

SECTION 23 73 13 FACTORY ASSEMBLED, MODULAR CONSTRUCTION AIR HANDLING SYSTEMS

PART 1 - GENERAL

1.01 RELATED WORK

- A. Section 23 05 13: Motors for HVAC
- B. Section 23 05 48: Vibration Isolation
- C. Section 23 05 93: HVAC Systems Test and Balance
- D. Section 23 41 00: Particulate Air Filtration

1.02 SUBMITTALS

- A. Submit product data including dimensions, rating and performance data for review.

1.03 PERFORMANCE

- A. Certify unit components in accordance with ARI Standard 430 as applicable.
- B. Certify coils in accordance with ARI Standard 410. Substantiate performance by ARI computer generated output.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Trane- Climate Changer
- B. JCI/York- Solutions
- C. McQuay - Vision Series
- D. Carrier -39M series
- E. Temptrol –WF series

2.02 GENERAL

- A. Fabricate draw-thru type air handling units suitable for the scheduled air pressure operation.
- B. Fabricate units with fan section, coil sections and access sections per the configurations shown on the mechanical plans and schedules.
- C. Factory fabricate and test air handling units of sizes, capacities, and configuration as indicated and specified. Units shall be fully assembled on 6 inch base rail up to practical shipping limitations. On units not shipped fully assembled, manufacturer shall tag each section to indicate location in direction of airflow to facilitate assembly at the job site.
- D. All sections shall be shrink-wrapped in polyurethane by manufacturer for shipment to site.

2.03 CASING

- A. Unit shall be double wall constructed in all sections.
 - 1. Exterior wall shall be minimum 18 gauge galvanized steel. Interior wall shall be minimum 20 gauge solid galvanized steel.
 - 2. All portions of the interior of the unit exposed to the airstream shall be covered with steel to allow cleaning and prevent fiberglass erosion into the airstream. Foil facing on insulation shall not be acceptable as a substitute for double wall construction.
 - 3. Insulate all sections of air handling unit (walls, roof and floor) with 2" thick 1-1/2 lb matt faced fiberglass between two sheets of solid galvanized steel.
- B. Units with welds on exterior surfaces or welds that have burned through from interior welds shall also receive a final shop coat of zinc-rich protective paint in manufacturer's standard color.
- C. Unit shall be designed and constructed such that all exterior panels are non-load bearing. Removal of all exterior panels shall not affect the structural integrity of the unit.
- D. As required for routine service access, unit shall be supplied with full height, galvanized, double wall, hinged, removable access doors. Access door shall have a full perimeter automotive EPDM type gasket to prevent air leakage, and Ventlock style handle that can be opened from unit interior. Hinged access doors shall swing outward on negative pressure and inward on positive pressure. An 8" sealed glass and wire inspection window shall be installed in access door of fan section to view unit operation.
- E. Units shall have internally mounted motor and drives and shall be shipped with a full size removable service door on the drive side of the fan. Fan section access door shall contain an 8" square sealed glass and wire view window. Unit shall include a totally enclosed belt guard over drive components to prevent possible injury. Belt guard shall be provided with tachometer holes to facilitate RPM readings of the fan.
- F. On units with cooling coils, provide IAQ drain pan under coil module. A drain pan shall also be provided under the complete supply fan section. Drain pans shall be 304 stainless steel, double wall construction. Slope and construct drains pans without gasketed seams to prevent standing water. Copper drain tube is to be used for stack coil sections.

2.04 FANS

- A. Provide supply fan section with double width, double inlet centrifugal fan, plenum fan, or as designated on mechanical plans and schedules, designed and suitable for class of service indicated in the unit schedule. Centrifugal fan wheels shall be air foil or as scheduled. Fan shaft to be properly sized and protectively coated with lubricating oil. Fan shafts shall be solid and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. Fans shall be statically and dynamically balance tested as an assembly at the required RPM to meet design specifications. Fan wheel shall be properly secured to shaft to prevent slippage.
- B. Provide internal factory mounted canvas duct connection at fan discharge connection to fan module.
- C. Provide self-aligning, grease lubricated pillow-block ball bearings with lubrication fittings. Provide extended grease lines to drive side of unit casing, for all fan bearings, rigidly attached for easy service access. If extended grease lines are not provided, unit shall include an opposite drive side access door and service room must be allowed on the opposite side of the unit to perform regular maintenance. All bearings shall perform to L-50 200,000 hour average life.
- D. Fan, motor and drive shall be internally isolated with 2" deflection spring isolators.

- E. Inlet vanes for fans shall be operated by an aluminum center rotating ball bearing hub located out of fan inlet. Inlet vanes shall be 14-gauge steel, welded to the vane rods and shall be plated to prevent corrosion. Vanes shall be formed to fit the circumference of the inlet orifice of the fan housing. Vane blades that are not welded to vane rods will not be acceptable. Inlet van rods shall be offset for rotation out of the fan housing inlet when open.

2.05 MOTORS AND DRIVES

- A. Fan motors to be mounted and isolated on the same integral base as the fan. Provide 2" spring deflection.
- B. Fan motors shall be heavy duty, premium efficiency open drip-proof unless noted otherwise on equipment schedule. See Section 23 05 13. Furnish "VFD Duty" motor for units with variable speed drives.
- C. Factory Mount Fan Drives: Make final alignment and belt adjustment after installation. Design drive for 1.4 service factor.
 - 1. For motors up to and including 15 hp, provide variable pitch drives. For motors above 15 hp, provide a variable and a fixed pitch drive. Factory mount the variable pitch drive at the factory and ship unit. After final test and balance of system and fan RPM has been determined, ship properly sized fixed pitch drive and replace the variable pitch drive with the fixed pitch. Turn over removed variable pitch drives to the Owner.

2.06 COILS

- A. Coils shall be manufactured by the same company as the supplier of the air handling unit. Coils shall be designed with aluminum plate fins and copper tubes. Coil casing and supports shall be fabricated from 16 gauge 304 stainless steel.
- B. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion of the tubes. No soldering or tinning shall be used in the bonding process. Coils shall be mounted in the unit casing to be accessible for service and can be removed from the unit either through the side or top as designated on plan drawings or scheduled. Capacities, pressure drops and selection procedure shall be certified in accordance with ARI Standard 410.
- C. Provide factory installed extended drain and vent connections for water coils.
- D. Fabricate casings and trim of continuous stainless steel.
- E. The main coil drain pan shall be double sloped to assure positive condensate drainage with connections on both sides. The pan shall be of double wall construction with stainless steel liner and have a minimum depth of 2" of insulation (uncompressed). The pan shall have a minimum of 8" extended drain pan that is 4" deep for accessibility and cleanability in accordance with the proposed ASHRAE 62-99. If drain pan is not continuous 8" past the coil face, provide as a minimum 12" access section with stainless steel IAQ drain pan after the coil section to capture any condensate carryover to the motor and fan section. Coils with finned height greater than 46" shall have an intermediate drain pan extending the entire finned length of the coil. Cooling coil in excess of 48" in height shall not be acceptable unless provided with an intermediate drain pan. The intermediate pans shall have copper drop tubes to guide condensate to the main drain pan. The drain pan shall extend a minimum of 12" past the leaving face of the coil.
- F. Completely enclose coil headers within the insulated casing with connections extended through cabinet.

G. Water Cooling Coils

1. All coils shall be enclosed in an insulated coil section. Coil headers and U-bends shall not be exposed.
2. Waterflow shall be counter to airflow.
3. Coils shall be proof tested to 300 psig and leak tested to 200 psig air pressure under water.
4. Headers shall be round copper pipe or cast iron.
5. Tubes shall be 1/2" or 5/8" OD thick with 0.035" wall thickness.
6. Headers shall have PT plug connections on inlet and outlet connections.
7. Coils shall be stacked in the same plane. No staggered coils shall be allowed.

H. Water Heating Coils

1. All coils shall be enclosed in a coil section. Coil headers and U-bends shall not be exposed.
2. Waterflow shall be counter to airflow.
3. Coils shall have a supply header to ensure distribution of hot water to each tube of coil.
4. Coils shall be proof tested to 300 psig and leak tested to 200 psig, air pressure under water.
5. Tubes shall be 1/2" or 5/8" OD thick with 0.035" wall thickness.
6. Headers shall have PT plug connections on inlet and outlet connections.
7. Coils shall be stacked in the same plane. No staggered coils shall be allowed.

2.07 ACCESS SECTIONS

- A. Access sections shall be supplied as shown on the plans between unit sections. Access doors shall be provided on one side of section. Door shall be constructed specified above.

2.08 FILTER SECTION

- A. Furnish factory built filter sections complete with filters as specified in mechanical schedule on drawings. Filter area to be equal to or greater than area listed on unit schedule. Refer to Section 15886 for filter specifications.
- B. Pre-filter sections shall have access doors on both sides and minimum length of 10".
- C. Final filter section shall be front loading with Type-8 holding frame without side access doors.. For final filter sections noted otherwise on plans, provide access doors on both sides.
1. Provide filter housings which seal air tight so that removal and replacement of the filter does not break the seal.
 2. Provide 16 gauge galvanized frames with gasket to seal between frame and filter.
 3. Filter latches for upstream filter loading and unloading. Latch to meet scheduled filter.
 4. Section to be minimum length of 24".

2.09 MARINE OBSERVATION LIGHTS

- A. Provide factory mounted marine observation lights in all access sections and fan section. Marine lights shall be prewired in conduit to switch located on the exterior of the module adjacent to the access door. Switches shall be factory mounted complete with outlet box for wiring connection by Division 26 and switch face plate.

2.10 HUMIDIFIER SECTION

- A. Same construction and drain pan as specified for coil section.
- B. Minimum length shall be 36".

2.11 MIXING BOX AND DISCHARGE PLENUM SECTIONS

- A. Provide on units as shown on drawings.
- B. These sections to include openings to meet field conditions or shipped with no openings so that openings can be made in the field.
- C. These sections to include one access as shown on plans.

2.12 DIFFUSER SECTION

- A. Provide on units as shown on the drawings a factory fabricated diffuser section.
- B. Construct diffuser plate of 1/16" thick aluminum with 1/2" diameter holes staggered 5/8" center to center, with a minimum free area of 70%. Anchor plate to the sheet metal housing with angle iron as required.

2.13 ENTHALPY WHEEL HEAT EXCHANGER

- A. The enthalpy wheel assembly shall be ARI certified to ARI 1060 and tested in accordance to ASHRAE 84-2013.
- B. The unit shall have a re-circulation (bypass type) defrost cycle and shall include associated dampers, actuators, and controls.
- C. Enthalpy wheel shall transfer heat between airstreams in a counter flow arrangement.
- D. Wheel shall be cleanable with low-pressure air or vacuum cleaner without degrading the latent recovery media.
- E. Wheel shall be located so that it is easily accessible for maintenance or replacement.
- F. An access section shall be provided upstream and downstream of the enthalpy wheel allowing for service and cleaning of the wheel.
- G. WHEEL MATRIX: The rotary air-to-air heat exchanger(s) shall be equal to Munters/Des Champs Technologies, Airxchange, NovelAire, or Semco. Rotor shall be constructed of rotating honeycomb matrix consisting of a highly selective desiccant, permanently bonded to aluminum. The desiccant material shall be a molecular sieve with pore diameters ranging from 3A to 4A to minimize the carryover of undesirable gases. The corrugated media provides individual flutes to channel the airflow and thus minimize cross contamination and ensure rated performance under all differential pressure conditions. The desiccant coating shall provide corrosion resistance against attack from office, laboratory, hospital, pharmaceutical chemicals, etc., and protection in coastal and marine environments. Ribbon Wheels shall not be used due to excessive air leakage from either side of the wheel.
- H. WHEEL CASING: The wheel frames shall consist of evenly spaced galvanized steel spokes, galvanized steel outer band, and a rigid center hub. The wheel construction shall allow for wheel alignment. The wheel seals shall be brush type and shall be easily adjustable. Brush seals shall be included to separate fresh air from exhaust air across entire surface of air entering side, air leaving side and outer band (all four planes). Additionally, the entire circumference of the rotor shall include brush seal to minimize air bypass. Cassettes shall be fabricated of heavy-duty, reinforced 16-gauge galvanized steel. Bearings shall be outboard-flanged ball bearing with concentric locking collars. Bearings shall be permanently sealed and lubricated for zero maintenance and long life, minimum L-10 life in excess of 400,000 hours. Drive system shall consist of a heavy-duty AC motor driving a self-adjusting, easily replaceable multi-link belt. Heat

exchangers shall be tested in accordance with ASHRAE Standard 84-2013 and ARI Standard 1060.

- I. Variable speed drive and temperature or enthalpy controls for frost prevention shall be provided as scheduled.
- J. Provide a 5 year parts and labor warranty for enthalpy wheel heat exchanger section.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Rigidly install A/C unit modules and base rails on a concrete curb of sufficient height to install properly sized condensate drain.
- B. Provide clearance at each unit for routine service including the changing of filters, removal of coils, bearing replacement, greasing, opening of access doors, pulling of blower shaft, and removal of motors.
- C. Ductwork: Duct connectors to each unit to allow for straight and smooth air flow. Do not install turns at the fan discharge which are in the opposite direction to fan wheel rotation.
- D. Provide flexible connections at duct connections to unit.
- E. Piping:
 - 1. Install di-electric flange kits on both coil water supply and return connections.
 - 2. Support piping independently of coils and with adequate flexibility to prevent undue stress at coil header connections.
 - 3. Install full size drain lines from the drain pan connection and include trap to permit condensate to drain freely.
 - 4. Install service valves on both supply and return lines to coils and install so valves can be shut off, a small section of pipe removed, and coil allowed to slide out.

3.02 START-UP, TESTING, TRAINING

- A. Start-up unit, check for proper performance, motor rotation, air leakage, or infiltration, etc.
- B. Prepare unit for test and balance as required under Section 23 05 93.
- C. Correct deficiencies found by test and balance firm.
- D. Demonstrate and instruct maintenance personnel in the operation of the system.
- E. Do not operate air handling unit without scheduled filters in place. During construction, do not operate air handling unit without scheduled filters and temporary roll filter media in place. Refer to Section 23 41 00: Particulate Air Filtration.
- F. Clean air handling units as required by Section 23 05 00 prior to start-up. Do not store any items in air handling units that are not to be installed in the units at a future time.

END OF SECTION