**PRICE AW-A PACKAGED AIR HANDLING UNITS**

# Division 23 – Heating, Ventilating, and Air Conditioning

# Section 23 75 00 – Custom-Packaged Outdoor HVAC Equipment

**PART 1 – GENERAL**

* 1. **Section Includes:**
     1. Packaged Air Handling Units

# 1.02 Reference Standards

* + 1. All referenced standards and recommended practices in this section pertain to the most recent publication thereof, including all addenda and errata.
    2. ASHRAE Standard 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings.
    3. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
    4. NEMA MG 1 - Motors and Generators.
    5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
    6. CAN/ULC S102 - Standard Method of Test for Surface Burning Characteristics of building Materials and Assemblies.
    7. UL723 - Standard for Test for Surface Burning Characteristics of Building Materials.
    8. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
    9. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
    10. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
    11. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
    12. NFPA 70 - National Electrical Code.
    13. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.
    14. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

# Administrative Requirements

# Pre-installation Meeting: Contractor shall conduct a pre-installation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

# Sequencing: Contractor shall ensure that utility connections are achieved in an orderly and efficient manner.

# Submittals

* + 1. See Section 01 30 00 - Administrative Requirements for submittal procedures.
    2. Product Data:
       1. Provide data indicating dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.
       2. The performance schedule shall include the following information (**select all that apply**):
          1. Unit weight
          2. Heating capacity:

1. Delivery temperature
2. Temperature rise
3. Airflow
4. External static pressure.
   * + - 1. Electrical Characteristics:

Horsepower

Voltage

Maximum Overcurrent Protection (MOP), Minimum Circuit Ampacity (MCA) and Full Load Amperage (FLA)

* + - * 1. Cooling capacity:

Rated cooling output

Evaporator entering temperature (wet bulb and dry bulb)

Condenser ambient air temperature

Minimum efficiency ratio

* + - * 1. Evaporator Coil capacity
    1. Shop Drawings:
       1. Provide general layout drawings with plan and elevation views including relevant dimensions to include duct, piping, and electrical service connection locations for the following items:
          1. Provide roof curb mounting details.
          2. Provide electrical schematics including field wiring connections.
          3. Provide component details including construction method and materials.
    2. Sustainable Design Documentation:
       1. When applicable to job specification, submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

# 1.05 Quality Assurance

* + 1. Manufacturer Qualifications:
       1. The manufacturer shall be a company specializing in manufacturing the type of products specified in this section, with a minimum of 5 years of documented experience.
    2. The unit shall bear a certification label by ETL, UL, or CSA.

# 1.06 Inspection, Storage, and Rigging

* + 1. Inspection:
       1. The unit shall be inspected immediately upon delivery to ensure there is no apparent physical damage.
       2. Any damage claims should be filed immediately with the carrier.
       3. The manufacturer shall not assume responsibility for damage caused during shipment, handling, storage and rigging.
    2. Storage:
       1. Equipment shall be stored in the original factory shipping packaging away from construction areas where it will be safe from damage and protected from harmful weather conditions.
       2. Factory shipping packaging shall remain in place until unit is ready to be installed.
       3. The air handling unit is not to be used for temporary heating, cooling or ventilation during construction. Doing so will void the terms of the equipment warranty.
    3. Rigging:
       1. Follow manufacturer’s instructions for rigging and placement of equipment.

# 1.07 Coordination

* + 1. Coordinate all system connections and building penetrations including electrical and duct connections.
    2. Coordinate curb placement, structural and roofing.

# Regulatory Requirements

## The packaged air unit shall conform to NFPA 70, and requirements of authorities having jurisdiction.

# 1.09 Warranty

* + 1. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
    2. The manufacturer will provide a parts only warranty of 12-month from startup or 18-months from shipping, whichever comes first.

# PART 2 – PRODUCTS

**2.01 Packaged Air Handling Units**

* + 1. Basis of Design: Price Industries
       1. Packaged air handling units: AW-A
    2. General:
       1. Units supplied with an integral or split air cooled DX coil shall be built in accordance with Energy Efficiency Rating (EER), Coefficient of Performance (COP) within the requirements of ASHRAE 90.1 I-P
       2. Units shall be supplied with a single point power [dual point power] connection.

# 2.02 Cabinet

1. General:
2. The units casing shall be designed for sustainable developments with a long lasting service life. It shall:
   1. Include recycled and recyclable material.
   2. Be light in weight and high in strength.
   3. Support low energy loss.
   4. Be fire resistant.
   5. Have a high degree of UV reflectivity.
   6. Be resistant to corrosion.
   7. Be air tight.
   8. Be manufactured for low VOC production.
3. Cabinet Material:
4. The entire cabinet with the exception of hinges and hardware shall be constructed of marine grade aluminum.
5. The entire cabinet shall reduce galvanic corrosion within the system by:
   1. Minimizing the use of dissimilar metals.
   2. Ensuring anodic materials are larger in surface area than contacted cathodic materials.
6. Both external and internal steel supports are not permitted.
7. Cabinet Construction:
8. All areas of the unit in contact with treated air shall have double wall construction, with a marine grade aluminum liner.
9. The unit frame and panel components shall be constructed with a double thermal break. The balance to be at minimum a single thermal break.
10. The cabinet will be designed to minimize fastener penetration through the inner and outer wall. Through penetrations that cannot be eliminated shall be water sealed on the outer wall and vapor sealed on the inner wall.
11. The unit shall include an integral base constructed from marine grade aluminum and include lifting points.
12. [Optional] The unit will be designed with a sloped roof in the **[insert section(s)]** to prevent water pooling.
13. Finish
    1. All marine grade aluminum cabinet surfaces shall be unpainted.
14. Insulation:
    * + 1. The cabinet insulation shall have the following characteristics:
           1. The insulation R-value shall be a minimum of R14.
           2. The insulation shall have a flame spread and smoke development index of 0, when tested according to ASTM E84, CAN/ULC S102, and UL723.
           3. The insulation shall be chemically inert, water resistant, and shall not rot or sustain vermin.
           4. The insulation shall be corrosion resistant when tested according to ASTM C795 and ASTM C665
           5. The insulation shall not promote the growth of fungi or mildew, when tested according to ASTM C1338.
           6. The insulation shall display low moisture sorption when tested according to ASTM C1104.
           7. The insulation shall have a VOC content of 0, and shall be non-off-gassing.
           8. The insulation shall include recycled content.
15. Component Access:
    * + 1. Units shall be designed so that all components can easily be removed through access doors and removable panels, with the exception of heating components.
        2. Dismantling of the structural components of the unit shall not be required for component service or replacement with the exception of heating components.
        3. All access doors and removable panels on the air handling section shall be gasketed and close against positive pressure.
           1. [Optional] All access doors and removable panels will include a pressure relief latch.
16. Drain Pan:
    * + 1. The units shall be supplied with cleanable, positive draining, drain pan(s).
        2. The drain pan(s) shall be marine grade aluminum. Alternative materials shall not be acceptable in order to prevent the potential for galvanic corrosion.
        3. The drain pan(s) shall be designed as necessary to prevent carryover of water droplets beyond the drain pan to 0.0044 oz/ft2 (1.5 mL/m2) of face area per hour under peak sensible and peak dew-point conditions, accounting for both latent load and a coil face velocity 20% above the design velocity.
17. Hardware:
    * + 1. All hardware, hinges, handles and fasteners shall be non-corrosive.
        2. All external hardware, handles and fasteners, shall be non-corrosive [aluminum], [300 series stainless steel] or [plastic].
        3. All internal fasteners used on insulated panels shall be non-corrosive [aluminum] or [300 series stainless steel].
18. Electrical Panels:
    1. All electrical panels located in the air handler shall have sealed and insulated doors.

# 2.04 Fans

* + 1. Fan Construction:
       1. The fans shall be direct drive plenum fans with variable frequency drives.
       2. The fans shall be statically and dynamically balanced.
       3. The fan and motor assembly shall be mounted on common base with (**select one**):
          1. Rubber in shear (RIS) isolation;
          2. [one-inch] or [two-inch] deflection spring isolation;
          3. [one-inch] or [two-inch] deflection seismic rated spring isolation.
       4. The fan shall be connected to fan bulkhead by a canvas type flex connector.
    2. Fan Motor:
       1. Fan motors shall be (**select one**):
          1. NEMA rated high efficiency Open Drip Proof (OPD) type.
          2. NEMA rated high efficiency Totally Enclosed Fan Cooled (TEFC) type.
       2. The motor electrical requirement shall be as specified in the plans and drawings.
       3. [Optional] Motors shall include extended lubrication lines piped for access from the side of the unit.
       4. [Optional] The motor shall be provided with a shaft grounding ring.

# 2.05 Electrical

* + 1. Disconnect:
       1. The unit shall be supplied with a disconnect (**select all that apply**):
          1. [Through-the-door] or [external] type switch;
          2. [Non-fused] or [fused];
          3. [NEMA 3R] or [NEMA 4X] or [NEMA 12] rated;
          4. Disconnect to be field supplied and installed by others.
    2. Control Enclosure:
       1. All electrical components shall be enclosed within a [NEMA 3R] or [NEMA 4X] enclosure.
    3. Electrical Panel:
       1. The unit electrical panel shall contain the following components:
          1. Motor starters/protectors;
          2. Motor contactors;
          3. Control transformers;
          4. Control circuit fuses;
          5. Terminal block for factory mounted controls.
       2. [Optional] Low temperature cabinet heater(s) shall be provided for each panel containing unit mounted controls and/or variable frequency drive(s) to prevent condensation during winter months..
       3. The wiring and controls shall be factory tested prior to shipment.
       4. The unit electrical panel shall include (**optional**):
          1. Industrial control wiring with numbered and color-coded wiring run in Panduit.
          2. High and low voltage wiring shall be provided on separate panels.

# 2.06 Controls

* + 1. Factory Installed Controls:
       1. The factory installed controls shall be located in the integral controls cabinet with a hinged access door.
       2. All controls shall operate off a transformer from the main power supply for single point power connection.
       3. The unit controller shall operate all unit components.
       4. Operator controls shall include unit on-off switch, summer - winter (heat enabled) switch and supply air temperature set point adjustment.
       5. The unit shall be pre-wired for field connection of power supply.
    2. Air Temperature Sensor:
       1. The unit shall be provided with a factory mounted supply air temperature sensor in the discharge of the supply air fan.
       2. [Optional] Provide room reset via a remote temperature sensor that is factory supplied for field installation.
       3. [Optional] A remote control panel shall be supplied for field installation and shall include (**select all that apply**):
          1. On-off switch;
          2. Summer-winter switch;
          3. Heat-Off-Cool switch;
          4. Indicating lights for (**select all that apply**):

Supply fan;

Exhaust fan;

Heat operation;

Blower operation;

Heat fail;

Lockout indication;

Clogged filter indication.

* + 1. Variable Frequency Drive (**select all that apply**):
       1. The fan motor shall be provided with variable frequency drive (VFD) control:
          1. VFD control shall be provided [with] or [without] manual bypass;
          2. VFD control shall be [with] or [without] [input; or output] line reactors;
          3. VFD(s) to be provided for (**select one**):

VAV control;

Building static control;

CAV control;

Final balancing;

Filter-loading-offset.

* + 1. Control Accessories (**select all that apply**):
       1. Interlocks: Unit to start when the exhaust fan is running; or Unit will start and allow a 3 minute delay for the exhaust fan to turn on].
       2. Timer
       3. Manual Reset Low and High Limit Controls: Maintain supply air temperature between set points.
       4. Door kill switches shall be provided on [fan access doors] or [all access doors].
       5. Marine service lights shall be provided in each accessible section.
       6. Service outlet [GFI type] or [duplex type] shall be provided.
       7. Power supply for service lights and/or outlets shall be provided [by others]; or [from the factory installed transformer].
       8. Phase monitor.

# 2.07 Refrigeration Package

* + 1. Integral DX Cooling System:
       1. The unit shall include an integral DX cooling system including cooling coil, condensing section, and compressors where indicated on the plans.
       2. The DX coil(s) shall:
  1. Be of non-corrosive aluminum fin, non-corrosive aluminum frame, and copper tube construction.
  2. Be mounted over a non-corrosive, non-cathodic, marine grade aluminum double sloped drain pan.
     + 1. The unit shall include a controller with the capability of remote connectivity to a virtual network interface, and with remote diagnostic capabilities.
          1. Temperature sensors shall be provided on all:

Liquid line(s);

Suction line(s);

Compressor(s)

* + - * 1. Sensors shall be provided for head and suction pressure.
        2. The controller shall be capable of providing all normal refrigeration operating parameters without the connection of service manifolds or supplementary temperature measurement devices.
        3. The manufacturers shall be capable of providing a cellular modem to service personnel when servicing units without connectivity.
      1. The condensing section shall include:
         1. A low noise, high efficiency condenser fan assembly.
         2. Direct drive condensing fan motor(s) that are rated for 158°F/70°C operation.
      2. The unit shall also include:
         1. Scroll compressors.
         2. Filter driers.
         3. Electronic expansion valves.
      3. Unit shall be factory charged with refrigerant and include all necessary controls and safeties for standalone operation. Split units will disassembled after testing.
      4. The condenser coils shall be of non-corrosive aluminum fins, non-corrosive aluminum frame and copper tube construction with low fins per inch to reduce external coil contamination.
      5. Each unit shall have heavy-duty scroll compressor(s).
         1. The compressors shall be isolated with resilient neoprene rubber isolators to decrease noise transmission.
         2. Each compressor shall be supplied complete with:

High and low pressure protection;

Motor overload protection;

[Optional] Crankcase heater

* + - 1. To maintain desired temperature control, the unit shall have standard:
         1. A minimum two stages of capacity control [when providing 8 to 12 tons of cooling capacity]
         2. A minimum four stages of capacity control [when providing 14 or more tons of cooling capacity]
         3. [Optional] Full variable capacity control [when providing 8 or more tons of cooling capacity]
      2. Refrigeration capacity control shall be accomplished by (**select one**):
         1. Staging of the unit’s multiple compressors;
         2. Full modulation of the unit’s digital scroll compressor(s) through **(select one):**

Cascading control with one digital circuit combined with one or more fixed circuits.

Parallel control with all circuits being digital.

* + - 1. All compressor capacity control staging shall be controlled by the factory installed main unit control system.
      2. [Optional] The modulating hot gas reheat shall be provided complete with modulating valves, reheat coil and low dew point capabilities for dehumidification control.
      3. [Optional] The unit will operate low ambient conditions, at temperatures down to 45°F/ 7.2°C.
      4. [Optional] The unit will operate under extreme low ambient conditions, at temperatures down to -40°F/ -40°C.
      5. [Optional] The unit can supply air with dew points down to 42°F/ 5.5°C
      6. [Optional] The unit shall operate in outdoor ambient temperatures up to 105°F/ 40°C
      7. [Optional] The unit shall have a hot gas bypass system for use in variable air volume applications. **(select all that apply)**
         1. The hot gas bypass control shall be factory installed on [a single] or [all] refrigerant circuit(s).
         2. The hot gas bypass control shall include a modulating hot gas bypass control valve, all associated piping, and shall be automatically operated by the unit’s control.
    1. Performance:
       1. The unit shall meet or exceed scheduled performance
    2. Refrigerant:
       1. The unit shall only use R-410A refrigerant.

# 2.08 Hydronic Package

* + 1. Chilled Water Coil:
       1. The unit shall include aluminum fin, aluminum frame, and copper tube type chilled water coil(s) as indicated on the plans.
       2. The chilled water coil(s) shall be mounted over a non-corrosive, non-cathodic, marine grade aluminum double sloped condensate pan.
       3. The chilled water coil(s) shall be certified per AHRI 410.
       4. [Optional] A piping vestibule shall be included.
    2. Hot Water Coil:
       1. The unit shall include aluminum fin, aluminum frame, and copper tube type hot water coil(s) as indicated on the plans.
       2. The chilled water coil(s) shall be certified per AHRI 410.
       3. [Optional] The hot water coil(s) shall be mounted over a non-corrosive, non-cathodic, marine grade aluminum drain pan with a drain.
       4. [Optional] A piping vestibule shall be included.

# 2.09 Roof Curb (optional)

* + 1. A roof curb shall be supplied knocked down and constructed with marine grade aluminum.
       1. The roof curb shall include a wood nailer strip and intermediate bracing as required.
       2. Cross braces shall be provided to support field supplied duct collar sleeves.

# PART 3 EXECUTION

**3.01 Installation**

* + 1. The make-up air unit shall be installed in accordance with the manufacturer's installation instructions, all applicable building codes, and in accordance with NFPA 90A; NFPA 90B.
    2. Refer to Section 22 05 48 for information regarding the installation of the make-up air unit with vibration isolators.
    3. Refer to Section 23 33 00 for information regarding flexible duct connections on the make-up air unit.

# Start-up Service

* + 1. Engage factory authorized service technician to start up and commission units.
    2. Provide start up report to owner.

# 3.03 Maintenance

* + 1. Refer to Section 01 70 00 - Execution and Closeout Requirements for additional requirements relating to maintenance service.
    2. A separate maintenance contract shall be provided for specified maintenance service.
    3. Service and maintenance of units shall be provided for one year from Date of Substantial Completion.
    4. Maintenance Materials:
       1. Furnish the following for the Owner's use for project maintenance:
          1. Extra filters of each type and size.