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 01 - General Requirements, Section 230500 - Basic HVAC Materials and Methods, and other Sections in Division 23 specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 230500: Basic HVAC Materials and Methods

B. Section 230593: Testing, Adjusting and Balancing

C. Section 230900: Building Automation System (BAS) Controls

D. Section 232113: Mechanical Insulation

E. Section 233113: Air Distribution

F. Division 26: Electrical

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide air handling 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. Certifications: Provide certified ratings of units based on tests performed in accordance with ARI 430, "Central-Station Air Handling Units."

C. 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, Heating and Refrigeration Institute (AHRI):
      a. 410 - Forced-Circulation Air-Cooling and Air-Heating Coils
      b. 430 - Central-Station Air-Handling Units
   4. American Society of Heating, Refrigerating and Air-Conditioning Engineers

(ASHRAE):
a. 193 – Method of Test for Determining the Air Leakage of HVAC Equipment. All systems that move less than 3,000 cfm shall comply with less than 1.4% cabinet leakage rate.

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 air handling unit internal insulation having flame spread rating not higher than 25 and smoke developed rating not higher than 50:
   a. (CEC) - California 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 air handling units, which have been listed and labeled by UL.

1.4 SUBMITTALS

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

B. Shop Drawings: Submit shop drawings showing unit dimensions, weight loadings, required clearances, field connection details and methods of support. Draw to a scale of one half inch to one foot. Include field fabricated mixing boxes, dampers and duct connections.

C. 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.

1.5 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.

1.6 DELIVERY, STORAGE, AND HANDLING

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

B. Store and protect unit against dirt, water, chemical, and mechanical damage. Do not install damaged unit - remove from project site.

1.7 WARRANTY

A. Provide one-year (12 months) warranty. 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 FAN COIL UNIT – FOR COMMERCIAL APPLICATION

A. Manufacturers
1. Huntair, Temtrol, Carrier, Trane, Miller-Picking, Buffalo, Energy Labs, Haakon Industries or EIC.

B. General
1. Factory fabricated fan coil units of the size, type configuration and capacity as scheduled on the drawings.
2. All pressure drops, horsepowers and dimensions shown are maximum allowable. All capacities shown are minimum allowable. All units must have AMCA certified performance data for fans tested in the unit casings. Bare fan certification without casing is not acceptable.
3. Manufacturers unable to meet this criteria will only be considered as an alternate to specified and as a deduct to base bid. Manufacturer listed by name does not imply that their standard construction meets the specifications nor that they are approved. All manufacturers are required to meet all details of this specification without exception.

C. Unit Casing
1. Unit shall be constructed of no less than 16 gauge formed cold-rolled steel with minimum 1" 1.5 lb. density internal insulation. Insulation shall be attached with adhesive with all exposed edges coated to prevent erosion. All exposed metal inside and out shall be finished with at least one coat of gray enamel. Bottom access doors shall be aluminum construction 0.063 thickness painted to match unit.

D. Fan Assembly
1. Bearings shall be ball or roller type. Sleeve bearings are not acceptable. Bearings shall have replaceable inserts so entire housing need not be replaced. Bearings shall be self-aligning to assist in shaft alignment. Self-locking collars shall be proved to secure bearing to the shaft. Bearing housing shall be cast iron for strength and long life. Each bearing shall have pressure relief fittings to assure bearing seal life. Bearing life shall be minimum L-10 100,000 hour. Calculations shall be made on the basis of load ratings based on the AFBMA "Method of evaluating load ratings for ball bearings", and are the steady, radial loads that bearings can endure at various speeds for 1,500 hours with 90% of the group surviving. Calculations shall be submitted for engineer review upon request. Bearing operation shall be checked under load at the design speed. Bearing pass/fail criteria shall be based on 1987 ASHRAE Handbook, chapter 52, table 26.
2. Rotating assembly shall be steel channel type construction to provide rigid support for motor, drive, bearings, shaft and wheel. Entire assembly to be mounted on open coil type springs with seismic restraint. Assembly shall have bottom access and entire assembly shall swing down for maintenance. Assembly shall also be completely removable without disassembling unit casing.

3. Shafting shall be carbon steel, turned, ground and polished to close tolerance and oversized to insure vibration free operation. Shafts shall be selected not to exceed 75% of first critical speed. Shaft shall be cleaned and coated to protect against condensation and/or airborne contamination. The cleaning procedure shall include removing any surface rust, loose mill scale, weld spattering and sharp prominences by scraping, sanding and wire brushing to the degree specified by SSPC-SP-1 & 2. The removal of all oil, grease, dirt, salts, soil and contaminants shall be accomplished by cleaning with solvent. After cleaning, shaft shall be coated all over exposed surfaces with a lacquer based shaft protectant. Bluing pigment shall be added to facilitate visual conformation of total coverage. Removal of coating for wheel and hub service shall be achieved with the use of only a lacquer thinner.
4. Drives shall be V-belt with cast iron sheaves. Motor sheaves shall be of the adjustable pitch diameter type. Drives shall be rated at no less than 150% of nameplate horsepower.
5. Motors shall be standard NEMA frame type. All motors shall be premium efficiency type. No others are acceptable.
6. Fractional horsepower motors to be resilient mounted and integral horsepower motors to be rigid mounted to spring isolated rotating assembly frame. Power leads from motors to be field installed with flex connection to field supplied junction box allowing enough length for rotating assembly swing down.

E. Coils
1. Coils shall be ARI certified and of the same manufacturer as the unit to insure proper fit and quality. All coil casings shall be 16 gauge galvanized steel minimum or stainless steel. Copper tubes shall be minimum 5/8” diameter with a minimum thickness of 0.020 and return bends of minimum 0.035. Headers shall be non-ferrous seamless copper. Aluminum fins shall have a minimum thickness of 0.0080 and tubes shall be mechanically expanded into fin collars to provide permanent mechanical bond. No exposed copper shall show between fins.
2. Coils shall be mounted in stainless steel drain pans.

F. Filter Section
1. Filters shall be two inch thick FARR 30/30 or equal. Filter velocity shall be less than 500 FPM.
2. Filter access is bottom removal unless shown otherwise on plans and schedule.

G. Unit Suspension
1. Manufacturer to provide factory welded mounting clips for suspension of units. Clips to be capable of accepting 1/2" rod or isolators. Weights shown on plans are maximum allowable operating weights including water in coils.

H. Side Access
1. Where shown on plans provide side access to unit components. Access panel is to be hinged and large enough to provide full access to the sections internal components. Door latch to be CAD plated spring steel manual quick release "Ludwig" latch with pressure closure mechanism. Door to be painted galvanized 16-gauge steel with pin break edge reinforcement. Door to be sealed on all four edges with gasket adhesively attached to the door panel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Examine site to verify if site is ready to receive work. Provide a layout drawing of air handler and fan locations 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. Install unit supported by vibration isolation springs.

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

H. Control installers shall install all wiring associated with control signals into the cabinet fan.

I. Electrical installer shall install all line voltage power wiring and conduit. Coordinate with Division 26 work.

3.2 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