

SECTION 15783
SPLIT HEAT PUMP SYSTEM

PART 1 - GENERAL**1.01 DESCRIPTION OF WORK**

- A. Provide split type air-cooled heat pump systems of single or multiple indoor unit types as specified herein, shown on the Drawings, and needed for a complete and proper installation. Product specific requirements are contained herein; Section 15501, General Provisions for Heating, Ventilating and Air Conditioning Work, shall be referred to for general requirements.

1.02 COMMISSIONING REQUIREMENTS

Not used

1.03 RELATED SECTIONS

- A. Division 7 Sections
- B. Division 15 Sections

1.04 SUPPLEMENTAL SUBMITTALS

- A. Product Data: Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics; and start-up instructions.
- B. Wiring Diagram: Diagram power and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Certificate: Contractor's start-up and demonstration affidavit.
- D. Maintenance Data
1. Maintenance Manual
- E. Maintenance Materials
1. Spare Filters
- F. Manufacturer's Warranties.

1.05 SUPPLEMENTAL QUALITY ASSURANCE

- A. Codes and Standards
1. ARI Compliance: Test and rate heat pump unit in accordance with ARI Standards.
 2. NFPA Compliance: Provide heat pump unit internal insulation having flame spread rating not over 25 and smoke developed rating no higher than 50; and complying with NFPA 90A: Standard for the Installation of Air Conditioning and Ventilating Systems.
 3. UL and NEMA Compliance: Provide electrical components required as part of heat pump unit, which have been listed and labeled by UL and comply with NEMA Standards.
 4. NEC Compliance: Comply with National Electrical Code as applicable to installation and electrical connections of ancillary electrical components of heat pump unit.
- B. Split air cooled heat pump units shall comply with the EER, IEER and COP_H requirements of the 2016 edition of the New York City Energy Conservation Code (NYCECC) and ASHRAE 90.1-2013 as modified by Appendix CA of the 2016 NYCECC.
- C. Refrigeration equipment shall be listed and labeled to UL 1995-2005. UL listing shall be indicated on the Shop Drawings.
- D. All appliances regulated by the New York City Construction Codes shall be listed and labeled (reference Sections MC 301.4 and MC 301.6 of the 2014 NYC Mechanical Code). Testing of material shall be in accordance with Section §28-113 of the NYC Administrative Code (reference Section MC 301.5). Whenever the NYC Construction Codes or the Rules of the Department of Buildings requires that material be listed or labeled and material proposed to be used is not so listed or labeled, the use of such material shall be subject to prior approval by the Commissioner (Office of Technical Certification and Research OTCR) and such material shall be used only to the extent set forth in such approval. Materials that were previously approved by the Board of Standards and Appeal (BSA) or by the Department (MEA) before the effective date of the NYC Construction Codes may continue to be used, but only to the extent set forth in such approval, and only if such approval is not specifically amended or repealed by the Commissioner.

- E. Refrigeration system shall be constructed in accordance with ASHRAE 15-2010: Safety Standard for Refrigeration Systems and ASHRAE 34-2010 as modified by NYC Mechanical Code Chapter 11.
- F. Split heat pumps systems shall be provided in accordance with the NYC Construction Codes and NYC Electrical Code.

1.06 MAINTENANCE MATERIALS

- A. Provide two (2) complete set of spare filters for each **indoor** unit.

1.07 WARRANTY

- A. Split heat pump units shall have a 2-year parts warranty and the compressors shall be covered by an additional 3-year warranty. The installing contractor shall be responsible for warranty service and emergency repair during the first 24 months of the system operation. All warranties shall use Substantial Completion as the warranty start date. The warranty shall include parts, labor, and travel costs incurred by the manufacturer to provide factory authorized on-site services. Equipment submittals will not be approved until submission of the manufacturer's warranty indicating compliance with the above.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Approved Manufacturers:
 - 1. Mitsubishi Electric Corp.
 - 2. Panasonic (Sanyo Fisher Co.)
 - 3. Coolair Corp.
 - 4. Daikin Industries
 - 5. LG Corporation

2.02 SINGLE INDOOR UNIT DUCTLESS SPLIT HEAT PUMP SYSTEM

- A. Provide an air-to-air electric heat pump (outdoor unit) in combination with a direct expansion fan-coil heat pump (indoor unit) in the location shown on the Drawings. The units shall be designed and tested for use with Refrigerant R-410A and be equipped with refrigerant line fittings which

permit mechanical or sweat connection and shall be in accordance with Section MC 1107. The electrical requirements, the size, the cooling and heating capacities shall be as indicated on the Drawings.

- B. Unit shall be factory assembled, piped, and internally wired. Units shall be UL listed and carry a UL label. Unit shall be factory run-tested to check cooling and heating operation, defrost operation, fan and blower rotation and control sequence. Unit shall be designed to operate at ambient temperature between 115°F and 55°F in cooling mode (as shipped) and between 75°F and -20°F in heating mode.
- C. All coils shall be constructed with aluminum plate fins mechanically bonded to Oxygen Free Copper (OFC) or aluminum tubing with all joints brazed and outdoor coil shall be coated with factory-applied anti-corrosion coating to prevent leaks due to corrosion.
- D. The outdoor unit shall contain a semi-hermetic compressor with crankcase heater, automatically reversible oil pump, internal and external motor protection. Outdoor fan shall be propeller type, with vertical discharge and direct driven by a factory-lubricated motor. Per Section MC 1101.12, refrigerant circuit access ports located outdoors shall be fitted with locking-type tamper-resistant caps requiring a special tool or key to open.
- E. Indoor unit shall operate properly on horizontal position (with or without) ductwork. Unit shall have electric resistance heaters as specified for back-up of heat pump heating capacity) and shall contain refrigerant metering device and indoor fan relay. Fan shall be centrifugal type, belt driven.
- F. Controls and protective devices shall include a high pressurestat, loss-of-charge pressurestat, crankcase heater, suction line accumulator and pressure relief device. Motor compressor shall have both thermal and current sensitive overload devices. The outdoor unit shall provide short cycle protection or safety lockout compressor protection.
- G. Defrost control shall sense need to defrost every 90 minutes based on liquid temperature. On system using multiple units, a defrost interlock control shall be provided. A 24-volt transformer shall be factory installed and wired on outdoor units for external control circuit.

- H. System accessories shall include indoor thermostat, outdoor thermostat, head pressure control, heat pump piping package, return air grille, filters, electric resistant heaters, discharge air grille and plenum, suspension package, indoor coil defrost thermostat, sub-base, fan and drives, outdoor fan cycling thermostat, emergency heat control package, compressor short cycle protection and sequencer control.
- I. Each unit shall have the cooling and heating capacity, phase, voltage and amperage shown on the Drawings. Provide a metal name plate securely attached to the side of the unit (outdoor and indoor), readily visible. The name plate shall have inscribed on it, the following information in clear and legible lettering, manufacturer's name, Model No., month and year of installation, BTUH Rating, voltage and current rating for each unit.
- J. The maximum radiated outdoor unit sound power levels shall be as follows:

Center Frequency (Hz)	63	125	250	500	1000	2000	4000	8000
Band Designation	1	2	3	4	5	6	7	8
Db								

2.03 MULTIPLE INDOOR UNITS, DUCTLESS, SPLIT HEAT PUMP SYSTEM

Not used

PART 3 - EXECUTION

3.01 SUPPLEMENTAL INSTALLATION

- A. Install outdoor unit with mounting legs supplied by the manufacturer, on prefabricated roof equipment curbs provided by the contractor, with all the clearances required as shown on the Drawings.
- B. Install the indoor unit with the suspension package tied to the overhead construction as shown on the Drawings.
- C. Install the wall mounted unit as close as possible to the ceiling clear of any obstruction in front of unit by at least 5'0".
- D. For ceiling hung and wall hung units, per Section MC 307.2.3, Mechanical Contractor shall provide a [primary pan overflow drain line] [auxiliary drain pan and associated drain line]

as shown on the Drawings for each cooling or evaporator coil to avoid damage to any building component as a result of overflow from the primary equipment drain pan or stoppage in the primary condensate drain piping. One of the following methods shall be used:

1. Mechanical Contractor shall coordinate with sheet metal subcontractor to provide an auxiliary drain pan as shown on the Drawings with a separate drain under the coils on which condensation will occur. The auxiliary pan drain shall discharge to a conspicuous point of disposal (as shown on the Drawings) to alert occupants in the event of a stoppage of the primary drain. The auxiliary pan shall have a minimum depth of 1.5", shall not be less than 3" larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion-resistant material. Auxiliary metallic pans shall have a minimum thickness of not less than 0.0236" (No. 24 gage) for galvanized sheet metal pans, 0.0179" (No. 26 gage) for stainless steel pans, or 0.0320" (No. 20 gage) for aluminum pans. Nonmetallic pans shall have a minimum thickness of not less than 0.0625"
or

1. Mechanical Contractor shall provide a separate overflow drain line connected to the primary drain pan provided with the equipment. Such overflow drain shall discharge to a conspicuous point of disposal (as shown on the Drawings) to alert occupants in the event of a stoppage of the primary drain. The overflow drain line shall connect to the primary drain pan at a higher level than the primary drain connection or

2. Alternate Acceptable Installation: Mechanical Contractor shall coordinate with sheet metal subcontractor to provide an auxiliary drain pan without a separate drain line under the coils on which condensate will occur. Mechanical Contractor shall coordinate with the Temperature Controls subcontractor to provide a hard-wired water-level detection device for the auxiliary pan that will shut off the equipment served prior to overflow of the auxiliary pan. The auxiliary pan shall have a minimum depth of 1.5", shall not be less than 3" larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion-resistant material. Auxiliary metallic pans shall have a minimum thickness of not less than 0.0236" (No. 24 gage) for galvanized sheet metal pans,

0.0179" (No. 26 gage) for stainless steel pans, or
0.0320" (No. 20 gage) for aluminum pans. Nonmetallic
pans shall have a minimum thickness of not less than
0.0625"
or

2. Alternate Acceptable Installation per Section MC 307.2.3.1 water-level monitoring devices: On down-flow units and all other coils that do not have a secondary drain or provisions to install a secondary or auxiliary drain pan, a water-level monitoring device shall be installed by the Mechanical Contractor or Temperature Controls Contractor inside the primary drain pan. This device shall shut off the equipment served in the event that the primary drain becomes restricted. Devices installed in the drain line shall not be permitted.
- E. Install all other accessories as required by the manufacturers and indicated on the Drawings.
- F. Clearances shall be maintained around all components so as to permit inspection, servicing, repair, replacement and visibility of all appurtenances. When units are installed or replaced, clearance shall be provided to allow access for inspection, maintenance and repair. Passageways around all sides of the units shall have an unobstructed width as required by the manufacturer.
- G. Per Section MC 1107.3, rigid or flexible metal enclosures or pipe ducts shall only be provided for soft annealed copper tubing used for refrigerant piping erected on the premises and containing other than Group A1 refrigerants.

3.02 CONTROL SEQUENCE FOR DUCTLESS MULTI- INDOOR UNITS

Not used

3.03 CONTROL SEQUENCE FOR DUCTLESS SINGLE- INDOOR UNIT

- A. Cooling
1. If power to unit has been off for an extended period of time, crankcase heater shall be energized at least 24 hours prior to starting compressor.
 2. If cooling is required, the indoor and outdoor units shall start immediately upon command from the microcomputer control.

- B. Heating: When the microcomputer controls calls for heating, the indoor and outdoor units shall be energized.

3.04 FIELD QUALITY CONTROL

- A. The refrigerant lines between the indoor unit and the outdoor unit shall be tested in accordance with the requirements as defined in Section 15992, Cleaning and Testing.
- B. Upon completion of installation of the heat pump unit, start-up and operate equipment to demonstrate capability and compliance with requirements in the presence of the Manufacturer's Representative and the Authority. Field correct malfunctioning units, then retest to demonstrate compliance. Install new filters at completion of heat pump unit work, and prior to testing, adjusting, and balancing work. Obtain receipt from Contractor that new filters have been installed. Provide written Start-Up and Demonstration Affidavit certifying that the equipment is operating as designed. The contractor shall perform necessary Interdisciplinary Tests and Functional Performance Tests according to manufacturer's procedures.

3.05 TRAINING

- A. The Custodian and DOE Maintenance Representative shall be trained on the operation and maintenance of the system. All training shall be a minimum of 4 hours.

3.06 INTERDISCIPLINARY TESTS AND FUNCTIONAL PERFORMANCE TESTS

- A. Interdisciplinary Pre-Start-Up and Start-Up Tests

The Contractor shall conduct interdisciplinary pre-start up and start up tests as per the manufacturer's start up procedures. Contractor shall submit signed start up affidavit signed by the factory authorized service representative indicating that all of the manufacturer's pre-start up and start up procedures have been successfully completed.

- B. Functional Performance Tests

Contractor shall also submit signed functional performance testing affidavit signed by the factory authorized service representative indicating that all of the manufacturer's functional performance tests have been successfully completed.

3.07 COMMISSIONING OF SPLIT AIR COOLED HEAT PUMP AIR CONDITIONING UNITS

Not used

3.08 SIGNS, NAMEPLATES AND OPERATION AND EMERGENCY SHUTDOWN INSTRUCTIONS

- A. Signs, nameplates, and operation and emergency shutdown instructions for refrigeration systems shall comply with the following (per Section MC 1101.11):
1. Sections 9.15, 11.2.1, 11.2.2 and 11.7 of ASHRAE 15-10 as identified below.
 2. Each refrigeration unit or system shall be provided with a nameplate indicating the "rated" horsepower of the prime mover or compressor and the equivalent of such horsepower in kilowatts.
 3. MC 1105.11 which states that emergency signs shall comply with the following:
 - a. Refrigeration units or systems having a refrigerant circuit containing more than 220 pounds of Group A1 or 30 pounds of any other group refrigerant shall be provided with approved emergency signs, charts, and labels in accordance with NFPA 704.
- B. Per ASHRAE 15-10 Section 9.15: Nameplate: Each unit system and each separate condensing unit, compressor, or compressor unit sold for field assembly in a refrigerating system shall carry a nameplate marked with the manufacturer's name, nationally registered trademark or trade name, identification number, the design pressures, and the refrigerant for which it is designed by the refrigerant number (R number as shown in Table 1 or Table 2 of ASHRAE 34-10).
- C. Per ASHRAE 15-10 Section 11.2.1:
11.2.1 Installation Identification: Each refrigerating system erected on the premises shall be provided with a legible permanent sign, securely attached and easily accessible, indicating (a) the name and address of the installer, (b) the refrigerant number and amount of refrigerant, (c) the lubricant identity and amount, and (d) the field test pressure applied.
- D. Per ASHRAE 15-10 Section 11.2.2:

11.2.2 Controls and Piping Identification: Systems containing more than 110 lb (50 kg) of refrigerant shall be provided with durable signs having letters not less than 0.5 in. in height designating: (a) valves or switches for controlling the refrigerant flow, the ventilation, and the refrigeration compressor(s), and (b) the kind of refrigerant or secondary coolant contained in exposed piping outside the machinery room. Valves or piping adjacent to valves shall be identified in accordance with ANSI A13.1, Scheme for Identification of Piping Systems.

E. Per ASHRAE 15-10 Section 11.7:

11.7 Responsibility for Operation and Emergency Shutdown: For a refrigerating system containing more than 55 lb (25 kg) of refrigerant, provide a schematic drawing or panel giving directions for the operation of the system at a location that is convenient to the operators of the equipment. Emergency shutdown procedures, including precautions to be observed in case of a breakdown or leak, shall be displayed on a conspicuous card located as near as possible to the refrigerant compressor. These precautions shall address (a) instructions for shutting down the system in case of emergency; (b) the name, address, and day and night telephone numbers for obtaining service; and (c) the names, addresses, and telephone numbers of all corporate, local, state, and federal agencies to be contacted as required in the event of a reportable incident.

END OF SECTION

LIST OF SUBMITTALS

<u>SUBMITTAL</u>	<u>DATE SUBMITTED</u>	<u>DATE APPROVED</u>
Product Data:	_____	_____
1. Manufacturers Product Data		
2. Installation Instructions		
3. Performance Data		
4. Start-up Instructions		
Shop Drawings:	_____	_____
1. Assembly-type		
2. Mounting Details		
3. Location		
4. Connection Details		
Wiring Diagrams:	_____	_____
1. Power Wiring		
2. Control Wiring		
Certificate:	_____	_____
1. Contractor's Start-Up and Demonstration Affidavit		
Maintenance Data:	_____	_____
1. Maintenance Manual		
Maintenance Material:	_____	_____
1. Spare Filters		
Warranty:	_____	_____

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NO TEXT