# SECTION 23 04 51

# VARIABLE REFRIGERANT FLOW SPLIT SYSTEM HEAT RECOVERY WITH SIMULTANEOUS HEATING AND COOLING

## PART 1 – GENERAL

### 1.1 RELATED DOCUMENTS

A. The general provisions of the contract, including the conditions of the contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.

B. Refer to Section 230200 for HVAC General Provisions

C. Refer to Section 230210 for HVAC Basic Materials & Methods.

### 1.2 DESCRIPTION OF WORK

A. This Section includes labor, material, equipment and supervision for the following:

1. Single or Multiple Outdoor Condensing Units
2. Multiple Indoor Ceiling Cassette Cooling Units.
3. MCU refrigerant control unit(s) for simultaneous distribution of liquid and hot gas refrigerant to fan coil units for simultaneous heating and cooling operation.

B. Provide complete refrigeration system including condensing units, cooling units, aboveground refrigerant piping, and all required controls and accessories for a complete and operable system.

C. The variable capacity, air conditioning system shall be a split system consisting of ductless evaporators exclusively matched to the outdoor condensing unit.

### 1.3 REFERENCE STANDARDS

A. Refer to Section 230200 for a general description of requirements applying to this section.

B. Comply with applicable provisions of:

1. International Mechanical Code
2. ASME Codes for Pressure Vessels
3. A.R.I. Capacity Ratings
4. NFPA Pamphlets
5. ASHRAE Standard 15
6. ASHRAE Standard 90.1, Section 6, Table 6.8.1A thru J, minimum equipment efficiency.
7. ISO 9001 and 14001.

1.4 QUALITY ASSURANCE

A. Refer to Section 230210 for a general description of requirements applying to this Section.

B. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

C. All wiring shall be in accordance with the National Electric Code (NEC).

D. The system shall be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.

E. The outdoor unit shall be factory charged for a length of 25 feet of refrigerant with R410A refrigerant.

F. A dry air holding charge shall be provided in the evaporator(s).

1.5 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 230200.

B. Submit the following:

1. Shop drawings and product data for all equipment in this section.

1.6 SUBSTITUTIONS

A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

1.7 WARRANTY/GUARANTEE

A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements. In addition, the following special guarantee applies:

1. Manufacturer shall warrant all refrigeration equipment including parts and labor, for one (1) year from start-up.

2. Compressors shall be warranted for parts only for an additional four (4) years.

## PART 2 – PRODUCTS

### 2.1 GENERAL REQUIREMENTS

A. The system performance shall be in accordance with ARI 210/240 test conditions as shown in the performance table below. System refrigerant piping shall be sized and installed per the manufacturer's piping diagrams and piping procedures.

B. The cooling performance is based on 80°F DB / 67°F WB for the indoor unit and 95°F DB /75°F WB for the outdoor unit and 25 feet of piping.

C. The operating range in cooling will be 23°F DB ~ 115°F DB.

D. Provide all equipment, materials, programming and technical support as required to interface with the Building's DDC System.

### 2.2 INDOOR UNIT

A. General: The indoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. Both liquid and suction lines shall be individually insulated between the outdoor and indoor units. The unit shall have a self diagnostic function, 3-minute time delay mechanism, and have a factory pre-charge of R410A adequate for 25 feet of total length.

B. Unit Cabinet Ceiling Recessed Type:

1. The indoor unit shall have a finished cabinet for exposed ductless applications.

2. The drain and refrigerant piping shall be concealed above the finished ceiling for flexible installation from the right side.

3. The cabinet shall be supplied with suspension bracket for securely mounting the cabinet to threaded rod.

4. The cabinet includes a receiver to accept signals from a wired remote controller.

5. The indoor unit shall include a stub duct connection for air distribution to an adjoining zone as shown on the drawings.

6. The indoor unit shall include a factory mounted and wired high lift condensate drain pump capable of 29" lift. The condensate pan shall be internally trapped.

C. Fan:

1. The evaporator fan shall be an assembly with of a direct-driven single motor.

2. The fan shall be statically and dynamically balanced and operate on a motor with permanent lubricated bearings.

3. The indoor fan shall offer a choice of three speeds, High, Medium, and Low.

4. The supply air shall be distributed to the space through a 4-way blow wide blade grille.

5. The return air shall be returned to the unit through an integral center return air grille.

D. Filter:

1. The return air filter shall be integral to the unit and shall be replaceable and washable.

E. Coil:

1. The evaporator coil shall be a nonferrous, aluminum fin on copper tube heat exchanger.

2. All tube joints shall be brazed with silver alloy.

3. All coils shall be factory pressure tested.

4. A condensate pan shall be provided under the coil with a drain connection.

5. The evaporator coil shall be controlled by a factory mounted electronic thermal expansion valve.

F. Electrical:

1. The indoor unit shall be powered by 208 volt, 1 phase, 60 hertz power.

G. Control:

1. The indoor fan coil unit shall have a wired remote controller capable to operate the system.

2. The wired remote controller shall control: on/off operation, operation mode, fan speed, temperature set point and filter alarm.

3. The wired remote control shall perform fault diagnostic functions which may be system related, indoor unit or outdoor unit related depending on the fault code. Temperature range on the remote control shall be 64°F to 90°F in cooling mode and 50°F to 86°F in heating mode.

4. The indoor unit microprocessor shall have the capability to receive and process commands via return air temperature and indoor coil temperature sensors enabled by commands from the remote control.

5. The system shall have automatic restart capability after a power failure has occurred.

6. Multiple indoor fan coil units located in the same room shall be controlled in a master/slave configuration with a single wired remote controller connected to the master indoor unit and interconnecting wiring between the master and slave units.

7. The indoor fan coil unit shall include a field installed relay module for interface to the BAS system.

8. Each system shall be networked to a centralized controller with data management service device to provide local schedule and set point control, error history management, and web server browsing from static IP address.

I. Sound:

1. Indoor unit sound levels shall not exceed: 41 dBA

J. MCU Refrigerant Distribution Control Module: (DN)

1. The MCU unit shall include refrigerant liquid, suction and hot gas connections to the outdoor unit. All three refrigerant lines shall be insulated from the MCU to the outdoor unit.

2. The MCU unit shall include refrigerant liquid and vapor connections to the indoor units.

3. The MCU unit shall include a 208/230-1-60 power supply connection.

4. The MCU shall include a condensate drain connection.

5. The MCU shall include a control communications connection for network to the indoor fan coil units and outdoor air-cooled condensing unit(s).

6. The MCU shall include heating and cooling solenoid valves for automatic distribution of liquid refrigerant or hot gas for simultaneous heating and cooling fan coil operation.

2.3 OUTDOOR UNIT

A. General: The outdoor unit(s) shall be specifically matched to the corresponding indoor unit size(s). The outdoor unit(s) shall be complete factory assembled and pre-wired with all necessary electronic and refrigerant controls.

B. Unit Cabinet: The cabinet shall be ivory with a finished powder coated baked enamel paint.

C. Fan

1. The fan shall be a direct drive, propeller type fan.

2. The motor shall be BLDC type with permanently lubricated type bearings and inherent overload protection.

3. The fan shall be capable of high static operation up to 0.31” WC for ducted applications.

4. A fan guard is provided on the outdoor unit to prevent contact with fan operation.

5. Airflow shall be vertical discharge.

D. Coil: The outdoor coil shall be nonferrous construction with corrugated fin tube.

E. Compressors:

1. The outdoor unit shall have a minimum two compressors. One compressor shall be a Copeland digital scroll compressor with 10% to 100% capacity modulation and one compressor shall be a Copeland fixed scroll compressor. Outdoor unit shall be capable of capacity modulation down to 10% of full load capacity.

2. The outdoor unit shall have an accumulator.

3. The compressor shall have an internal thermal overload.

4. The outdoor unit shall operate with a maximum vertical height difference of 164 feet and overall maximum piping length of 3280 feet and maximum 721 feet (equivalent length) from outdoor unit to furthest indoor unit.

F. Electrical:

1. The outdoor unit shall be powered by 460 volt, 3 phase, 60 hertz power.

2. The outdoor shall be controlled by a microprocessor located in the outdoor unit and via signals from the indoor units.

G. Sound: Outdoor unit sound levels shall not exceed: 64 dBA

2.4 DESIGN MAKE: Samsung

2.5. MANUFACTURERS: Daikin, Samsung, Mitsubishi (Citi-Multi), LG HVAC, Panasonic.

A. Any listed equivalent manufacturer and the Mechanical Contractor shall be completely responsible to comply with all requirements on the contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades.

**PART 3 – EXECUTION**

3.1 REFRIGERATION EQUIPMENT

A. All equipment shall be installed in accordance with manufacturer's recommendations.

3.2 FIELD QUALITY CONTROL

A. The system shall be installed under the supervision of a certified manufacturer’s representative.

B. Start up all units in accordance with manufacturer's start-up instructions. Replace damaged or malfunctioning controls and equipment.

C. Start up service and first year preventative/emergency service shall be provided by the manufacturer's authorized representative.

D. Customer operator training shall be provided by the manufacturer's authorized representative.

**END OF SECTION 23 04 51**