SECTION 15732
PACKAGED HVAC UNITS

PART 1 GENERAL

1.1 APPLICABLE REQUIREMENTS

A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 1 - General Requirements, and Section 15050 - Basic Materials and Methods, and other Sections in Division 15 specified herein.

1.2 SCOPE

A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 1, and shall include, but not necessarily be limited to, the following:

1. Packaged unit.

2. Controls and control connections.

3. Electrical power connections.

4. Roof mounting frame and base.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 15050: Basic Materials and Methods

B. Section 15080: Mechanical Insulation

C. Section 15880: Air Distribution

D. Section 15900: Controls and Instrumentation

E. Section 15990: Testing, Adjusting and Balancing

F. Division 16: Electrical

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide packaged units that are the standard product of an equipment manufacturer regularly engaged in the production of such units who issues complete catalog information on such products. Units shall not be fabricated by the Contractor.

B. Codes and Standards: Provide air handling units conforming to the requirements of the latest addition of the following:

1. Air Movement and Control Association (AMCA):
   a. 99 Standards Handbook
   b. 210 Laboratory Methods of Testing Fans for Rating [Unit shall bear AMCA Certified Rating Seal]
   c. 300 Reverberant Room Method for Sound Testing of Fans [Unit shall bear AMCA Certified Rating Seal]
   d. 301 Methods for Calculating Fan Sound Ratings from Laboratory Test Data
   e. 500 Test Method for Louvers, Dampers, and Shutters

2. American National Standards Institute (ANSI):
   a. 9 Load Ratings and Fatigue Life for Ball Bearings
   b. 11 Load Ratings and Fatigue Life for Roller Bearings
   c. 900 Test Performance of Air Filter Units

3. Air-Conditioning and Refrigeration Institute (ARI):
   a. 210 Unitary Air Conditioning Equipment
   b. 270 Sound Rating of Outdoor Unitary Equipment

4. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
   a. 15 Safety Code for Mechanical Refrigeration

5. National Electrical Manufacturers Association (NEMA): Except for motors, provide electrical components required as part of air handling units, which comply with NEMA Standards.

6. National Fire Protection Association (NFPA): Provide unit internal insulation having flame spread rating not higher than 25 and smoke developed rating not higher than 50:
   a. 70 National electrical Code
   b. 90A Standard for the Installation of Air Conditioning and Ventilating Systems
   c. 90B Standard for the Installation of Warm Air Heating and Air Conditioning Systems

7. Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA): Comply with applicable SMACNA standards including "HVAC Duct Construction Standards - Metal and Flexible."

8. Underwriters Laboratories, Inc. (UL): Except for motors, provide electrical components required as part of units, which have been listed and labeled by UL.

1.5 PRODUCT SUBSTITUTIONS

A. The Contractor shall certify the following items are correct when using substituted products other than those scheduled or shown on the drawings as a basis of design:

   1. The proposed substitution does not affect dimensions shown on drawings.

   2. The Contractor shall pay for changes to building design, including engineering design, detailing, structural supports, and construction costs caused by proposed substitution.

   3. The proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.

   4. Maintenance and service parts available locally are readily obtainable for the proposed substitute.

B. The Contractor further certifies function, appearance, and quality of proposed substitution are equivalent or superior to specified item.

C. The Contractor agrees that the terms and conditions for the substituted product that are found in the contract documents apply to this proposed substitution.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for packaged units showing dimensions, weights, capacities, ratings, fan performance with operating point clearly indicated,

motor electrical characteristics, finishes of materials, installation instructions, sound and vibration test report, and bearing life calculations.

B. Maintenance Data: Submit maintenance instructions, including instructions for lubrication, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data, shop drawings, and wiring diagrams in operating and maintenance manuals; in accordance with requirements of Division 1.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver units to the site in containers with manufacturer's stamp or label affixed.

B. Protect units against dirt, water, chemical, and mechanical damage. Do not install damaged units - remove from project site.

1.9 WARRANTY

A. Provide general one year (12 months) warranty with five (5) year warranty on compressors. The warranty shall include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory authorized service.

PART 2 PRODUCTS

2.1 PACKAGED ROOFTOP HEATING/COOLING UNIT (GAS/ELECTRIC)

A. General:

1. Factory assembled, single-piece heating and cooling unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, refrigerant charge (R-22), and special features required prior to field start-up.

B. Unit Cabinet:

1. Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a prepainted baked enamel finish on all externally exposed surfaces.

2. Evaporator fan compartment interior cabinet surfaces shall be insulated with a minimum ½" thick, 1lb density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the gas heat compartment.

3. Cabinet panels shall be easily removable for servicing.

4. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.

5. unit shall have a factory installed sloped condensate drain pan made of a non-corrosive material, providing a minimum ¾" – 14 NPT connection with both vertical and horizontal drains, and shall comply with ASHRAE Standard 62.

6. Unit shall have a factory installed filter access panel to provide filter access with tool-less removal.

7. Unit shall have standard thru the bottom gas and power connection capability (accessory kit is required).

C. Fan:

1. Evaporator Fan:
   a. Fan shall be belt driven. Belt drive shall include an adjustable pitch motor pulley.
   b. Fan wheel shall be double inlet type with forward curved blades.
   c. Bearings shall be sealed, permanently lubricated ball-bearing type for longer life and lower maintenance.

2. Evaporator fan shall be made from steel with a corrosion resistant finish and shall be dynamically balanced.

3. Condenser fan shall be of the direct-driven (with totally enclosed motors) propeller type and shall discharge air vertically.

4. Condenser fan shall have aluminum blades riveted to corrosion resistant steel spiders and shall be dynamically balanced.

5. Induced draft blower shall be of the direct driven, single inlet, forward curved centrifugal type made from steel with a corrosion resistant finish and shall be dynamically balanced.

D. Compressor(s):

1. Fully hermetic type, internally protected scroll type.

2. Factory mounted on rubber grommets and internally spring mounted for vibration isolation.

3. On dual electrically and mechanically independent circuits (008-014).

E. Coils:

1. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joint brazed.

2. Dual compressor models (size 008-014) shall have face split type evaporator coil (circuit no. 1 on bottom).

3. Testing:
   a. Evaporator and condenser coils shall be qualified to UL 1995 burst test at 2,200 psi.
   b. Evaporator and condenser coil shall be leak tested to 150 psig and pressure tested to 400 psig.

F. Heating Section:

1. Induced draft combustion type with energy saving direct spark ignition system and redundant main gas valve.

2. Heat Exchanger:
   a. The stainless steel heat exchanger shall be of the tubular section type, constructed of a minimum of 20-gage type 409 stainless steel.

3. Burners shall be of the in shot type constructed of aluminum coated steel.

4. All gas piping shall enter the unit cabinet at a single location.

5. The integrated has controller (IGC) board shall include gasheat operation fault notification using a LED (Light emitting diode).

6. Unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout switch or 4 continuous short cycles on the high temperature limit switch. Fault indication shall be made using a LED.

7. The IGC board shall contain algorithms that modify evaporator fan operation to prevent future cycling on high temperature limit switch.

8. The LED shall be visible without removal of control box access panel.

G. Refrigerant Components:

1. Refrigerant circuit components shall include:
   a. Fixed orifice metering system (Acutrol™ device).
   b. Refrigerant filter drier.
   c. Service gage connections on suction, discharge, and liquid lines.

H. Filter Section:

1. Standard filter section shall consist of factory installed, low velocity, throwaway 2 in. thick fiberglass filters of commercially available sizes.

2. Filter face velocity shall not exceed 320 fpm at nominal airflows.

3. Filter section should use only one size filter

I. Controls and Safeties:

1. Unit Controls
   a. Unit shall be complete with self contained low voltage control circuit protected by a fuse on the 24-v transformer side (008-014 units have a resettable circuit breaker).

2. Safeties:
   a. Unit shall incorporate a solid state compressor protector which provides anti-cycle reset capability at the space thermostat, should any of the following standard safety devices trip and shut off compressor.
      1) Compressor overtemperature, overcurrent.
      2) Los of charge/low pressure switch.
      3) Freeze-protection thermostat, evaporator coil.
      4) High pressure switch.
      5) Automatic reset motor thermal overload protector.
   b. The lockout protection shall be easily disconnected at the control board, if necessary.
   c. Heating section shall be provided with the following minimum protections:
      1) High temperature limit switches.
      2) Induced draft motor speed sensor.
      3) Flame rollout switch.
      4) Flame proving controls.

J. Operating Characteristics:

1. Unit shall be capable of starting and running at 125°F ambient outdoor temperature, meeting maximum load criteria of ARI Standard 210/240 or 360 at ± 10% voltage.

2. Compressor with standard controls shall be capable of operation down to 25°F ambient outdoor temperature.

K. Electrical Requirements:

1. All unit power wiring shall enter unit cabinet at a single factory-predrilled location.

L. Motors:

1. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have line break thermal and current overload protection.

2. Evaporator fan motor shall have permanently lubricated bearings and inherent automatic-reset thermal overload protection. Evaporator motors do not have conventional horsepower (HP) ratings listed on the motor nameplate. Motors are designed and qualified in the "air over" location downstream of the cooling coil and carry a maximum continuous bhp rating that is the maximum application bhp rating for the motor; no "safety factors" above that rating may be applied.

3. Totally enclosed condenser fan motor shall have permanently lubricated bearings, and inherent automatic reset thermal overload protection.

4. Induced draft motor shall have permanently lubricated sealed bearings and inherent automatic reset thermal overload protection.

M. Options:

1. See equipment schedule for options.

N. Manufacturer: Carrier (model 48PG), Trane (Model YHC, YSC), or approved equal.

2.2 SPRING ISOLATING ROOF CURB

A. Curb mounted rooftop packaged air conditioning air handlers shall be flexibly ducted, provided with double arch EPDM Expansion Joints, and electrical lines with flexible conduits. The units shall be supported by a spring isolation curb, the lower member of which is a rigid steel tube or a specially formed steel section containing adjustable and removable steel springs that support the upper floating section. The upper frame must provide continuous support for the equipment and must remain captive when resiliently resisting wind and seismic forces. All directional neoprene snubber bushings must be a minimum of 1/2" thick. Steel springs shall rest on 1/4" neoprene acoustical pads. Minimum spring deflection shall be 1 1/2". Hardware must be cadmium or zinc electroplated and the springs similarly plated or provided with an approved rust resistant finish.

B. The curb's waterproofing shall consist of a continuous galvanized flexible counterflashing nailed over the lower curb's waterproofing and joined at the corners by EPDM bellows. All spring locations shall have access ports with removable waterproof covers.

C. The floating member of the roof curb shall have perimeter angle and cross members to support two layers of 5/8" waterproof sheetrock laid on with stagered joints. Sheetrock must surround ducts to provide a continuous sound break. This acoustical barrier shall be caulked to minimize sound transmission. Where the mechanical arrangement makes attachment to the floating member unfeasible, the barrier shall be attached at the highest practical elevation of the fixed curb with provision for 1" thick closed cell neoprene flexible seals around the ductwork. A four inch layer of 1.5 density fiberglass shall cover the entire solid roof surface under the unit.

D. Curbs shall be Mason Industries Type ISC or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that mounting surface, e.g. roof, is ready to receive work.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide layout drawings of units, locations and power requirements to electrical installer.

C. Install minimum 30% efficiency air filters in unit during installation phase. Do not operate the unit without filters in place.

D. Mount rooftop unit on factory built roof mounting frame. Install roof mounting frame level.

E. Install 3" flexible duct connection at inlets and outlets of units.

F. Install condensate drain piping and traps in accordance with manufacturer's instructions and as shown on the Drawings.

G. Control installers shall install thermostat and all wiring associated with control signals into the units.

H. Electrical installer shall install all line voltage power wiring and conduit. Coordinate with Division 16 work.

I. Install a new set of filters prior to final air balance and substantial completion.

3.3 MANUFACTURER'S START-UP SERVICES

A. The manufacturer shall provide start-up service in the form of a factory trained service technician. The service technician shall verify correct installation, verify unit mounting, verify fan rotation, verify spring isolator adjustments, verify control wiring, verify power wiring, start-up the fans, and check for proper operation. The service technician shall provide final adjustments to meet the specified performance requirements. Fully staffed parts and service personnel shall be within four hours travel from the job site.

END OF SECTION 15732

SECTION 15734
MAKE-UP AIR UNITS

PART 1 GENERAL

1.1 APPLICABLE REQUIREMENTS

A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 1 - General Requirements, and Section 15050 - Basic Materials and Methods, and other Sections in Division 15 specified herein.

1.2 SCOPE

A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 1, and shall include, but not necessarily be limited to, the following:

1. Packaged unit.

2. Controls and control connections.

3. Electrical power connections.

4. Mounting frame and base.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 15050: Basic Materials and Methods

B. Section 15080: Mechanical Insulation

C. Section 15880: Air Distribution

D. Section 15900: Controls and Instrumentation

E. Section 15950: Testing, Adjusting and Balancing

F. Section 15960: Variable Frequency Drives (VFD)

G. Division 16: Electrical

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide packaged units that are the standard product of an equipment manufacturer regularly engaged in the production of such units who issues complete catalog information on such products. Units shall not be fabricated by the Contractor.

B. Codes and Standards: Provide air handling units conforming to the requirements of the latest addition of the following:

1. Air Movement and Control Association (AMCA):
   a. 99 Standards Handbook
   b. 210Laboratory Methods of Testing Fans for Rating [Unit shall bear AMCA Certified Rating Seal]
   c. 300Reverberant Room Method for Sound Testing of Fans [Unit shall bear AMCA Certified Rating Seal]

d. 301Methods for Calculating Fan Sound Ratings from Laboratory Test Data
e. 500Test Method for Louvers, Dampers, and Shutters

2. American National Standards Institute (ANSI):
   a. 9Load Ratings and Fatigue Life for Ball Bearings
   b. 11Load Ratings and Fatigue Life for Roller Bearings
   c. 900Test Performance of Air Filter Units

3. National Electrical Manufacturers Association (NEMA): Except for motors, provide electrical components required as part of air handling units, which comply with NEMA Standards.

4. National Fire Protection Association (NFPA): Provide unit internal insulation having flame spread rating not higher than 25 and smoke developed rating not higher than 50:
   a. 70National electrical Code
   b. 90AStandard for the Installation of Air Conditioning and Ventilating Systems
   c. 90BStandard for the Installation of Warm Air Heating and Air Conditioning Systems

5. Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA): Comply with applicable SMACNA standards including "HVAC Duct Construction Standards - Metal and Flexible."

6. Underwriters Laboratories, Inc. (UL): Except for motors, provide electrical components required as part of units, which have been listed and labeled by UL.

1.5 PRODUCT SUBSTITUTIONS

A. The Contractor shall certify the following items are correct when using substituted products other than those scheduled or shown on the drawings as a basis of design:

   1. The proposed substitution does not affect dimensions shown on drawings.

   2. The Contractor shall pay for changes to building design, including engineering design, detailing, structural supports, and construction costs caused by proposed substitution.

   3. The proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.

   4. Maintenance and service parts available locally are readily obtainable for the proposed substitute.

B. The Contractor further certifies function, appearance, and quality of proposed substitution are equivalent or superior to specified item.

C. The Contractor agrees that the terms and conditions for the substituted product that are found in the contract documents apply to this proposed substitution.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for packaged units showing dimensions, weights, capacities, ratings, fan performance with operating point clearly indicated, motor electrical characteristics, finishes of materials, installation instructions, sound and vibration test report, and bearing life calculations.

B. Maintenance Data: Submit maintenance instructions, including instructions for lubrication, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data,

shop drawings, and wiring diagrams in operating and maintenance manuals; in accordance with requirements of Division 1.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1. Deliver units to the site in containers with manufacturer's stamp or label affixed.

B. Store/protect products under provisions of Division 1. Protect units against dirt, water, chemical, and mechanical damage. Do not install damaged units - remove from project site.

1.9 WARRANTY

A. Provide general one year (12 months) warranty with five (5) year warranty on compressors under provisions of Division 1. The warranty shall include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory authorized service.

PART 2 PRODUCTS

2.1 ROOFTOP, POWER-VENTED HEATING AND MAKEUP AIR UNITS

A. Manufacturers: Reznor, or approved equal.

B. General:

1. Provide packaged, rooftop heating and makeup air with evaporative cooling section, power-vented units. The units shall be minimum 81% efficiency, designed for rooftop mounting.

C. Controls:

1. All units shall be equipped for use with natural gas, supply voltage with rainproof safety type disconnect switch factory installed in the electrical control panel, 24-volt control transformer; protective air proving switch; resiliently spring isolated venter motor; and a high temperature limit control. Operation shall be controlled through an integrated circuit board. The circuit board shall monitor heater operation and have LED diagnostic indicator lights to identify abnormalities in control functions. Unit shall have a two stage gas control.

2. The unit to be furnished with an electrical control panel which shall contain burner, blower and damper service switches in the electrical compartment to provide manual operation of the unit.

3. Provide fan starter with overload resets, control transformer, fuse blocks, relay switches and other control components for completely automatic operation of the unit. A rainproof safety type disconnect switch shall be factory installed in the electrical control panel, wired to starters and motors. Unit to be prewired and ready for connection to the building service and to the Control Cabinet. All electrical components shall be U.L. listed.

4. For VFD driven motors, see Section 15960 for additional requirements.

D. Heating Section:

1. The gas furnace shall have a heat exchanger and single burner combustion system. The heat exchanger shall be 409 stainless steel.

2. The furnace shall be equipped with all required safety elements.

E. Blower Section:

1. The double wall insulated blower section shall be supplied with horizontal supply opening. The blower section shall include an adjustable belt driven spring vibration isolated centrifugal blower and totally enclosed spring vibration isolated motor with factory installed variable frequency drive. Unit includes 2" permanent aluminum filter.

F. Evaporative Cooling Section:

1. Evaporative cooling module. Construction of evaporative cooling cabinet will be white pre-painted with 300 series stainless steel reservoir and 2" aluminum pre-filter. Water system to include recirculating float and pump, AquaSaver, and evaporative media 12" Glasdek media.

2. The water pump shall be prepiped and prewired to the air handler main electrical panel through a contactor to permit pump actuation by the packaged control system. A 4" deep water pan and all other internal components shall be constructed with 16 gauge welded stainless steel. The overflow drain and float valve shall be factory installed and preset to provide proper water level. An even water distribution system constructed of stainless steel shall be provided to give uniform water flow over the entire top surface of the cooling media. The line from the water pump to the distribution trough shall be copper with a valve installed to adjust flow.

3. Provide an interface for on/off control of the system from a building management system interface.

4. Provide all necessary control interface for integration of evaporative cooling section with unit controls.

5. Sequence of Operation (Provided by Unit Manufacturer except where noted).

6. Startup and shutdown is to be by remote building management system signal or by local remote control panel provided with unit and mounted in the range control room. Startup and shutdown is to be interlocked with the associated exhaust fan startup. Upon startup signal, outdoor air dampers are to be opened and fan started.

7. Evaporative cooling sump is to be drained at each end-of-day shutdown. A freeze stat is to activate the drain valve at any time outside temperatures fall below 40° F. The fill valve is to be energized when outdoor air temperature exceeds an adjustable 80° F during operating hours. The spray pump is to be energized when sump is filled and there is a call for cooling at the remote console.

G. DX Cooling Coil Section:

1. Draw through cooling coil module with factory installed DX coil. Construction of cooling coil module will be double wall with standard R value 3.8 insulation.

H. Accessories:

1. Downturn plenum cabinet. Construction of downturn plenum will be double wall with standard R value 3.8 insulation.

2. See equipment schedule for additional accessories.

3. Draw through cooling coil module with factory installed dx coil. Construction of cooling coil module will be double wall with standard R-value 3.8 insulation.

I. Cabinet:

1. The packaged system shall have a pre-coat RAL 9001 white paint finish. Finish shall be a minimum 60 gloss. Finish shall meet ASTM B117 specifications for salt spray at 1,000 hours.

2. Cabinet shall have through-the-base utility knockouts. Control, burner, and blower service compartment doors shall be hinged. Blower door hardware shall be heavy duty stainless. Control and burner door hardware shall have heavy duty external hardware.

J. Certifications:

1. The packaged heating and makeup air system shall be design-certified to ANSI Z83.8 and CSA 2.6 Standards. The energy usage shall be designed to meet ASHRAE Standard 90.1.

PART 3EXECUTION

3.1 EXAMINATION

A. Verify that mounting surface, e.g. roof, is ready to receive work.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide layout drawings of units, locations and power requirements to electrical installer.

C. Install minimum 30% efficiency air filters in unit during installation phase. Do not operate the unit without filters in place.

D. Mount rooftop unit on factory built roof mounting frame. Install roof mounting frame level.

E. Install 3" flexible duct connection at outlet of units.

F. Install water supply and drain piping in accordance with manufacturer's instructions and as shown on the Drawings.

G. Control installers shall install thermostat and all wiring associated with control signals into the units.

H. Electrical installer shall install all line voltage power wiring and conduit. Coordinate with Division 16 work.

I. Install a new set of filters prior to final air balance and substantial completion.

3.3 MANUFACTURER'S START-UP SERVICES

A. The manufacturer shall provide start-up service in the form of a factory trained service technician. The service technician shall verify correct installation, verify unit mounting, verify fan rotation, verify spring isolator adjustments, verify control wiring, verify power wiring, start-up the fans, and check for proper operation. The service technician shall provide final adjustments to meet the specified performance requirements. Fully staffed parts and service personnel shall be within four hours travel from the job site.

END OF SECTION 15734

SECTION 15741

SPLIT AIR CONDITIONING UNITS

PART 1 GENERAL

1.1 APPLICABLE REQUIREMENTS

A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 1 - General Requirements, and Section 15050 - Basic Materials and Methods, and other Sections in Division 15 specified herein.

1.2 SCOPE

A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 1, and shall include, but not necessarily be limited to, the following:

1. Split air conditioning unit.
2. Controls and control connections.
3. Electrical power connections.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 15050: Basic Materials and Methods

B. Section 15080: Mechanical Insulation

C. Section 15185: Refrigerant Piping Systems

D. Section 15880: Air Distribution

E. Section 15900: Controls and Instrumentation

F. Section 15950: Testing, Adjusting and Balancing

G. Division 16: Electrical

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide packaged units that are the standard product of an equipment manufacturer regularly engaged in the production of such units who issues complete catalog information on such products. Units shall not be fabricated by the Contractor.

B. Codes and Standards: Provide air handling units conforming to the requirements of the latest addition of the following:

1. Air Movement and Control Association (AMCA):
   a. 99 Standards Handbook
   b. 210 Laboratory Methods of Testing Fans for Rating [Unit shall bear AMCA Certified Rating Seal]
2. Air-Conditioning and Refrigeration Institute (ARI):
   a. 210 Unitary Air-Conditioning Equipment
   b. 270 Sound Rating of Outdoor Unitary Equipment
3. National Electrical Manufacturers Association (NEMA): Except for motors, provide electrical components required as part of air handling units, which comply with NEMA Standards.
4. National Fire Protection Association (NFPA): Provide unit internal insulation having flame spread rating not higher than 25 and smoke developed rating not higher than 50:
   a. 70 National Electrical Code
   b. 90A Standard for the Installation of Air Conditioning and Ventilating Systems

c. 90B Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

5. Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA): Comply with applicable SMACNA standards including "HVAC Duct Construction Standards - Metal and Flexible."

6. Underwriters Laboratories, Inc. (UL): Except for motors, provide electrical components required as part of units, which have been listed and labeled by UL.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for systems with air handler units, evaporator coils, and outdoor condensing units showing dimensions, weights, capacities, ratings, fan performance with operating point clearly indicated, motor electrical characteristics, finishes of materials, installation instructions, sound and vibration test report, and bearing life calculations.

B. Maintenance Data: Submit maintenance instructions, including instructions for lubrication, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data, shop drawings, and wiring diagrams in operating and maintenance manuals; in accordance with requirements of Division 1.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1. Deliver units to the site in containers with manufacturer's stamp or label affixed.

B. Store/protect products under provisions of Division 1. Protect units against dirt, water, chemical, and mechanical damage. Do not install damaged units - remove from project site.

1.8 WARRANTY

A. Provide general one year (12 months) warranty from date of installation and five (5) year warranty on compressors under provisions of Division 1. The warranty shall include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory authorized service.

PART 2 PRODUCTS

2.1 DUCTLESS SPLIT SYSTEM AIR CONDITIONING UNIT WITH INDOOR FAN COIL

A. Acceptable Manufacturers: Mitsubishi, Sanyo, or Carrier.

B. General:

1. The air conditioning system shall be a split system series. The system shall be a split system series. The system shall consist of a slim silhouette, compact, wall mounted indoor fan coil section with wireless remote controller and a slim silhouette horizontal discharge outdoor unit with constant speed compressor, charged with R410A refrigerant.

C. Indoor Unit

1. General:

a. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, internal piping, control circuit board and fan motor.

b. The unit shall have a self diagnostic function, 3 minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch.

c. Indoor unit and refrigerant pipes shall be charged with dry air before shipment from the factory.

2. Unit Cabinet:

a. The casing shall have a white finish.

b. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining shall be standard.

c. There shall be a separate installation plate which secures the unit firmly to the wall.

3. Fan:

a. The indoor unit fan shall be an assembly with a line-flow fan direct drive by a single motor.

b. The fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.

c. A manual adjustable vertical guide vane shall be provided with the ability to change the airflow from side to side (left to right).

d. An integral, motorized air sweep flow louver shall provide an automatic change in airflow by directing the air up and down to provide for uniform air distribution.

e. The indoor unit fan motor shall operate in three (3) selectable speeds, High, Medium and Low.

4. Filter:

a. Return air shall be filtered by means of easily removed Catechin air filter and an anti allergy enzyme filter – blue bellows type.

5. Coil:

a. The indoor unit (evaporator) coil shall be of nonferrous construction with smooth, pre-coated aluminum fins on copper tubing.

b. Tubing shall have inner groves for high efficiency heat exchange.

c. All tube joints shall be brazed with PhosCopper or silver alloy.

d. The coil shall be pressure tested at the factory.

e. A sloped condensate pan and drain with extension hose shall be provided under the coil.

6. Electrical:

a. The electrical power of the unit, supplied from the outdoor unit. The system shall be capable of satisfactory operation within voltage limits of 103 volts to 127 volts.

b. The unit shall be equipped with Mitsubishi Electric's micro processor control system directing indoor and outdoor unit coordinated operation by two polarity sensitive control wires.

c. The indoor unit shall not have any supplemental electrical heat elements.

7. Control:

a. This system shall have a wireless remote controller to perform input functions necessary to operate the system. The controller shall consist of a Power On/Off switch, Mode Selector, Temperature Setting, Timer Control, Fan Speed Select and Auto Vane Selector.

b. Temperature changes shall be by 1°F increments with a range of 65°F to 87°F.

c. There shall be a 24 hour On/Off timer.

d. The unit shall have an emergency operation mode to allow operation without the remote controller.

e. The microprocessor located in the indoor unit shall have the capability of sensing return air temperature and indoor coil temperature, receiving and processing commands from the wireless remote controller, providing emergency operation and controlling the outdoor unit.

f. The control voltage between the indoor unit and the outdoor unit shall be 115 volts, AC.

g. The system shall be capable of automatic restart when power is restored after power interruption.

h. The control system shall control the operation of the air sweep louvers, as well as provide on/off and system/mode function switching.

D. Outdoor Condensing Unit:

1. General:

a. The outdoor unit is designed specifically for use with indoor units. These units are equipped with a circuit board that interfaces to the indoor unit circuit board. The outdoor unit shall be completely factory assembled, internally piped and wired. Each unit shall be run tested at the factory.

2. Unit Cabinet:

a. The casing shall be fabricated from zinc coated steel, bonderized with an electrostatically applied, thermally bonded, acrylic or polyester powder coating for corrosion protection.

b. Case and mounting feet shall be as follows:

1) The MS-A09WA base shall be of Aluminum-Zinc Magnesium alloy coated steel, with welded mounting feet.

2) The base for the MS-A12WA shall have a galvanized steel base with welded mounting feet.

3. Fan:

a. The unit shall be furnished with a direct drive propeller type fan, statically and dynamically balanced for smooth and quiet operation.

b. The fan motor shall have inherent protection, be equipped with permanently lubricated bearings. The fan motor shall be mounted and isolated for quiet operation.

c. The fan shall be provided with a raised guard to prevent contract with moving parts.

d. The outdoor unit shall have horizontal discharge airflow.

4. Coil:

a. The condenser coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing.

b. The coil shall be protected with an integral metal guard.

c. Refrigerant flow from the condenser shall be controlled by means of a metering orifice.

5. Compressor:

a. The compressor shall be a high performance, hermetic, rolling piston, rotary type.

b. Compressor shall be mounted using rubber isolating bushings to avoid the transmission of vibration.

c. Compressor shall be protected by an automatic over current relay and a thermal overload switch.

6. Operation:

a. The outdoor unit shall have an accumulator.

b. The outdoor unit must have the ability to operate with a maximum height difference of 35 feet between indoor and outdoor units.

c. The unit shall have a maximum refrigerant tubing length of 65 feet between indoor and outdoor units without the need for line size changes, traps or additional oil.

d. The unit shall be pre-charged for a maximum of 25 feet of refrigerant tubing.

7. Electrical:

a. The unit shall be capable of satisfactory operation within voltage limits of 103 volts to 127 volts.

b. The outdoor unit shall be controlled by the microprocessor located in the indoor unit.

2.2 ROOF-TOP CONDENSING UNIT

A. Acceptable Manufacturers: Reznor or Approved Equal.

B. General

1. Provide a condensing section for a split system. The units shall be designed for outdoor mounting. Unit shall be compatible with split system.

2. Unit shall use non-ozone depleting, R-410A refrigerant.

3. Unit shall have dual circuits with independent scroll compressors capable of operating in stages to operate at 1/3, 2/3, and 3/3 capacity as needed. Condensing section to be shipped pre-charged with nitrogen. Unit shall have an angled aluminum micro-channel type condensing coil. Dual circuits shall have independent liquid line receivers.

4. All units shall be equipped for with supply voltage with field disconnect switch. A 75 VA transformer with manual circuit breaker shall be included to provide independent secondary control voltage. Control circuit shall have isolation relay.

5. The unit shall have a corrosion protective pre-coat RAL 9001 white paint finish. Finish shall be a minimum 60 gloss with G90 substrate and meet ASTM B117 specification for salt spray to 1,000 hours. Inside cabinet shall also have corrosion protective finish.

6. Heavy gauge metal base cabinet will have fork lift openings to assist in installation.

7. All circuits shall high and low pressure switches and liquid receivers. Service valves with gauge ports shall be supplied on liquid and suction lines. Liquid line filter driers shall be shipped loose with the unit for field installation.

PART 3 PRODUCTS

3.1 EXAMINATION

A. Verify that mounting surfaces are ready to receive work.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide layout drawings of units, locations and power requirements to electrical installer.

C. Install air filters in unit during installation phase. Do not operate the unit without filters in place.

D. In the case of suspended units, mount the fan coil units on springs or from spring hangers as required and as shown on Drawings. Provide Mason #DNHS combination isolator hangers to fully support horizontal units hung from building framing.

E. Provide 4" high concrete pad extending 6" beyond edge of condensing unit on all sides. Attach condensing unit to concrete pad with concrete anchors and angle brackets.

F. Install condensate drain piping and traps in accordance with manufacturer's instructions and as shown on the Drawings.

G. Install copper refrigerant piping and insulate lines.

H. Install controller and all wiring associated with control signals between air handling unit and condensing unit. Conceal low voltage wiring in building structure, or inside the refrigerant pipe insulation, or in conduit.

I. Electrical installer shall install all line voltage power wiring and conduit. Coordinate with Division 16 work.

J. Install a new set of filters prior to final air balance and substantial completion.

3.3 MANUFACTURER'S START-UP SERVICES

A. The manufacturer shall provide start-up service in the form of a factory trained service technician. The service technician shall verify correct installation, verify unit mounting, verify fan rotation, verify spring isolator adjustments, verify control wiring, verify power wiring, start-up the fans, and check for proper operation. The service technician shall provide final adjustments to meet the specified performance requirements. Fully staffed parts and service personnel shall be within four hours travel from the job site.

END OF SECTION 15741