SECTION 23 62 13 – Packaged Air Cooled DX Air conditioning units

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
				2. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.
				3. Related Specifications Sections include but are not limited to the following:

Section 230513 Variable Frequency Drives

Section 230593 System TAB for HVAC

* + - 1. SUMMARY
				1. Perform all Work required to provide a fully packaged air-cooled, direct expansion (DX) air conditioning (AC) unit. The packaged AC unit shall perform to manufacturer’s product data, installation instructions, Start-up instructions and maintenance information indicated by all Specification Sections, and Contract Documents with supplementary items necessary for proper operation.
				2. Air-cooled AC unit shall consist of hermetic scroll compressor component utilizing HFC refrigerant, evaporator coil, air-cooled condenser coil, condenser fans, supply fan, vibration isolation assemblies, and microprocessor control center.
			2. REFERENCE STANDARDS
				1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
				2. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
				3. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

ARI - 1060 Rating Air-to-Air Energy Recovery Equipment.

ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.

ARI 340/360 - Commercial Unitary Air-Conditioning and Air-Source Heat Pump Equipment.

ARI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils.

ANSI/ASHRAE 15 - Safety Standard for Refrigeration Systems.

ASHRAE 90.1 - Energy Standard for Buildings Except Low High Rise Residential Buildings.

ASHRAE 52.2 - Method of Testing General Ventilation Air-Cleaning Devices Used for Removal Efficiency.

ANSI/AMCA Standard 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

AMCA Publication 211 - Certified Ratings Program - Product Rating Manual for Fan Air Performance.

AMCA Standard 300 - Reverberant Room Method for Sound Testing of Fans.

AMCA Publication 311 - Certified Ratings Program.

AMBA Method of Evaluating Load Ratings of Bearings ANSI-11.

ANSI/AMCA Standard 204 - Balance Quality and Vibration Levels for Fans.

ASTM B-117 - **Standard Practice for Operating Salt Spray (Fog) Apparatus.**

ANSI Z21.47 - Gas-Fired Central Furnaces.

ANSI/ASHRAE Standard 135 BacNet - A Data Communication Protocol for Building Automation and Control Network.

NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

* + - 1. QUALITY ASSURANCE
				1. The design of the unit shall be AGA and ARI certified as combination heating-cooling units for rooftop installation.
				2. Unit construction shall comply with ASHRAE 15 safety code, NEC, and
				UL applicable codes.
				3. Cooling capacity ratings shall be in accordance with ARI standard 210/240, most recent edition.
				4. In no case shall the air cooled packaged DX air conditioning unit selected have an EER or SEER (if cooling capacity is less than 65,000 Btu/hr) less than that specified in Table 6.8.1A of AHRAE 90.1.
				5. Insulation and adhesive shall meet NFPA 90A requirements.
			2. SUBMITTALS
				1. Product Data:

Provide literature that indicates dimensions, weight, loading, clearances, capacities, gauges, thickness, and finishes of materials, electrical characteristics and connections.

Rigging, installation, testing, Start-up and operating instructions, maintenance data including type and quantity of oil and refrigerant change (pounds), parts lists, and troubleshooting guide.

Data on energy input versus cooling load output from 100 percent to 20 percent of full load with constant entering condenser air temperature.

Information about control and wiring diagrams.

Product test data on sound power levels for both fan inlet and outlet at the rated design capacity.

Operating data such as fans speeds, compressor LRA and RA, sound levels

Product data on special condenser coating.

Product data on all condenser fan accessories such as controls.

* + - 1. DELIVERY, STORAGE and HANDLING
				1. Deliver, store, protect and handle products to the Project Site under provisions of Division 01 and Division 20.
				2. Accept products on Site in factory-fabricated protective containers or coverings, with factory-installed shipping skids and lifting lugs. Inspect for damage.
				3. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.
				4. Check and maintain equipment on monthly basis to ensure equipment is being stored in accordance with manufacturer’s recommended practices. Storage record shall be maintained that indicates above requirements have been met.
			2. extra materials
				1. Provide an additional replacement set of 2-inch thick pleated filters arranged for approximate filter face velocity of 300 feet per minute (fpm); maximum 350 fpm.
			3. WARRANTY

A. Units shall be furnished with full coverage warranty against defects in materials. Warranty on the complete unit shall be for one year from the Substantial Completion date. On the compressors, warranty shall be for five (5) years from the Substantial Completion date.

1. PRODUCTS
	* + 1. GENERAL
				1. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
				2. Factory assembled air-cooled packaged DX air conditioning unit using a refrigerant charge (HFC) with the following construction:

Double wall G90 galvanized cabinet.

Factory control and electrical wiring and piping shall be contained within the unit cabinet.

Double wall access doors with stainless hinges and zinc cast lockable handles.

Compressors and unit controls contained within single isolated compartment.

Scroll compressors installed on sheet metal deck with rubber isolation mounts for quiet efficient operation.

Compressor isolation valves.

DX coil(s).

Condenser coil(s) with protective coating on fins.

Stainless steel gas heat exchanger.

 Stainless steel evaporator coil support.

Direct drive blower plenum fan(s) with variable frequency drive (VFD).

Stainless steel drain pan.

Blower motor(s) installed on rubber isolation mounts for quiet efficient operation.

Direct drive condenser fan(s).

Bottom access return and supply air.

Air filters with multiple options, efficiencies and monitoring devices.

Roof sloped for proper drainage.

Single point power connection.

Thermostatic expansion valves on DX coils.

Manual reset high pressure cutoffs.

Automatic reset low pressure cutoffs.

Run test report, wiring diagram, installation manual and Start-up form in control access compartment.

GFI convenience outlets.

Weather-resistant finish paint coating which passes 2,000 hour salt spray test.

* + - * 1. Optional equipment as indicated on the Drawings:

Power return axial fan and economizer.

Power exhaust with plenum fan, and energy recovery wheel.

Smoke detectors in return and/or supply air.

Phase and brown-out protection.

Disconnect switch.

Horizontal supply and return air curb.

Humidity control.

* + - * 1. Compressor shall have load capacity ratings per the requirements ARI 210/240.
				2. Unit efficiency shall be in compliance with the requirements of the International Energy Conservation Code AHSRAE 90.
			1. manufacturers
				1. Equipment Procurement Procedure.
			2. CABINET AND INSULATION
				1. The double wall cabinet housing shall be constructed of heavy gauge galvanized steel framework covered with galvanized steel sheet casing. Casing metal shall be finished with weather-resistant finish paint.
				2. Provide stainless steel lifting lugs to allow placement of the unit using a crane and sling.
				3. The double wall weatherproof cabinet of the indoor air section shall be suitably insulated, and have thermal breaks to prevent condensation on any cabinet surface exposed to outside atmosphere conditions.
				4. If the unit is not placed on a roof, make provisions to elevate and support the unit off the ground or grade level to protect unit from standing in water.
			3. COMPRESSORS
				1. Each scroll compressor shall be fitted with crankcase heater, vibration isolators, refrigerant dryer, external connections for external oil level control if multiple compressors are required, motor winding protection, high and low pressure cutouts, plus any other protective or operating device or fitting required and provided as standard by the compressor manufacturer. Compressors shall be designed for continuous or cycling operation at the specified design conditions without detrimental effect.
			4. FANS, MOTORS, AND DRIVES
				1. Indoor airflow and external static pressure capabilities shall be no less than the values indicated on the Drawings. Internal static pressure shall include a minimum allowance for 2-inch pleated type filters.
				2. All fan(s) and motor(s) shall be in compliance with the fan power limitation in Table 6.5.3.1 of ASHRAE 90.1
				3. Outdoor fans shall be direct drive, shaft mounted propeller type, statically and dynamically balanced. Outdoor fan motor(s) shall be TEFC weather resistant with permanently lubricated bearings.
				4. Indoor fans shall be direct drive, shaft mounted centrifugal type, statically and dynamically balanced. Indoor fan motor(s) shall be TEFC with sealed lubricated bearings.
			5. AIR FILTERS
				1. Front frame loaded filters shall be easily accessible for removal through access panels or doors.
				2. Filters shall be MERV 8 efficiency in accordance with ASHRAE Standard 52.2. Furnish additional filter casings and filters per the Drawings.
			6. COILS AND CAPACITY CONTROL
				1. Coils shall be standard construction copper tubes with aluminum fins. All copper work shall be brazed. Coils shall be factory pressure tested.
				2. Indoor coils shall be capable of the performance indicated on the Drawings with no “blow-off” of condensate.
				3. Indoor coils shall be equipped with a sloped, corrosion resistant condensate pan terminating at a condensate drain located outside the unit cabinet.
				4. Units smaller than 7.5 tons nominal capacity shall not be required to have part-load refrigeration capability. Each unit of 7.5 to 18 tons refrigeration capacity shall have minimum two (2) stages of cooling.
				5. The refrigeration system shall be equipped with filter dryers on the liquid lines and service valves with gauge port connections on the discharge and suction lines.
				6. UV lighting shall be located on the downstream airside of the cooling coil. UV light density shall have the intensity to preclude algae growth in the drip pan and dirt build-up on coil tubes and fins.
			7. GAS HEAT EXCHANGER
				1. Units shall be equipped with a natural gas burning heat exchanger of corrosion resistant components to provide efficient heating operation. Burner shall be designed for natural gas supply at seven (7) inches water column manifold pressure.
				2. Burner shall be equipped with electronic or spark ignition, flame sensor, manual shut-off, and A.G.A. approved controls.
				3. The induced draft blower shall pre-purge and shall be provided with a proving switch to prevent burner operation if blower is not in operation.
				4. Units with a heating input rating in excess of 150,000 BTUH shall be equipped with gas valves with minimum two-stages of capacity.
				5. A.G.A. thermal efficiency for the heat exchanger shall minimum 80 percent.
				6. Limit switch shall shutdown the burner in case operating controls fail.
			8. ELECTRICAL REQUIREMENTS
				1. The unit shall be designed for the electrical service designated on the Drawings.
				2. Arrange electrical cabinet for connecting electrical service at one point only.
				3. Power and control wiring of the unit shall be factory installed complete within the unit. Provide correctly identified suitable lugs and terminal strips for field connection to electrical power and external controls.
				4. Factory equip unit with motor starters for each of the motor driven components.
			9. CONTROLS
				1. Integral Unit Controls: As a minimum, the packaged AC unit’s components shall be protected with high pressure-stat, loss-of-charge protection, current and temperature sensitive overload devices, and anti-short cycle timer control circuit to prevent the compressor from restarting for five (5) minutes after stopping.
				2. The microprocessor controller provided by the equipment manufacturer shall be capable of receiving signals from a variety of control sources, which are not mutually exclusive.

The controller shall interface with the building automation system (BAS) via the BACNet interface panel.

All variables listed in the points list shall be passed to the BAS via the BACnet gateway.

Application specific controllers (ASC) shall communicate using BACNet.

 BACnet controllers shall conform to ASHRAE Standard 135 and communicate to a TCP/IP Ethernet physical layer.

* + - * 1. Equipment manufacturer shall include on-site programming assistance to both the Owner and BAS Provider to:

Assure that data from their respective interface is available.

Assist the BAS Provider to establish proper communication.

Confirm that the interface and controller are operating in accordance with sequence of operation.

Provide software or hardware tools as required to operate and checkout the controller interface.

* + - * 1. Insulate all surfaces expected to be at or below a dew point temperature of 87 degrees F to prevent condensation.
			1. ACCESSORIES
				1. Roof Curb:

Furnish one complete roof curb for each packaged unit, designed for weatherproof installation. Curb shall be furnished approved by unit manufacturer.

Supply and return ducts shall connect through the curbed opening with flexible connections to the bottom of the A/C unit, unless shown otherwise on the Drawings.

Curb shall comply with National Roofing Contractors Association requirements.

Slope of roof curb shall match roof slope to provide for level support of packaged unit.

Contractor shall be responsible for coordination of curb, supply and return ducts, and weatherproofing of the entire installation.

* + - * 1. On units of nominal cooling capacity 15 tons and higher, supply and install a 14-inch minimum height vibration isolation roof curb fabricated to the National Roofing Contractor’s Association. The curb shall be fabricated of aluminum upper and lower sections incorporating vibration isolation springs with a minimum of 1-inch deflection. Provide a continuous weather resistant skirt or seal to cover the spring assembly.
				2. Outside air intake assembly, including low-leak dampers, weather hood, and motorized open/closed actuators.
				3. Where applicable per AHSRAE 90.1 (Climate Zones), units shall be equipped with economizers as specified on the Drawings. Economizers shall include a fully modulating 100 percent outside air damper that is mechanically interlocked with a return air damper.

Where designated on the Drawings, units shall be equipped with a powered exhaust fan and necessary controls to prevent pressurization of the building during economizer operation.

* + - 1. [ENERGY RECOVERY MODULE OPTION]
				1. The packaged unit shall be equipped with a total energy recovery wheel as indicated on the Drawings. The wheel shall either be installed internal to the housing of the unit or shall be installed in a housing of similar construction to the unit and attached to the unit in the field.
				2. Where provided as a separate field-installed unit, the casing shall be fabricated of galvanized steel and lined with a minimum of ½-inch thick insulation.
				3. Protect the outdoor air intake opening with a sheet metal weather hood equipped with insect screen and a stainless steel automatic isolation damper actuated with electric motor. Protect the exhaust air discharge with a stainless steel isolation damper and weather hood with bird screen.
				4. The supply air inlet and exhaust air outlet shall not be located on the same side or in close proximity of each other or in close proximity with another module.
				5. Provide access to components via doors or removable panels.
				6. Blower fan(s) shall be centrifugal type. Fans shall be driven by variable speed direct drive motors (preferred) or by motors using belts and sheaves.
				7. [Optional: The module shall be equipped with both outside air and exhaust air filters to protect the energy wheel from contamination by dust and debris.]
				8. Energy recovery wheel performance shall be certified in accordance with ARI-1060 Rating Air-to-Air Energy Recovery Equipment.
				9. Rotating wheels shall have aluminum or galvanized steel frame containing porous heat exchanging media. The wheel shall be equipped with adjustable seals around the perimeter to minimize cross flow of air.
				10. Wheels shall be equipped with permanently lubricated bearings and fractional horsepower A.C. drive motors with drive belts.
				11. Total energy recovery rotor:

Capable of transferring both sensible and latent energy between two air streams.

The porous structure of the wheel shall contain a desiccant material to provide for the latent transfer of energy between airstreams.

Total energy recovery wheels shall have a sensible effectiveness not less than 70 percent and a latent effectiveness not less than 50 percent when measured with equal supply and exhaust air flow.

* + - * 1. Sensible energy recovery rotor:

Capable of transfer of sensible energy only between the two air streams.

Sensible energy recovery wheels shall have a sensible effectiveness not less than 70 percent when measured with equal supply and exhaust airflow.

1. EXECUTION
	* + 1. INSTALLATION
				1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
				2. All installation shall be in accordance with manufacturer’s published recommendations.
				3. Gas/electric packaged air conditioning units shall be installed according to manufacturer's recommendations to be completely weatherproof. Protect the roof from damage during installation. Secure factory touch-up paint to repair scratches and minor damage to equipment prior to Start-up.
				4. Power wiring to the units, including externally mounted service disconnect switch, shall be furnished and installed under Division 26. Installing Contractor shall be provided with the manufacturer's Shop Drawings as required for power wiring installation.
				5. Controls for conditioned spaces shall be as required under Division 25, Building Automation System. Control wiring shall be under Division 23. Actual pulling of wires may be accomplished by subcontract or Division 26 Contractor; however, Division 25 shall retain responsibility for correctness of wiring, connections, and full operation of the control system.
			2. testing
				1. Equipment shall be cycled through all heating, cooling, and ventilation cycles to ensure proper operation of all components and controls prior to test and balance.
				2. At time of Start-up, manufacturer's representative shall visit the Project Site and verify that unit installation and performance is satisfactory, and to make any adjustments or settings to unit operating and safety controls that may be required.
				3. Include Start-up checkout service of at least one working day for one service technician, including a written report of operational check provided to the Owner. Owner’s Representative may require that the Start-up service be performed with Owner’s attendance and on-site review.
				4. Clean filters shall be placed within the unit at the time of Substantial Completion.

END OF SECTION 23 62 13