total number of cores needed to meet the minimum 10 year warranty.

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PART 2 - PRODUCTS

2.1 EQUIPMENT

A. GENERAL

1. Bundled, heat recovery ventilator(s) (outdoor or indoor as shown in equipment schedule) consisting of flat plate heat exchanger, ventilation air fan, exhaust air fan, optional dampers as specified, temperature sensors, and microprocessor controls shall be field wired, commissioned by the contractor, tested and wiring housed in a NEMA 3R Metal Enclosure.

B. UNIT CABINET

1. Outdoor units shall have galvanized steel or stainless steel corrosion resistant exterior all duct connections shall be sealed for weather proof connections.
2. Larger units (over 2000 cfm each flow direction) shall be shipped on pallets to allow for lifting and rigging of the unit at the job site and in transport of the units.

C. ACCESS

1. Access to all components that require servicing shall be provided through sealed and easily removable access panels(s), hoods or removable duct connections.
2. Flat plate heat exchanger will be sealed and attached permanently to the enclosure to minimize leaks and maintenance.

D. FLAT PLATE HEAT EXCHANGER

1. Ruffed polypropylene or polyethylene flat plate heat exchanger designed for general purpose or corrosive applications and shall meet ASTM D-1784, D-2467/ D-2665 where applicable.
2. Energy recovery effectiveness values shall be tested in accordance with ASHRAE 84 and ARI Standard 1060. The overall efficiency of the ERV

including all motors, fans, controls and other energy parasitics shall provide a summer time design (95 db & 78 wb) conditions EER of 30.0 or better.

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E. OPERATING CHARACTERISTICS

1. Unit shall be capable of providing a constant volume of air at a specified external static pressure as specified at different fan operating speeds.

F. MOTORS

1. Motors shall be continuous duty, permanently lubricated, and matched to the fan loads. The shall have superior energy efficiency shall provide efficiencies at .25" wc of 0.19 to 0.5 watts/cfm or better and specifically and shall meet the following energy efficiency as tested by ETL (Edison testing laboratory) to the following standards;

For 500 cfm or larger flow applications the fans shall provide efficiencies at .25" wc of 0.4 watts/cfm or better.

For 1000 cfm or larger flow applications the fans shall provide an energy efficiency of 0.251 watts/cfm for example for a FKD 14 Fan of max watts of 495 at 1965 cfm at 0.25" of W.G.

2. Motor shall be inline high efficiency direct drive plastic or metal (as required for plenum rating) housing fan. The fan shall be a high efficiency centrifugal fan that together with the ERV will provide overall efficiency of the ERV including all motors, fans, controls and other energy parasitics shall provide a summer time design (95 db & 78 wb) conditions EER of 30.0 or better.

G. BLOWERS

1. Contractor shall verify that Fans are correctly installed with the fresh air fan pushing fresh air into the ERV and the exhaust fan pulling air out of the ERV.

Contractor shall verify supply air is positive pressure through the ERV.
Contractor shall verify exhaust air is negative pressure through the ERV.

Contractor shall verify the exhaust and fresh air stream are directly opposing each other. **NOTE: Concurrent flow greatly reduces operating efficiency.**

2. Fans shall be Penn Barry, Ziehl-Abegg or equal Biomimetic blade design and centrifugal airfoil.

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3. Fans are to have duct inlets and duct outlets attachments for flex duct and/or metal duct and be dynamically balanced and tested prior to shipment.
4. Fan shall not have belts and/or other parts that need periodic maintenance.
5. Fans shall be engineered to positive pressurize fresh air side of heat exchanger and provide negative pressure for exhaust air stream so that in the limited chance of a leak, fresh air is drawn from the fresh air side to the exhaust side of the heat exchanger.
6. Fan housing shall be constructed of heavy gauge galvanized sheet metal or polymer. Fan shall be supplied with externally mounted electrical terminal box with pre-wired terminal strip connections. Integral disconnect switch shall be provided when specified.
7. Motorized impeller shall be totally enclosed external rotor type, Class F insulation. Single phase motors shall be permanent split capacitor type. Three phase motors shall be dual wound for 230V or 440/460V. All motors shall be permanently sealed self-lubricating ball bearing type. Motors shall be equipped with automatic reset thermal overload protection. Motors shall be acceptable for continuous duty. Sufficient service factor shall be provided to ensure long maintenance free operation over maximum load conditions.
8. Fan wheel shall be of the mixed flow centrifugal type with a well-designed inlet venture for maximum performance. Motorized impeller shall be both statically and dynamically balanced as one integral unit to provide for vibration free performance. Impeller shall be molded of high density polyamide resin or aluminum.
9. Fan air flow and sound performance shall be based on tests conducted in accordance with AMCA Standard 210 and 301 and shall be licensed to bear the AMCA Certified Ratings label.
10. Fans shall be tested and approved by UL and CSA (or equals) for safety.

H. Filtration

1. Unit shall be installed with standard size medium efficiency filtration (30% DSE) in areas of excess dust or possible contamination. Bird or animal screens are required for all applications and installing contractor shall include 1/4" bird screen for all intakes and exhausts.

2. For applications of 1000 cfm or larger a boars hair filter at a minimum is recommended.

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2.2 CONTROLS

A. GENERAL

1. CO₂ sensor shall be added for additional energy saving. Recommended on control point 600 ppm CO₂ and off point of 500 ppm CO₂ for both fans adjustable.
2. Factory mounted breaker for on/off operation.
3. Controls and sensors are to be furnished by the ATC contractor.
4. All interior locations shall be installed with drain pans and drains as needed for the application.

B. BACnet Controls – Option SC-UNI (Self Contained Unitary BPE ERV and HRV)

1. Powerful user interface:
 2. Large 4.3" animated color touchscreen, customizable with customer's company logo.
 3. Quick-start wizard for easy setup.
 4. Internal BACnet Explorer.
 5. System test screen for rapid commissioning.
 6. Highly detailed status reporting and diagnostics.
 7. Service status display with custom messaging.
 8. Calibration of temperature inputs for greater accuracy.
 9. Selectable BACnet or TCSbus communication:
 10. BACnet BTL Listed (B-ASC)
 11. Backwards-compatible with existing TCSbus networks
 12. All inputs/outputs fully commandable via network
 13. WiFi models use BACnet IP over WiFi
 14. Optional built-in humidity sensor with advanced dehumidification control sequences:
 - Staged cooling to remove moisture
 - Staged reheat to maintain comfort
 - Cooling modulation control
 - Heating modulation control
- Four temperature inputs (one built-in, three remote) for mixed-air applications:
 - Outdoor, discharge, remote room
- Configurable weighted averaging of built-in and remote room sensors
- Full-featured BACnet scheduling (SCHED-I-B):

Five heat/cool setpoint groups

- C. Bypass door with R-5, Mylar insulation and sealing gasket controlled with Balimo Actuators – Must be ordered with BPE SC-UNI and BACnet controller with single point of power tie in. System shall be factory assembled and tested as a complete working unit with high efficiency fans.**

2.3 OPTIONS

D. SOLID WALL CONSTRUCTION

1. Cabinet and duct connections shall be constructed with Galvanized Steel or Stainless Steel as approved by the engineer, and heat exchanger factory installed. The wall insulation shall have a;
Flame Spread Index (ASTM E 84): Less than 25
Smoke Developed Index (ASTM E 84): Less than 50
Fire Rating: Class A/ Class 1

E. Mr. Cool Heat pump with back-up electric resistive heat

1. Heat pump shall be MRCOOL Universal Series, R-454B refrigerant, factory-matched outdoor/indoor unit pair, available in the following capacities:
 - 2 ton – Model UHP18024-O / UAH18024-O
 - Rated Capacity: 24,000 BTU/h cooling / 24,000 BTU/h heating @ 47°F (min/max: 6,400–28,700 BTU/h cooling)
 - SEER2: 18.6 | EER2: 12 | HSPF2: 10 | COP: 3.49
 - Indoor MCA: 5.5A (115V) / 3.5A (208/230V); Indoor MOP: 15A
 - Outdoor MCA: 19A; Outdoor MOP: 20A
 - Power supply: 115/208/230V, 60Hz, 1Ph (indoor); 208/230V, 60Hz, 1Ph (outdoor)
 - Optional electric resistive back-up heat via UHK05/UHK08/UHK10/UHK15 kit (5–15 kW); recommend UHK10 (10kW) for balanced supplemental capacity
 - 2.5 ton – Model UHP18030-O / UAH18030-O
 - Rated Capacity: 30,000 BTU/h cooling / 33,000 BTU/h heating @ 47°F (min/max: 11,200–40,000 BTU/h cooling)
 - SEER2: 17.2 | EER2: 12 | HSPF2-4: 10.8 | COP: 3.54
 - Indoor MCA: 8A (115V) / 6A (208/230V); Indoor MOP: 15A
 - Outdoor MCA: 29.5A; Outdoor MOP: 30A
 - Power supply: 115/208/230V, 60Hz, 1Ph (indoor); 208/230V, 60Hz, 1Ph (outdoor)
 - Optional electric resistive back-up heat via UHK05/UHK08/UHK10/UHK15 kit (5–15 kW); recommend UHK10 (10kW) for balanced supplemental capacity
 - 3 ton – Model UHP18036-O / UAH18036-O
 - Rated Capacity: 36,000 BTU/h cooling / 37,000 BTU/h heating @ 47°F (min/max: 12,100–43,000 BTU/h cooling)

- SEER2: 18 | EER2: 12 | HSPF2: 10 | COP: 3.5
- Indoor MCA: 8A (115V) / 6A (208/230V); Indoor MOP: 15A
- Outdoor MCA: 29A; Outdoor MOP: 30A
- Power supply: 115/208/230V, 60Hz, 1Ph (indoor); 208/230V, 60Hz, 1Ph (outdoor)
- Optional electric resistive back-up heat via UHK05/UHK08/UHK10/UHK15/UHK20 kit (5–20 kW); recommend UHK15 (15kW) for balanced supplemental capacity
- 5 ton – Model UHP18060-O / UAH18060-O
 - Rated Capacity: 54,000 BTU/h cooling / 55,000 BTU/h heating @ 47°F (min/max: 11,400–60,000 BTU/h cooling)
 - SEER2: 17.5 | EER2: 12 | HSPF2: 9.5 | COP: 3.35
 - Indoor MCA: 14.5A (115V) / 10A (208/230V); Indoor MOP: 15A
 - Outdoor MCA: 40A; Outdoor MOP: 40A
 - Power supply: 115/208/230V, 60Hz, 1Ph (indoor); 208/230V, 60Hz, 1Ph (outdoor)
 - Optional electric resistive back-up heat via UHK10/UHK15/UHK20 kit (10–20 kW); recommend UHK20 (20kW) for full cold-climate backup capacity
- 2. Heat pumps shall provide reversing-valve heating and cooling operation, with 100% rated heat output maintained down to -13°F outdoor ambience, and standard operating range of -22°F to 122°F (cooling) / -22°F to 75°F (heating).
- 3. Back-up electric resistive heat shall be factory- or field-installed as an optional auxiliary heat kit (UHK series — UHK05, UHK08, UHK10, UHK15, UHK20; up to 20kW), staged to engage automatically for supplemental heat below the heat pump's balance point or during defrost cycling. Heat kits shall include integral high-limit safety cutouts and shall be listed with UL.
- 4. Units shall include factory-standard chassis heater and crankcase heater for cold-climate reliability and shall be AHRI certified.
- 5. Refer to manufacturer's submittal data sheets for complete dimensional, piping, and performance data for each tonnage.

F. ROOF CURB

1. Shall be as manufactured by VMC or equal minimum 24" High.
2. Curb is to be provided by others for roof/duct penetrations.
3. Unit is not designed to be part of the curb.

END OF SECTION 237200