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| **EDIT NOTE: THIS SECTION IS FOR EXISTING CONSTRUCTION PROJECTS ONLY.** |

# **PART 1 – GENERAL**

**1.01 SUMMARY**

A. Section Includes: Floor and wall mounted heat pumps.

B. Related Requirements:

1. Division 01: General Requirements.
2. Division 26: Electrical.
3. Section 07 21 00: Thermal Insulation.
4. Section 22 10 00: Plumbing.
5. Section 23 05 00: Common Work Results for HVAC.
6. Section 23 05 13: Basic HVAC Materials and Methods.
7. Section 23 05 48: HVAC Sound, Vibration and Seismic Control.
8. Section 23 09 00: HVAC Instrumentation and Controls.
9. Section 23 09 23: Environmental Control and Energy Management Systems.
10. Section 23 20 13: Above Ground HVAC Piping.
11. Section 23 20 16: Underground HVAC Piping.
12. Section 23 30 00: Air Distribution.

**1.02 SUBMITTALS**

A. Provide in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

**1.03 QUALITY ASSURANCE**

A. Design, construction, testing and installation shall comply with the following standards as applicable:

1. UL or ETL.

2. ANSI/AHRI Standard 390.

3. ASHRAE/IESNA 90.1.

**1.04 OPERATION AND MAINTENANCE INSTRUCTIONS**

A. Provide Owner instructions on equipment operation and maintenance procedures, as indicated in Section 23 05 00: Common Work Results for HVAC.

**1.05 WARRANTY**

A. Compressors shall carry unconditional five-year warranty.

**PART 2 – PRODUCTS**

**2.01 EQUIPMENT**

A. Capacities of heat pumps as indicated on Drawings are net capacities actually required. Standard catalog ratings shall be adjusted to actual Project site environmental conditions.

**2.02 FLOOR MOUNTED HEAT PUMPS**

A. Low noise, high efficiency, single packaged, indoor, floor mounted heat pump unit, Airedale, or equal.

1. Sound Level: The unit shall operate at full load conditions with a maximum sound level of 45 dBA measured at five feet in front of the unit and five feet above the floor.
2. Energy Efficiency:
   1. Units less than 65,000 Btu/h: Minimum 13 SEER.
   2. Units greater than or equal to 65,000 Btu/h and less than 135,000 Btu/h: Minimum 11.2 EER.
   3. Units greater than or equal to 135,000 Btu/h and less than 240,000 Btu/h: Minimum 11.0 EER
   4. Units greater than or equal to 240,000 Btu/h and less than 760,000 Btu/h: Minimum 10 EER
   5. Units greater than or equal to 760,000: Minimum 9.7 EER.
3. Refrigerant: R-410A.

B. Cabinet:

1. Cabinet shall be constructed from galvanized sheet steel. After assembly cabinet shall be degreased and coated with a dry powder, epoxy resin paint, baked after application. Paint finish shall be easily cleanable and hard wearing to give maximum protection.
2. Cabinet shall be insulated with acoustic foam insulation containing no fibrous materials. Foam insulation shall have a fire rating of UL 94 HF-1.

3. The front of the unit shall contain a low-level return air grille integral to the front of the doors and a sound attenuating inlet plenum. Doors shall be hinged with a spring-loaded pin to allow for easy removal if required. Doors shall be secured with a key lock.

4. The rear of the unit shall allow for high sill outside air discharge (up to 38 inches). A condensate connection stub shall also be provided internally at the rear of the unit for connection to the field installed building condensate drain.

5. A vibration absorbing rubber mat shall be provided with each unit sized to fit exactly underneath the unit cabinet.

C. Evaporator Fan: The indoor fan assembly shall consist of two blowers and one common shafted electronically commutated motor (ECM). The ECM motor shall have a wide range of programmable speed and torque characteristics for ultra high efficiency and low audible noise. The ECM motor shall also be fully programmed to compensate for a wide variety of static pressures as well as lack of maintenance (dirty air filters).

D. Condenser Fan: The outdoor fan assembly shall consist of two backward curved plug fans with centrifugal blower wheels. The fans and fan motor shall be mounted on a fan board. The fan board shall be easily removable from the front of the cabinet so as to allow quick replacement of the entire assembly. The fan board shall be rubber mounted to the cabinet.

E. Compressor: The refrigeration system shall contain a two stage hermetic scroll compressor equipped with a crankcase heater to guard against liquid floodback conditions and the elimination of oil foaming upon start up. The compressor shall contain an internal unloading mechanism, providing capacity control and enabling part load efficiencies to be increased. An internal overload protector shall protect the compressor against excessive motor temperatures and currents. The compressor shall also be mounted on vibration absorbers for quiet operation and be fully encased in a precisely fitted, sand filled acoustic cover. The cover shall feature fasteners so as to permit easy removal for compressor servicing.

F. Evaporator: Quick draining, hydrophilic fin, evaporator coils of non-ferrous construction with enhanced louvered aluminum fins mechanically bonded to grooved copper tubes, and factory tested.

G. Condenser: The unit shall contain an enhanced, high efficiency, cross-rifle tube condenser coil. Coils shall be of non-ferrous construction with enhanced louvered aluminum fins mechanically bonded to grooved copper tubes, and factory tested.

H. Drain Pans: Non-corrosive drain pans sloped for positive drainage at both indoor and outdoor coils.

I. Expansion Valves: Thermostatic Expansion Valves with removable power head.

J. Refrigerant Filters: Bi-flow filter drier.

K. Air Filters: 2-inch disposable filters of MERV 13 efficiency with a separate filter access door.

L. Outdoor Air Intake: Shall have outside air make-up for ventilation mixed with return air, filtered through the same filter, prior to passing through evaporator coil. The outside air shall not by-pass evaporator. Outside air ventilation damper shall automatically adjust to set OSA CFM during any operation mode, ventilation, 1st stage or 2nd stage, and fully close during unoccupied modes.

M. Economizer: Each unit shall be fitted with a spring return modulating damper that acts to mix the outdoor air with the return air. The damper shall have the capability of permitting only the outside air into the space, or recycling the return air and allowing only a minimum of outside air to enter the space. Full modulation allowing any mixture of outside air and return air shall be possible. A minimum damper position setting shall also be possible to continuously maintain outside air ventilation requirements dependent on control via the unit’s microprocessor controller.

N. Powered Exhaust: Powered exhaust shall be integral to the unit to prevent over pressurization of the space with the exhaust fan capable of exhausting 100 percent of room air.

O. Controls: Unit shall be fitted with a programmable microprocessor controller mounted outside the air stream and specifically designed to operate the unit in an energy efficient manner using pre-engineered control strategies. The microprocessor shall determine mode of operation based on the return air, supply air, and ambient air temperatures. The microprocessor controller shall be capable of managing the unit in each of the following modes of operation:

1. Cooling Operation:

a. Stage One Cooling: 67 percent capacity compressor, low speed fan.

b. Stage Two Cooling: 100 percent capacity compressor, low speed fan.

c. Stage Three Cooling: 100 percent capacity compressor, high speed fan.

2. Heating Operation:

1. Stage One Heating: 67 percent capacity compressor, low speed supply fan.
2. Stage Two Heating: 100 percent capacity compressor, high speed supply fan.

3. The microprocessor controller shall also modify the minimum damper position to compensate for mode of operation and fan speed.

P. Disconnect Switch: The unit shall be fitted with a power disconnect switch located on the control panel and sized for the full load amperage of the unit. In the off position the switch can be locked out. The handle for the disconnect switch shall be flush mounted on the control panel lid.

Q. Thermostat: A temperature sensor and set point adjustment module with occupied override button shall be mounted either internally or externally on the unit.

R. Timer: A rotary dial time clock allowing up to six hours occupied operation shall be mounted on the front door of the unit.

S. Electrical: 480V 3 phase, 208-230V 3 phase, or 208-230V 1 phase as indicated on the drawings. Contractor shall verify available power on site before ordering equipment.

T. Mounting: Manufacturer shall provide DSA approved mounting details and hardware.

U. Factory Testing: Every unit shall be factory run tested and certified as being successfully tested before shipping.

V. Start-up and Training: Provide start-up and customer training for the supplied equipment. Start-up will be coordinated with the local representative.

W. Accessories:

1. Duct Shroud: The 26-inch or 38-inch three sided duct shroud shall be painted to match the unit and shall extend from the top of the unit through the ceiling. The shroud shall be trimmed in the field by the mechanical contractor to suit the ceiling height.

2. Acoustic Plenum: A plenum/box with top discharge shall be mounted on top of the unit. The plenum shall be lined with acoustic foam to minimize noise levels. The plenum shall be available in heights from 24 inches to 30 inches in 2-inch increments. The plenum shall be field mounted, provide all required hardware.

3. Outdoor Coil Filter: A wire framed synthetic filter shall be fitted across the inlet of the outdoor coils. This shall be reusable and may be vacuum cleaned.

4. Outdoor Louver: Provide outdoor louver when indicated on the drawings. Louver shall be suitable for masonry, glass, or panel wall construction. The louvers shall be provided available in the following materials and may be flanged or recessed style with bird screens. Verify with Architect for specific requirements:

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| **EDIT NOTE: SELECT OUTDOOR LOUVER STYLE AND FINISH FROM OPTIONS PRESENTED BELOW:** |

1. Style: [Flanged] [recessed].
2. Finish: [Aluminum with clear anodized finish].

[Aluminum with bronze anodized finish].

[Aluminum with baked enamel finish, color as selected by Architect].

[Unpainted galvanized steel].

5. Wall Sleeve: Wall sleeve shall be constructed from galvanized steel. An interior separator plate running the entire length of the sleeve shall separate the fresh air inlet from the exhaust air. The sleeve shall be provided by manufacturer and insulated by the installing contractor with foil back insulation.

**2.03 WALL MOUNTED HEAT PUMPS**

A. Low noise, high efficiency, single packaged, outdoor, wall mounted heat pump unit, Bard, or equal.

1. Sound Level: The system, including acoustical supply and return plenums, shall operate in an unoccupied room at a sound level of 45 dBA at a distance of five feet in front of unit and five above the floor.

2. Energy Efficiency:

1. Units less than 65,000 Btu/h: Minimum 13 SEER.
2. Units greater or equal to 65,000 Btu/h and less than 135,000 Btu/h: Minimum 11.2 EER.
3. Units greater or equal to 135,000 Btu/h and less than 240,000 Btu/h: Minimum 11.0 EER
4. Units greater or equal to 240,000 Btu/h and less than 760,000 Btu/h: Minimum 10 EER
5. Units greater or equal to 760,000: Minimum 9.7 EER.

3. Refrigerant: R-410A.

B. Cabinet: **Galvanized 20 gage zinc coated steel** with minimum 14 gage steel frame**.** Cabinet shall be cleaned, rinsed, sealed, dried and primed with polyurethane primer and finished with a baked on textured enamel. Cabinet shall withstand 1000 hours of salt spray tests per ASTM B117. Provide front or top supply air discharge as indicated on the drawings.

C. Evaporator Fan: Forward curved centrifugal twin blower wheels with a high efficiency ECM direct drive, variable speed motor. Motor shall have permanently lubricated bearings.

D. Condenser Fan: Propeller fan with single speed motor. The outdoor motor and shroud assembly shall slide out for easy access.

E. Compressor: Hermetically sealed two stage scroll compressor mounted on isolation rails with double grommets and an insulated sound cover. The two stage compressors cooling/heating system shall be capable of changing stages while running without shutting the compressor off. The compressor shall include built-in thermal and current overload protection. A current sensing relay shall be included to detect high compressor amps due to low voltage and high ambient temperatures, and drop compressor to first stage keeping the compressor on-line until the low voltage condition is corrected. Three phase units shall be provided with a built-in phase monitor device to prevent reverse rotation of scroll compressor motor.

F. Evaporator: Coils shall be of non-ferrous construction with enhanced louvered aluminum fins mechanically bonded to grooved copper tubes, and factory tested.

G. Condenser: Coils shall be of non-ferrous construction with enhanced louvered aluminum fins mechanically bonded to grooved copper tubes, and factory tested. The outdoor coil shall be draw through and discharge horizontally out both sides of the unit.

H. Drain Pans: Stainless steel drain pans sloped for positive drainage at both indoor and outdoor coils.

I. Expansion Valves: Thermostatic Expansion Valves with fixed power head.

J. Refrigerant Filters: Bi-flow filter drier.

K. Filters: 2-inch disposable filters of MERV 13 efficiency with a separate filter access door.

L. Outdoor Air Intake: Shall have outside air make-up for ventilation mixed with return air, filtered through the same filter, prior to passing through evaporator coil. The outside air shall not by-pass evaporator. Outside air ventilation damper shall automatically adjust to set OSA CFM during any operation mode, ventilation, first stage or second stage, and fully close during unoccupied modes. OSA shall be factory set for 450 CFM.

M. Safety Controls: High and Low pressure switches shall be provided with a built in lock out circuit that resets from the room thermostat. The controls shall include a low pressure bypass time delay to prevent nuisance tripping of the low pressure control.

N. Operating Controls: Shall have controls to automatically operate the mechanical equipment through the heating or cooling and ventilating cycles as required.

O. Electrical Power: 480V 3 phase, 208-230V 3 phase, or 208-230V 1 phase as indicated on the drawings. Contractor shall verify available power on site before ordering equipment.

P. Mounting: As indicated in the drawings.

Q. Factory Testing: Every unit shall be factory run tested and certified as being successfully tested before shipping.

R. Accessories: Provide the following accessories:

1. Indoor supply and return air acoustical plenums.

2. Exterior sound isolation curb.

3. Expanded metal mesh outdoor coil guard, minimum 13 gage.

**PART 3 – EXECUTION**

**3.01 GENERAL**

A. Examine areas under which Work of this Section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

**3.02 EQUIPMENT FOUNDATIONS**

A. Provide foundations (housekeeping pads, level platforms or curbs) for mechanical equipment whether indicated on drawings or not. Equipment foundations shall be of sufficient size and weight, and of proper design to preclude shifting of equipment under operating conditions, or under any abnormal conditions imposed upon equipment.

B. Foundations shall meet requirements of equipment manufacturer and, when required by Architect, obtain from equipment manufacturer, approval of foundation design and construction, for equipment to be installed. Equipment vibration shall be maintained within design limits, and shall be dampened and isolated. Isolators shall be bolted to a structural member so as to be readily removable.

**3.03 EQUIPMENT DESIGN AND INSTALLATION**

A. Uniformity: Unless otherwise specified, equipment of same type or classification shall be product of same manufacturer.

B. Application: Only provide equipment as reviewed by Architect.

C. Equipment Installation: Equipment installation shall be in strict accordance with these Specifications, and installation instructions of manufacturers. Equipment installed on concrete foundations shall be grouted before piping is installed. Piping shall be installed in such a manner as not to place a strain on any of equipment. Flanged joints shall be adequately extended before installation. Piping shall be graded, anchored, guided and supported, without low pockets.

1. Install equipment in a neat and skillful manner, properly aligned, leveled, and adjusted for satisfactory operation.

2. Install so connecting and disconnecting of piping and accessories can be readily accomplished, parts are readily accessible for inspection, service and repair. Space shall be provided to readily remove filters, coils, compressors and fan wheels. Access doors shall be hinged with cam lock door handles.

3. Provide flexible connections for duct, pipe and conduit connections at moving equipment.

**3.04 NOISE AND VIBRATION**

A. Operation of Equipment: Mechanical equipment and piping systems shall operate without exceeding specified noise and/or vibration levels.

B. Corrective Measures: If specified noise and/or vibration levels are exceeded, the installing HVAC contractor must provide necessary changes to reduce noise and/or vibration levels to within specified levels.

**3.05 FIELD TESTS AND INSPECTION**

A. General: Perform field inspections, field tests, and trial operations as specified in Section 23 0500: Common Work Results for HVAC. Provide labor, equipment and incidentals required for testing. The Project Inspector will witness field tests and trial operations as specified in Section 23 05 00: Common Work Results for HVAC.

B. Equipment and Material: Equipment and material certified as being successfully tested by manufacturer, in accordance with referenced Specifications and standards, will not require re-testing before installation. Equipment and materials not tested at place of manufacture will be tested before or after installation, as applicable or necessary, to determine compliance with reference Specifications and standards.

C. Extent of Field Tests: After installation and before completion, Work of this Section shall be subjected to required field tests, including those specified here and in Section 23 05 00: Common Work Results for HVAC.

1. TAB (Test and Balance) and sound level measurement according to SMACNA and ANSI Standard S12.6, respectively, will be performed by a District approved agency.  Noise level generated by the HVAC unit measured 5 feet from the unit shall not exceed 45 dBA.

D. Operation and Maintenance Data: Provide required operation and maintenance data as specified in Section 23 05 00: Common Work Results for HVAC.

**3.06 CONDENSATE DRAIN LINE PIPING**

A. Sleeve penetrations of floors, walls and ceiling to allow for free motion of piping. Provide type L copper pipe and 24 gage chrome-plated escutcheon plates. Pack annular space between pipe and sleeve with incombustible material such as fiberglass and seal each end with mastic to provide a waterproof seal.

**3.07 CLEANUP**

##### A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

**3.08 PROTECTION**

A. Protect Work of this Section until Substantial Completion.

END OF SECTION