SECTION 23 70 00

VARIABLE REFRIGERANT FLOW SYSTEMS

1 PART 1 GENERAL

1.01 SCOPE

A. Work Included:

1. Air Cooled Heat Pump Unit - Heat Recovery (heat and cool model).
2. Branch Selector (BS) Units or Branch Circuit (BC) Terminal for Heat Recovery systems.
3. Ceiling Cassette Fan Coils
4. Wall Hung, Ductless Fan Coils.
5. Concealed Ducted Fan Coils.
6. Controls

1.02 SYSTEM DESCRIPTION

A. Heat Recovery (heat **and** cool model):

1. The variable capacity heat pump air conditioning system shall be a VRV/VRF series heat **and** cool model. The system shall consist of multiple evaporators, Branch Selector Units or Branch Circuit Terminals, heat recovery condensing unit with variable speed inverter driven compressors, and PID DDC (direct digital controls). All zones are each capable of operating separately with individual temperature control.

2. Operation of the system shall permit either individual cooling or heating of each indoor unit simultaneously or all of the indoor units associated with each branch of the cool/heat selector box. Each indoor unit or group of indoor units shall be able to provide set temperature independently via a local remote controller, and an Intelligent Touch Controller.

1.03 LIMITED WARRANTY

A. Under normal use and maintenance for comfort cooling and conditioning applications the products will be free from defects in material or workmanship. This warranty applies to parts only and is limited in duration to one (1) year from the earlier to occur of (a) the date of original installation, whether or not actual use begins on that date, or (b) twenty-four (24) months from the date of shipment.

1.04 INSTALLATION REQUIREMENTS

A. The system must be installed by factory trained contractor. The mechanical contractor's installation price shall be based on the systems installation requirements.

2 PART 2 PRODUCTS

2.01 VARIABLE REFRIGERANT VOLUME/FLOW AIR CONDITIONING SYSTEM

A. Manufacturers: Daikin, Mitsubishi or approved equal.

2.02 HEAT PUMP UNIT

A. General:

1. The condensing unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.

2. Refrigerant lines from the outdoor unit to the BS or BC unit shall be individually insulated between the condensing and fan coil units.

3. The condensing unit can be wired and piped with access from the left, right, rear or bottom.

4. Each condensing system shall be able to support the connection of up to 50 indoor units dependent on the model of the condensing unit.

5. The sound pressure level standard shall no greater than 65 dBA at 3 feet from the front of the unit. The condensing unit shall be capable of operating automatically at further reduced noise during night time.

6. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.

7. The unit shall incorporate an auto-charging feature.

8. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.

9. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.

10. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.

11. Each system shall maintain continuous heating during oil return operation.

12. The condensing unit shall be capable of heating operation at -13°F dry bulb ambient temperature without additional low ambient controls or an auxiliary heat source.

13. As one zone (BS box) changes mode the rest of the system must provide continuous heating or cooling to all other zones. Capacity interruption of the system while zones change mode is not acceptable.

14. The system shall continue to provide heat to the indoor units in heating operation while in the defrost mode.

B. Unit Cabinet: The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

C. Fan:

1. The condensing unit shall consist of one or more propeller type, direct-drive fan motors that have multiple speed operation via a DC (digitally commutating) inverter.

2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG.

3. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.

4. The fan motor shall be provided with a fan guard to prevent contact with moving parts.

5. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature.

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.

2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.

3. The fins are to be covered with an anti-corrosion finish.

E. Compressor:

1. The inverter scroll compressors shall be variable speed controlled capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read and calculated. With each reading, the compressor capacity shall be controlled to eliminate deviation from target value.

2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll type

3. The capacity control range shall be as low as 4% to 100%.

4. Each non-inverter compressor shall also be of the hermetically sealed scroll type.

5. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.

6. Oil separators shall be standard in the equipment together with an intelligent oil management system.

7. The compressor shall be spring mounted to avoid the transmission of vibration.

2.03 BRANCH SELECTOR (BS) BOX/ BRANCH CIRCUIT (BC) CONTROLLER FOR HEAT RECOVERY SYSTEM

A. General: Branch selector boxes/ Branch circuit controllers are designed specifically for use with heat recovery system components.

1. Selector boxes / circuit controllers shall be factory assembled, wired, piped and run tested at the factory.

2. Selector boxes / circuit controllers must be mounted indoors.

3. When simultaneously heating and cooling, the units in heating mode shall energize their subcooling electronic expansion valve.

B. Unit Cabinet:

1. These units shall have a galvanized steel plate casing.

2. Each cabinet shall house multiple electronic expansion valves for refrigerant control per branch.

3. The unit shall have sound absorption thermal insulation material made of flame and heat resistant foamed polyethylene.

C. Refrigerant Valves:

1. The refrigerant connections must be of the braze type.

2. Multiple indoor units may be connected to a branch selector box / branch circuit controller.

D. Condensate Removal:

1. Provide integral condensate pan if required for condensate removal.

E. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.

2. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded 2 conductor cable.

2.04 VRV/VRF INDOOR FAN COIL UNITS

A. Concealed Cassette Fan Coil

1. Cassette style for recessed mounting into a ceiling.

2. Adjustable airflow with vertical and horizontal louvers.

3. 5 selectable fan speeds.

4. Integral ventilation air intake.

5. Mold resistant decorative interior panel.

6. Factory installed drain pump.

7. Galvanized steel plate casing.

8. Foamed polyurethane sound / thermal insulation.

9. Electronic expansion valve refrigerant control.

10. Standard resin net filter with mold control.

11. Controls: This unit shall use controls provided by the manufacturer to perform functions necessary to operate the system.

B. Wall Mounted Fans.

1. Indoor fan coil unit with direct expansion refrigerant cooling coil, fan motor, piping connections, electrical controls and hanging brackets (wall mounted). Unit to have integral discharge blades and return air grille.

2. Fan to be centrifugal type with adjustable discharge louvers.

3. Non_ferrous construction consisting of a refrigerant coil with aluminum plate fins mechanically bonded to seamless copper tubes. Integral drip pan and drain connection.

4. Electronic expansion valve.

5. Integral condensate pump.

6. Refrigerant metering piston and body.

7. Filter.

8. Controls: This unit shall use controls provided by the manufacturer to perform functions necessary to operate the system.

C. Ceiling-Concealed Ducted Indoor Unit

1. General: The shall be a ceiling-concealed ducted indoor fan coil design that mounts above the ceiling with a 2-position, field adjustable return and a fixed horizontal discharge supply and shall have a modulating electronic expansion device.

2. Indoor Unit. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

3. Fan:

a. The indoor unit fan shall be an assembly with one or two Sirocco fan(s) direct driven by a single motor.

b. The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.

c. The indoor fan shall consist of at least three (3) speeds. The indoor unit shall have a ducted air outlet system and ducted return air system.

4. Filter: Optional rear return filter box with high-efficiency filter (see specification section 23 41 00.

5. Coil:

a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.

b. The tubing shall have inner grooves for high efficiency heat exchange.

c. All tube joints shall be brazed with phos-copper or silver alloy.

d. The coils shall be pressure tested at the factory.

e. A condensate pan and drain shall be provided under the coil.

f. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water above the condensate pan.

g. Both refrigerant lines to the indoor units shall be insulated.

6. Electrical: The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

7. Controls: This unit shall use controls provided by the manufacturer to perform functions necessary to operate the system.

2.05 CONTROLS

A. Physical characteristics: The advanced multi-zone controller shall be made from plastic materials with a neutral color. Each control shall have a LCD (Liquid Crystal Display) that shows On/Off, setpoint, room temperature, mode of operation (Cool/Heat/Dry/Fan/Auto), louver position, fan speed, 7 day scheuduling, trouble shooting menu (Navigation style controller).

B. Electrical characteristics

1. General: The advanced multi-zone controller will require 24 VAC to power the controller. The advanced multi-zone controller shall supply 16 VDC to the communication bus on the F1F2 (out-out) terminal of the outdoor unit. The voltage may rise or fall in relation to the transmission packets that are sent and received.

2. Wiring: The advanced multi-zone controller communication wiring shall be terminated in a daisy chain design at the outdoor unit, which is then daisy chained to branch selector (Heat Recovery system), then daisy chained to each indoor unit in the system and terminating at the farthest indoor unit. The termination of the wiring shall be non-polar. The remote control wiring shall run from the indoor unit control terminal block to the remote controller connected with that indoor unit.

3. Wiring size: Wiring shall be non-shielded, 2-conductor sheathed vinyl cord or cable, and 18 AWG stranded copper wire.

C. VRV Controls Network

1. The VRV Controls Network is made up of local remote controllers that transmit information via the communication bus. The VRV Controls Network supports operation monitoring, scheduling, error, maintenance support, all of which blend to provide the optimal control strategy for the best HVAC comfort solution.

D. Basic Operation:

1. Capable of controlling by Area(s) or Group(s).

2. Controller shall control the following group operations:

a. On/Off.

b. Operation Mode (Cool, Heat, Fan, Dry, and Auto).

c. Independent Cool and Heat dual setpoints or single Setpoint for current mode in the occupied period.

d. Controller shall be able to limit the user adjustable setpoint ranges individually for cooling and heating based upon the Area or Group configurations.

e. Independent Setup (Cooling) and Setback (Heating) setpoints in the unoccupied mode adjustable to 50 - 95^{0}F.

1) Setup and Setback setpoints can only be set outside of the occupied setpoint range.

2) The Setup and Setback setpoints will automatically maintain a 2^{0}F fixed differential from the highest possible occupied setpoints.

3) The recovery differential shall be 4^{0}F (default) and adjustable between 2 - 10^{0}F.

4) Settings shall be applied based upon the Area or Group configurations.

f. Fan Speed: Up to 3 speeds (dependent upon indoor unit type).

g. Airflow direction (dependent upon indoor unit type).

1) 5 fixed positions or oscillating

h. Remote controller permit/prohibit of On/Off, Mode, and Setpoint.

i. Lock out setting for Intelligent Touch Manager display.

j. Indoor unit Group/Area assignment.

1) Capable of providing battery backup power for the clock at least 1 year when no AC power is applied.

2) The battery can last at least 13 years when AC power is applied.

3) Settings stored in non-volatile memory.

E. Programmability:

1. Controller shall support weekly schedule settings.

a. 7 day weekly pattern (7).

b. Weekday + Weekend (5 + 2).

c. Weekday + Saturday + Sunday (5 + 1 + 1).

d. Everyday (1).

e. The schedule shall have the capabilities of being enabled or disabled

1) Each scheduled event shall specify time and target Area or Group.

2) Each scheduled event shall include On/Off, Optimum Start, Operation Mode, Occupied Setpoints, Setback Setpoints, Remote Controller On/Off Prohibit, Remote Controller Mode Prohibit, Remote Controller Setpoint Prohibit, Timer Extension Setting, Fan Speed, and Setpoint Range Limit.

3) Setpoint when unit is on (occupied).

4) Configurable Setup (Cooling) and Setback (Heating) setpoints when unit is off (unoccupied).

5) Time setting in 1-minute increments.

6) Timer Extension shall be used for a timed override (settable from 30 - 180 minutes) to allow indoor unit operation during the unoccupied period.

2. Controller shall support auto-changeover.

a. Auto-change shall provide Fixed (default), Individual, Averaging, and Vote changeover methods for both Heat Pump and Heat Recovery systems based upon the changeover group configuration. This will allow for the optimal room temperature to be maintained by automatically switching the indoor unit's mode between Cool and Heat in accordance with the room temperature and setpoint. The following changeover scheme shall be applicable to the Fixed, Individual, and Averaging methods.

1) Changeover to cooling mode shall occur at cooling setpoint + 1^{0}F (0.5^{0}C) as the primary changeover deadband and takes the guard timer into consideration.

a) Configurable from 1 - 4^{0}F.

2) Changeover to cooling mode shall occur at the primary changeover deadband to cooling + 1^{0}F (0.5^{0}C) as the secondary changeover deadband.

a) Configurable from 1 - 4^{0}F.

3) Changeover to heating mode shall occur at heating setpoint - 1^{0}F as the primary changeover deadband and takes the guard timer into consideration

a) Configurable from 1 - 4^{0}F.

4) Changeover to heating mode shall occur at the primary changeover deadband to heating - 1^{0}F (0.5^{0}C) as the secondary changeover deadband.

a) Configurable from 1 - 4^{0}F.

5) A weighted demand shall be configurable for the Averaging and Vote methods.

b. Fixed Method

1) Changeover evaluated by room temperature and setpoint of the representative indoor unit (first registered indoor unit in changeover group) in the changeover group even when it is not operating (must be in Cool, Heat, or Auto mode)

2) Changeover affects all indoor unit groups in the changeover group.

c. Individual method (recommended for Heat Recovery Systems)

1) Changeover evaluated by room temperature and setpoints of the individual indoor unit group in the changeover group

2) Changeover affects individual indoor unit group in the changeover group

d. Average method

1) Changeover evaluated by the average of all indoor unit group's room temperatures and setpoints operating in Cool, Heat, or Auto mode in the changeover group list

2) If none of the indoor units in the group meet the above requirements the fixed method of changeover will be applied

3) A weighted demand (0 - 3) can be configured for each indoor unit in the changeover group.

4) Changeover affects all indoor unit groups in the changeover group.

e. Vote Method

1) In each indoor unit, the cooling demand is calculated based upon the difference between the room temperature and cooling setpoint. If the room temperature falls below the primary cool changeover point (cool setpoint plus the primary changeover deadband) the cooling demand is considered as 0 (zero). Then the total cooling demand is calculated as the sum of each indoor unit's cooling demand

2) The opposite is true for the total heating demand

3) A weight (0-3) can be added to each indoor unit's demand in the changeover group. The default setting is 1

4) The weight 0 (zero) means the indoor unit's demand is not added in the total demand, so the indoor unit's demand is considered to be 0 (zero)

5) The weight 2 or 3 means the indoor unit's demand is added 2 or 3 times in the total demand, respectively

6) Changeover to cooling mode shall occur when the total cooling demand is greater than the total heating demand.

7) The opposite is true for changeover to heating

8) Vote supports a Heating Override option, which prioritizes switching to the heating mode if at least one room temperature falls below the secondary heat changeover point (heat setpoint minus the secondary changeover deadband) even if the total cooling demand is greater than the total heating demand.

9) Changeover affects all indoor unit groups in the changeover group.

10) Changeover shall change the operation mode of the indoor unit that is set as the Changeover Master. The Changeover Master indoor unit shall then change the operation mode of all indoor unit groups daisy chained to the same outdoor unit in the Heat Pump system or branch selector box in the Heat Recovery system.

f. Guard timer

1) Upon changeover, guard timer will prevent another changeover during the guard timer activation period (15, 30, 60 (default) min).

2) Guard timer is ignored by a change of setpoint manually from either intelligent Touch Manger or Remote Controller, by schedule, or the room temperature meets or exceeds the secondary changeover deadband of the mode opposite of the current mode setting.

F. Auxiliary Equipment Integration:

1. HRV-1 to show up as an icon on the central controller visual display. Occupancy scheduling, setpoint control as well as monitoring of status and alarm to be communicated through VRV central controller and/or web interface.

3 PART 3 EXECUTION

3.01 GENERAL

A. Install fan coil units and heat pump units in accordance with the manufacturer's instructions. Do not start fan units until filters have been installed. Install a new set of filters upon job completion.

B. Provide all equipment piping connections, valves and miscellaneous accessories required for complete and fully functional mechanical systems.

C. Mount the heat pump units as noted on the drawings and secure to the mounting surface. Verify locations at the site. Install equipment to allow access to interior components as recommended by the manufacturer.

D. Provide complete charge of refrigerant and oil required for operation. Provide any additional refrigerant or oil required during first year of operation.

E. Suspend the ducted fan coil units from structure using spring isolators.

F. Provide seismic bracing and supports as required by the governing jurisdiction for all units. Provide seismic restraint details and calculations as required by the governing code jurisdiction. Cost for all seismic detail development and calculations are to be included in the base bid price.

G. Provide an external field fabricated sheet metal drip pan under the fan coils.

H. Verify all service access points as recommended by the manufacturer are easily accessible without the removal of additional mechanical equipment / piping.

I. Isolate ductwork from unit connections utilizing flexible connectors

J. Provide start-up service for each unit and verify proper operation per manufacturers' specifications.

3.02 CONTROL SEQUENCE

A. Energy Compliance:

1. Provide 365 day, 24 hour occupancy scheduling.

2. Provide sensors and/or software routines to operate the fan coil units to maintain the minimum night low limit temperature for that system. Operate the fan coil, heat pumps, etc. as required.

3. When controlling both heating and cooling (mechanical), provide a 5-degree deadband in which the heating energy provided to the zone is reduced to a minimum.

4. Provide optimum start controls to enable a morning warm-up cycle capable of varying the unit start time to meet occupied setpoint at scheduled time of occupancy.

5. Close rooftop unit outside air dampers as appropriate to the equipment when the units are off and during the warm-up period.

B. VRF system:

1. The VRF system will operate on the system integral / internal controls to maintain space cooling and heating setpoints.

2. The supply fans will be enabled to run continuously whenever zone is operating in an occupied mode.

3.03 FIELD QUALITY CONTROL

A. Startup: Implement a logical step_by_step startup and checkout of the control system. In addition, startup assistance and coordination shall be provided during startup of the mechanical equipment. Startup shall be considered complete after the entire system is operating properly.

B. Self-commission all hardware and software provided for the project.

C. Completed field commissioning sheets shall be included with the final "as-built" O&M manuals. These sheets shall include validation check fields for all physical and LAN inputs and outputs and graphics for each operating unit or system within the facility. Each system and point shall be listed, using logical names for future reference by the owner.

D. Commissioning shall include calibration and verification of operation of each I/O and graphic field. Functional commissioning of software programming to meet sequences of operation as submitted and approved shall be verified on the field commissioning sheets.

E. At the completion of the job, in the presence of an Owner's representative, thoroughly check out the entire control system by simulating each control function and determine that the system performs in accordance with the Contract Specifications.

3.04 OUTDOOR UNIT INSTALLATION

A. Install per manufacturer's requirements. Install level and plumb. Install with clearances as recommended by the manufacturer.

B. Install field mounted accessories.

3.05 INDOOR UNIT INSTALLATION

A. Install per manufacturer's requirements. Install level and plumb. Install with clearances as recommended by the manufacturer.

B. Where manufacture's standard condensate pump does not provide adequate lift, provide condensate pump that will meet lift requirements. Confirm unit shut down upon failure of condensate pump.

C. C. Install field mounted accessories

D. Provide vibration isolation as indicated on drawings.

E. Provide condensate drainage from indoor units. Provide secondary overflow pan and piping to observable location as required for concealed units.

3.06 REFRIGERANT PIPING

A. Refer to specification section 23 20 00.

3.07 CONTROLS

A. Wiring: Communication wiring shall be terminated in a daisy chain design at the outdoor unit, which is then daisy chained to branch selector (Heat Recovery system), then daisy chained to each indoor unit in the system and terminating at the farthest indoor unit. The termination of the wiring shall be non-polar. The remote control wiring shall run from the indoor unit control terminal block to the remote controller connected with that indoor unit. Wiring shall be non-shielded, 2-conductor sheathed vinyl cord or cable, and 18 AWG stranded copper wire.

3.08 CLEANING

A. Prior to acceptance, thoroughly clean equipment, remove shipping labels and traces of foreign substance. Touch up with factory machine paint on scratch surfaces.

3.09 START UP

A. The manufacturer shall provide start-up service in the form of a factory trained service technician. The service technician shall verify correct installation, verify unit mounting, verify fan rotation, verify spring isolator adjustments, verify control wiring, verify power wiring, start-up the fans, and check for proper operation. The service technician shall provide final adjustments to meet the specified performance requirements. Fully staffed parts and service personnel shall be within four hours travel from the job site.

END OF SECTION

SECTION 23 72 00

AIR TO AIR HEAT RECOVERY

1 PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Providing air to air energy recovery ventilators for building ventilation

2 PART 2 PRODUCTS

2.01 MANUFACTURERS: Oxygen8, Renewaire, Xetex, Lossnay, or approved equal.

2.02 EQUIPMENT

A. Construction

1. The energy recovery component shall be of fixed-plate cross-flow construction, with no moving parts.

2. No condensate drain pans or drains shall be allowed and unit shall be capable of operating in both winter and summer conditions without generating condensate.

3. The unit case shall be constructed of G90 galvanized, 20-gauge steel, with lapped corners and zinc plated screw fasteners.

4. Access doors shall provide easy access to blowers, ERV cores, and filters. Doors shall have an airtight compression seal using closed cell foam gaskets. Pressure taps, with captive plugs, shall be provided allowing cross-core pressure measurement allowing for accurate airflow measurement.

5. Cabinet shall be nominal 2-inch double wall panel with R13 thermal insulation. Cabinet exterior shall be 18-gauge galvanized steel on base panels and 24-gauge pre-painted steel on wall and roof panels and meets or exceeds 650-hour salt spray test based on ASTM B117. Liners and other steel components shall be galvanized steel. All seams shall be sealed to provide airtight casing.

6. The ERV core shall be protected by a MERV-13 rated, 4" nominal, pleated, disposable filter on the outside air side and a MERV-8 rated, 4" nominal, pleated, disposable filter on the return air side.

7. Unit shall have single-point power connection and a single-point 24 VAC contactor control connection.

8. Blower motors shall be Premium Efficiency, EISA compliant for energy efficiency. The blower motors shall be totally enclosed (TEFC) and be shall be supplied with factory installed motor starters.

9. Blowers shall be quiet running, forward curve.

10. The unit electrical box shall include a factory installed, non-fused disconnect switch and a 24 VAC, Class II transformer/relay package.

11. The ERV shall be provided "inverter-ready" allowing for applications of inverters supplied and installed by others.

B. Energy Transfer: The HRV shall be capable of transferring sensible heat between airstreams.

C. Frost Control: The HRV core shall be protected from frost accumulation with the installation of an electric pre-heater.

D. Continuous Ventilation: Unit shall have the capacity to operate continuously.

E. Efficiency: The unit shall meet or exceed energy efficiency requirements of the Washington State Energy Code 2021 Table C406.1 Section 7. Sensible effectiveness must be equal to or exceed 80% and total fan power W/CFM shall be less than 0.5 W/CFM.

3 PART 3 EXECUTION

3.01 INSTALLATION

A. Install the equipment in accordance with the manufacturer's recommendations, with clearances for maintenance access. Coordinate and provide and service requirement clearance per national electric code for the equipment electrical control box.

B. Provide seismic bracing and supports as required by the governing jurisdiction for all units. Provide seismic restraint details and calculations as required by the governing code jurisdiction. Cost for all seismic detail development and calculations are to be included in the base bid price.

C. Mount the heat recovery unit with spring isolators. Do not start unit until filters have been installed.

D. Provide all flexible ductwork connections and miscellaneous accessories required for complete and fully functional mechanical systems.

END OF SECTION

REVISED
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