STANDARD FEATURES

CABINET
- Welded structural base frame primed with zinc rich primer
- Lifting lugs
- Heavy gauge color bond steel casing with rust-resistant grey two part epoxy
- One inch thick 1.5# density neoprene coated fiberglass. The insulation is glued and pinned.
- Out door units complete with sloped roof.

BLOWER/MOTOR
- AMCA rated DWDI centrifugal blower or SWSI plenum fan.
- Polished steel shaft with rust inhibitor.
- Maximum operating speed less than 75% of first critical speed
- Standard heavy-duty industrial bearings
- ODP motor, 1800 RPM, T frame, 1.15 service factor mounted on adjustable base
- Drives designed for 150% motor brake horsepower
- Adjustable V-belt drives used up to and including 5 HP; fixed drives on 7.5 HP and larger

CONTROLS ENCLOSURE
- High and Low airflow pressure switches
- Manual reset high limit
- Factory wired control panel with numbered terminal strip
- Motor starter with overloads
- Control circuit transformer, 120 volt
- Control panel service switch
- Circuit breaker
- Terminal connections for exhaust interlock
- Nationally recognized components, service parts

OPTIONAL FEATURES

WEATHERHOUSING
Control and manifold enclosure
INLET HOODS
Expanded metal screen inlet with optional 2" filters.
FILTER SECTION
V-bank filter section with side access suitable for 2" filters
Hinged access doors completely sealed with gasketing.
WINTER FILTER SECTION
Located on the discharge side of blower.
FILTERS
2" thick permanent, pleated and throwaway filters;
Various efficiency bag filters and HEPA filters complete with filter gauge and/or indicating light.
MOTORIZED INLET & DISCHARGE DAMPER
Parallel blade damper with a two-position spring return actuator and end switch.
ROOF CURB
Prefabricated galvanized roof curb 16" or 24" high; full perimeter available on most units.
BLOWERS
Air foil, and plug fans, double supply fans.
REHEAT
Electric, High Turndown indirect gas fired or hot water/steam coil reheat.
HINGED ACCESS DOORS
Door switches
Special access door gasketing
#310 ventlock fasteners
MUSHROOM HOOD
Air velocity through the inlet ranges between approximately 450 and 550 feet per minute at maximum air capacities listed.
Complete with internal screen for debris.
LOUVERED INLET
Sized for a maximum velocity of 500 FPM to ensure moisture does not enter the unit.
4 WAY DISCHARGE HEAD
The adjustable 4 way discharge head provides 4 equal quantities of air in the conditioned space.
HORIZONTAL DISCHARGE HEAD
180 deg. Vertical and horizontal adjustment with 360 deg. of free rotation.
INTERNAL VIBRATION ISOLATION
Blower and motor isolated on separated frame with R.I.S. or spring c/w canvas connector.
EXTERNAL VIBRATION ISOLATION
Floor mounted or suspended isolation.
SERVICE PLATFORM
Provides access to controls and gas train.
MOTORS
TEFC and high-efficiency, meeting EER and CSA standards and 2-speed.
DISCONNECT SWITCH
Weatherproof enclosure; non-fused or fused.
PACKAGED COOLING
DX Coil, Condenser, Compressor
GIDM TYPE
Indirect Gas Heat (4 - Pass Drum & Tube Heat Exchanger)
GIDMH TYPE
Indirect Gas Heat (4 - Pass Drum & Tube Heat Exchanger), w/High CFM.
BMA TYPE
Direct Gas Heat
BMAE TYPE
Electric Heat
DIDM TYPE
Indirect Gas Heat (4 - Pass Drum & Tube Heat Exchanger)
DIDMH TYPE
Indirect Gas Heat (4 - Pass Drum & Tube Heat Exchanger), w/High CFM.
MTI TYPE
Indirect Gas Heat (Multiple Tube Heat Exchanger)
HTDM TYPE
Indirect Gas Heat (2 - Pass Drum & Tube Heat Exchanger)
HEAT RECOVERY TYPE
Heat Pipe, Heat Core, Enthalpy Wheel, Run Around Glycol
HUMIDIFICATION TYPE
Electric Humidifier, Gas to Steam Humidifier

Additional Options

- *Auto low limit freeze protection control with bypass timer*
- *10 point electronic circuit analyzer with signal lights*
- *Exhaust Interlock Relay*
- *Proof of Closure Valve*
- *Inlet Air Controller (burner economizer)*
- *Ultra violet flame supervision*
- *Audible alarm*
- *Firestat*
- *7-day programmable timeclock*
- *Purge timer*
- *Delay exhaust start*
- *115 volt GFI service receptacle*
- *Marine service light with 100 watt bulb, guard, and lighted switch*
- *High density insulation*
- *2' thick and 4" thick insulation*
- *Motor and bearings out of airstream*
- *JIC wiring*
- *Extended grease lines*
- *Belt guards*
- *Checker plate floor*
- *Walk-in service corridors*
- *Special coatings*
- *Special construction: aluminum, stainless steel, heavier gauge*

TYPICAL SPECIFICATIONS

CASING

The unit exterior casing shall be heavy gauge G90 rated bonderized steel. Unit roof shall feature standing seam construction. The entire unit casing shall be insulated with 1-in. thick 1.5-lb. (2-in. thick 1.5-lb.) fiberglass insulation with hard neoprene backing in a sandwich wall fashion (22-gauge solid liner). The unit exterior shall be finished with industrial enamel (catalyzed epoxy) paint. An integral welded iron channel frame shall support the unit casing. The structural iron frame shall be sandblasted, primed and finished with industrial enamel (catalyzed epoxy) paint.

BLOWER/MOTOR SECTION

The fan section and motor assembly shall be constructed in accordance with the requirements of the Air Moving and Conditioning Association (AMCA). The assembly shall be designed to house the fan(s), bearings, motor, and v-belts, which shall be selected for at least 50% above the rated motor capacity. The fan(s) and motor shall be mounted on a welded unitary base made of angle iron frame. The frame shall be sandblasted, primed and finished with industrial enamel (catalyzed epoxy) paint. The unitary base shall be provided with seismic spring vibration isolation. The blower section shall have a hinged access door with Ventlock handles to allow easy maintenance of filters and belts. The NEMA T-Frame motor shall be mounted on an adjustable base located within the fan section. The blower wheel shall be statically and dynamically balanced, and mounted on a turned, ground and polished shaft with rigid bearing supports. The shaft shall be designed with a maximum operating speed not exceeding 75% of the first critical speed. The bearings shall be split taper lock ball bearing type L20 minimum life of 100,000 hours (L10 200 kHr).

Fan performance shall be based on tests conducted in accordance with AMCA Standard Test Code for Air moving Devices. (All fans shall have sharply rising pressure characteristic extending throughout the operating range and continuing to rise well beyond the efficiency peak to assure quiet and stable operation under all conditions. Horsepower characteristics shall be truly non-overloading and shall reach a peak in the normal selection area.) Fan manufacturer shall provide sound power ratings in the eight octave bands, which shall be based on AMCA Standard 300-67, test, setup number one. Sound power ratings shall be referenced 10-12 watts. A factory dynamic balance shall be made on all fans after their assembly. An IRD or PMC analyzer shall be used to measure velocity, and the final reading shall not exceed 0.1 inches per second. The exact level of vibration shall be recorded on the fan as proof of the final dynamic balance at the factory.

COOLING CONTROLS

Cooling control shall be achieved via a Honeywell T775 multi-stage sequencer. The sequencer shall be controlled with an analog signal provided by the discharge air thermostat. As the discharge air thermostat requires cooling the signal shall increase, thereby turning on the stages at specific set points. The set points shall be set with appropriate offset and differential to ensure accurate discharge temperature is maintained. The stages are to be sequenced without turning on and off of compressors to minimize unnecessary wear on the compressors. Upon sensing a call for cooling from the space, the compressors shall provide full cooling until the space sensor is satisfied, upon which time the cooling shall revert to discharge air control. A low discharge temperature set point with a large differential shall

be set to prevent the compressor from cycling on and off. The compressor will remain on low setting until cooling is disabled manually or the ambient temperature falls below the minimum set point.

ELECTRICAL CONTROL EQUIPMENT

Electrical assembly and components shall be in strict accordance with the latest provisions and requirements of the National Electric Code. Control cabinet shall be designed and constructed to ETL specifications. A safety disconnect switch shall be mounted on the unit. The controls shall be located in a weatherproof cabinet. Provisions for service padlocking shall be provided. The following items shall be located within the cabinet: fuses, starters, control relays, timing and holding relays, resistors and numbered terminal strips. All components shall be labeled and cross-referenced to control and field wiring diagrams. The control circuit shall be 24V, single phase. Wiring shall be neatly run in "PANDUIT" wiring duct. Low and/or line voltage thermostats shall be furnished shipped loose for installation by others. Unit shall be equipped with automatic low limit freeze protection with bypass timer.

DAMPERS & FILTER SECTION

The dampers are to be galvanized steel (aluminum airfoil low leak) type (with seals). The dampers shall be equipped with 2-position (modulating) actuators. The filters shall be 2" pleated throwaway type with minimum of 85% arrestance and 30% efficiency. Filter access shall be through a latched and gasketed access doors located on both sides of the unit. (Final filters shall be 4 or 12 inch high efficiency cartridge filters.)

REMOTE CONTROL PANELS

Remote NEMA 1(12) locking control panel shall be equipped with summer/off/winter switch and blower on, burner on, flame failure and loaded filter lights. (A remote adjustment potentiometer shall control damper positioning.) (An LCD display shall provide system temperature and set points.)

FLUID COILS

Fluid coils are intended for use with water, glycol, or other appropriate heat transfer fluids. Coils are to be designed to maximize performance under specified conditions with minimal air-side pressure drop.
All water coils designed with 1/2” or 5/8” tubes are to be ARI performance certified and shall bear the ARI symbol.
Tubes and return bends shall be constructed from seamless UNS C12200 copper conforming to ASTM B224 and ASTM E527. Properties shall be O50 light annealed with a maximum grain size of 0.040 mm.
Tubes are to mechanically expanded into fins (secondary surface) for maximum heat transfer. Materials are to be 3/8” diameter x (0.014, 0.022) wall thickness, 1/2” diameter x (0.016, 0.025) wall thickness, or 5/8” diameter x (0.020, 0.025, 0.035, 0.049) wall thickness.
Secondary surface (fins) shall be of the plate-fin design using aluminum or copper, with die-formed collars. Fin design to be flat, waffle, or sine-wave in a staggered tube pattern to meet performance requirements.
Collars will hold fin spacing at specified density, and cover the entire tube surface. Aluminum properties are to be Alloy 1100 per ASTM B209, with O (soft) temper; copper is to be Alloy 11000 per ASTM B152-06 with soft (anneal) temper. Fins are to be free of oils and oxidation.

Headers are to be constructed of seamless UNS C12200, Type L (drawn) copper material sized to match specified connection size. Type K (drawn) copper headers and Schedule 40 steel headers shall be offered as optional materials.
Die-formed copper end caps are brazed on the inside of the headers, unless spun-closed (for sizes up to 1-3/8”). 1/4” vents and drains are to be provided for all fluid coils.
Connection material shall be copper, or Schedule 40 steel or red brass pipe. The type of connection is to be sweat type, MPT or FPT, grooved, or flanged as required.
Coil casing material shall be of G90 galvanized steel, 16 gauge minimum. Heavier material, stainless steel, copper, or aluminum casing are to be provided as required.
Intermediate tube supports are to be provided on all coils 48” and longer fin length. Coil casing on top and bottom of coils are to have double-flange construction, allowing for vertical stacking of coils.
All coils are to be brazed with minimum 5% silver content (BCup-3) filler material to insure joint integrity. Low-fuming, flux-coated bronze braze-weld material is to be used for ferrous to non-ferrous joints.
Coils shall be tested at 550 psig using dry nitrogen, submerged under water. Dual-operator verification shall determine that all coils are leak-free.
Fluid coils shall be designed to withstand 300ºF maximum operating fluid temperature, and 250 psig maximum operating pressure.

STEAM COILS

Steam distributing coils (tube-within-a-tube design) should be used for applications where freeze protection is a concern, and entering air temperatures are below 40ºF. Supply steam pressure for steam distributing coils should be a minimum of 5 psig for proper operation and freeze protection.
Modulating control valves should be used with steam distributing coils. Non-distributing type coils should be used only with on-off control valves.
All steam coils are to be ARI performance certified and shall bear the ARI symbol.
Tubes and return bends shall be constructed from seamless UNS C12200 copper conforming to ASTM B224 and ASTM E527. Properties shall be O50 light annealed with a maximum grain size of 0.040 mm.
Tubes are to mechanically expanded into fins (secondary surface) for maximum heat transfer. Minimum wall thickness for steam coils shall be .025 for performance longevity.
Materials are to be 5/8” diameter x (0.025, 0.035, 0.049) wall thickness, or 1” diameter x (0.035, 0.049) wall thickness.
Secondary surface (fins) shall be of the plate-fin design using aluminum or copper, with die-formed collars. Fin design to be flat, waffle, or sine-wave in a staggered tube pattern to meet performance requirements.
Collars will hold fin spacing at specified density, and cover the entire tube surface. Aluminum properties are to be Alloy 1100 per ASTM B209, with O (soft) temper; copper is to be Alloy 11000 per ASTM B152-06 with soft (anneal) temper. Fins are to be free of oils and oxidation.
Headers are to be constructed of seamless UNS C12200, Type L (drawn) copper material sized to match specified connection size. Type K (drawn) copper headers and Schedule 40 steel headers shall be offered as optional materials.
Die-formed copper end caps are brazed on the inside of the headers, unless spun-closed (for sizes up to 1-3/8”).
Steam distributing coils shall utilize a header-within-a-header design to facilitate freeze protection.
Connection material shall be copper, or Schedule 40 steel or red brass pipe. The type of connection is to be sweat type, MPT or FPT, grooved, or flanged as required.

Connections shall be sized to accommodate supply steam and condensate loads. Steam distributing coil connection locations shall be such that steam is distributed adequately among all tubes, and that condensate is removed from all tubes to insure freeze protection.
Coil casing material shall be of G90 galvanized steel, 16 gauge minimum. Heavier material, stainless steel, copper, or aluminum casing are to be provided as required.
All tube sheet holes are to be oversized to allow for free thermal expansion and contraction of tubes during operation. Intermediate tube supports are to be provided on all coils 48" and longer fin length.
Coil casing on top and bottom of coils are to have double-flange construction, allowing for vertical stacking of coils.
All coils are to be brazed with minimum 5% silver content (BCup-3) filler material to insure joint integrity. Low-fume, flux-coated bronze braze-weld material is to be used for ferrous to non-ferrous joints.
Coils shall be tested at 550 psig using dry nitrogen, submerged under water. Dual-operator verification shall determine that all coils are leak-free.
Steam coils shall be designed to withstand 150 psig saturated steam supply pressures with appropriate wall thicknesses.

EVAPORATOR COILS

Evaporator coils are intended for use with a wide range of applications and refrigerant types. Coils are to be designed to maximize performance under specified conditions with minimal air-side pressure drop.
Coils shall be UL recognized as Refrigerant Containing Component. Coils to be used with refrigerant R-410A shall have undergone cycle testing, and shall be safety listed with 750 psig rating.
Tubes and return bends shall be constructed from seamless UNS C12200 copper conforming to ASTM B224 and ASTM E527. Properties shall be O50 light annealed with a maximum grain size of 0.040 mm.
Tubes are to mechanically expanded into fins (secondary surface) for maximum heat transfer. Materials are to be 3/8" diameter x (0.014, 0.022) wall thickness, 1/2" diameter x (0.016, 0.025) wall thickness, or 5/8" diameter x (0.020, 0.025, 0.035, 0.049) wall thickness.
Secondary surface (fins) shall be of the plate-fin design using aluminum or copper, with die-formed collars. Fin design to be flat, waffle, or sine-wave in a staggered tube pattern to meet performance requirements.
Collars will hold fin spacing at specified density, and cover the entire tube surface. Aluminum properties are to be Alloy 1100 per ASTM B209, with O (soft) temper; copper is to be Alloy 11000 per ASTM B152-06 with soft (anneal) temper. Fins are to be free of oils and oxidation.
Headers are to be constructed of seamless UNS C12200, Type L (drawn) copper material sized to match specified connection size. Type K (drawn) copper headers shall be offered as optional material.
Die-formed copper end caps are brazed on the inside of the headers, unless spun-closed (for sized up to 1-3/8").
Evaporator coils shall be designed with brass liquid distributors (as required), and copper sweat suction connections. Distributors shall be capped using soft-solder for ease of cap removal; suction connections shall be capped.
Coil casing material shall be of G90 galvanized steel, 16 gauge minimum. Heavier material, stainless steel, copper, or aluminum casing are to be provided as required.
Intermediate tube supports are to be provided on all coils 48" and longer fin length. Coil casing on top and bottom of coils are to have double-flange construction, allowing for vertical stacking of coils.
All coils are to be brazed with minimum 5% silver content (BCup-3) filler material to insure joint integrity.

Coils shall be tested at 550 psig using dry nitrogen, submerged under water. Dual-operator verification shall determine that all coils are leak-free.
Coils shall be shipped with nitrogen charge to verify leak-free integrity, and to prevent moisture migration into coil.
Coils shall be certified to withstand 750 psig working pressure.

CONDENSER COILS

Condenser coils are intended for use with a wide range of applications and refrigerant types. Coils are to be designed to maximize performance under specified conditions with minimal air-side pressure drop.
Coils shall be UL recognized as Refrigerant Containing Component. Coils to be used with refrigerant R-410A shall have undergone cycle testing, and shall be safety listed with 750 psig rating.
Tubes and return bends shall be constructed from seamless UNS C12200 copper conforming to ASTM B224 and ASTM E527. Properties shall be O50 light annealed with a maximum grain size of 0.040 mm.
Tubes are to mechanically expanded into fins (secondary surface) for maximum heat transfer. Materials are to be 3/8” diameter x (0.014, 0.022) wall thickness, 1/2” diameter x (0.016, 0.025) wall thickness, or 5/8” diameter x (0.020, 0.025, 0.035, 0.049) wall thickness.
Internally enhanced rifled or cross-hatched tubes can be offered as an option.
Secondary surface (fins) shall be of the plate-fin design using aluminum or copper, with die-formed collars. Fin design to be flat, waffle, or sine-wave in a staggered tube pattern to meet performance requirements.
Collars will hold fin spacing at specified density, and cover the entire tube surface. Aluminum properties are to be Alloy 1100 per ASTM B209, with O (soft) temper; copper is to be Alloy 11000 per ASTM B152-06 with soft (anneal) temper. Fins are to be free of oils and oxidation.
Headers are to be constructed of seamless UNS C12200, Type L (drawn) copper material sized to match specified connection size. Type K (drawn) copper headers shall be offered as optional material.
Die-formed copper end caps are brazed on the inside of the headers, unless spun-closed (for sized up to 1-3/8”).
Condenser coils shall be designed with copper sweat connections, and shall be shipped with caps on connections.
Coil casing material shall be of G90 galvanized steel, 16 gauge minimum. Heavier material, stainless steel, copper, or aluminum casing are to be provided as required.
Coils designed for hot-gas applications shall have oversized tube sheet holes for hot gas feeds to allow for free expansion and contraction of tubes during operation.
Intermediate tube supports are to be provided on all coils 48” and longer fin length. Coil casing on top and bottom of coils are to have double-flange construction, allowing for vertical stacking of coils.
All coils are to be brazed with minimum 5% silver content (BCup-3) filler material to insure joint integrity.
Coils shall be tested at 550 psig using dry nitrogen, submerged under water. Dual-operator verification shall determine that all coils are leak-free.
Coils shall be shipped with nitrogen charge to verify leak-free integrity, and to prevent moisture migration into coil.
Coils shall be certified to withstand 750 psig working pressure.

REFRIGERATION COMPRESSORS

Hermetic compressors- Compressors shall be set on resilient neoprene mounts and complete with line voltage break internal overload protection, internal pressure relief valve and crankcase heater. Each unit shall have a minimum of two compressors or single digital scroll compressor. Whereby a unit utilizing two compressors in tandem, the first stage compressor must be a digital scroll operating with a Emerson EC3/EC2 series stand-alone superheat controller with a built in synchronization control for the digital scroll. Unit will provide modulation on cooling. Multiple refrigeration circuits shall be separate from each other. Refrigeration circuits shall be complete with liquid line filter-driers. Service ports fitted with Schraeder fittings and combination sight glass moisture indicators. Units shall incorporate electronic expansion valves and VFD controlled condenser fans operating on a floating head design. Thermostatic expansion valves and hot gas bypass valves will not be accepted. Each system shall be factory run and adjusted prior to shipment. Controls shall include:

- Compressor motor contactors
- Overload protection control
- Cooling relays
- Ambient compressor lockout
- Dual pressure controls
- Anti-cycle timers

Packaged units shall operate down to 50 degrees Fahrenheit as standard. Minus 40 refrigeration systems are available as an option. Compressors shall be located on the side of the unit in a service enclosure complete with hinged access doors.

GIDM/GIDMH TYPE HEAT EXCHANGER & BURNER

The heat exchanger shall be of four pass design with a primary combustion chamber and multi-tube secondary. Internal turbulators or other flue restrictor to boost efficiency are unacceptable. The entire primary heat transfer surface shall be constructed of Type 409 Series stainless steel, and shall be cooled in its entirety by the air to be heated. The secondary heat transfer surface shall also be constructed from Type 409 Series stainless steel. The stainless steel tubes shall be continuously welded into the secondary front and rear header tube sheets to ensure an airtight seal. Mechanically swedging the tubes are unacceptable. All heat transfer surfaces, including headers and the front collector box, shall be inside the casing and in the airstream. The construction of the heat exchanger shall permit free, unrestricted lateral, vertical, and peripheral expansion during the heating and cooling cycle without damage or strain to any part. The heat exchanger shall be designed to prevent contamination of heated air with the product of combustion. A spring loaded pressure relief door with glass view port shall be provided. The entire heater casing shall be lined with a 22 gauge liner.

The heater shall have of a power type 409 stainless steel burner, with integral combustion air blower and motor; combustion air proving switch, removable pilot assembly and positive pilot combustion air supply. The combustion air damper shall be interlocked with the main gas valve to insure a proper air/gas mixture. A solid state programmable safeguard relay with UV Scanner and purge card shall continuously monitor main and pilot flame. The main and pilot valve train to the burner shall be completely factory pre-piped. This assembly shall be wired and include the following minimum components; main and automatic shut off valves and adequate unions and test ports for service. A 6,000 volt transformer shall accomplish ignition of pilot flame. The unit shall be suitable for natural gas and

designed and certified by ETL and C.G.A to provide full gas modulation. Depending on the burner selection, turndown from 100% to 70% of output are achievable.

BMA TYPE BURNER SECTION

Each unit shall be equipped with a wide range fully modulating direct-fired burner capable of 30:1 turndown. The burner shall have stainless steel combustion baffles, non-clogging gas ports, spark-ignition intermittent pilot and flame safeguard system. Burner combustion must be clean and odourless. Combustion efficiency must limit the products of combustion to a maximum of 5 ppm carbon monoxide and 0.5 ppm nitrogen dioxide. The burner profile is to be equipped with adjustable profile plates. A heat-treated glass observation port shall provide a full view of the flame. Hinged access doors are to be provided to allow easy maintenance and inspection for burner, igniter and flame rod.

MTI TYPE FURNACE SECTION

The furnace section shall be positioned downstream of the blower section to ensure it is operating in a positive pressure chamber. The furnace is to be constructed of minimum 16 gauge heavy duty 409 (optional 304) stainless steel tubes. The furnace shall include heavy duty inshot burners.
The furnace section will operate under a negative pressure as induced by the power venter. The power venter will be two speed to provide optimum combustion and efficiency levels on reduced capacities. The power venter shall come standard with a blocked flue switch, and the burner equipped with a flame roll out switch. A modulating electro-mechanical valve will reduce gas flow in response to the signal from the unit mounted PLC. The modulation will allow reduction of capacity down to 1/6 of high fire per furnace.
Indoor units shall be suitable for sidewall venting, and shall come with optional sealed combustion kit.

HTDM TYPE HEAT EXCHANGER

The heat exchanger shall be of two-pass design, made up of at least 16-gauge stainless steel drum and tubes. The primary and secondary heat transfer surfaces shall be constructed of Type 409 series stainless steel, with internal stainless steel high efficiency enhancing baffles. The stainless steel tubes shall be continuously welded into the secondary front and rear header tube sheets to ensure an airtight seal. Units shall be provided with multiple condensate drains. The heat exchanger section shall have an internal radiation shield to maintain a jacket loss of less than 2% of rated output. All heat transfer surfaces, including headers and the front collector box, shall be inside the casing and in the airstream. The construction of the heat exchanger shall permit free, unrestricted lateral, vertical, and peripheral expansion during the heating and cooling cycle without damage or strain to any part. The burner shall be constructed with at least 14-gauge stainless steel and with the air baffles being made up of 430 stainless steel to ensure high durability and life of the burner. The burner assembly shall be a blow through positive pressure type with an intermittent pilot ignition system. Flame supervision shall be with a solid state programmed flame relay complete with flame rod. The unit's burner motor and modulating gas valve must be electronically controlled to guarantee, to the customer, a highly efficient unit at all times and applications. The unit efficiency shall be a minimum of 80% through the entire operating range and shall be independently tested and verified by ETL. The main and pilot manifolds shall be completely factory pre-piped to the burner. This assembly shall be wired and include the following minimum components; main and pilot manual shut-off valves, main and pilot regulators, main and pilot automatic

shut off valves and adequate unions and test ports for unconstrained service. There must also be a means of collecting and disposal of condensate formed in the flue gas by means of a 409 stainless steel flue box with drain and heat exchanger drains. Drains shall be made of copper (stainless steel) tubing.

HEAT WHEEL

The energy recovery enthalpy wheel shall be ARI certified and carry the official ARI certification stamp. The wheel shall be constructed of corrugated synthetic fibrous media, with a desiccant intimately bound and uniformly and permanently dispersed throughout the matrix structure of the media. Rotors with desiccants coated, bonded, or synthesized onto the media are not acceptable due to the delamination or erosion of the desiccant material. Media shall be synthetic to provide corrosion resistance and resistance against attacks from laboratory chemicals present in pharmaceutical, hospital, etc. environments as well as attack from external outdoor air conditions. Coated aluminum is not acceptable. Face flatness of the wheel shall be maximized (+/- 0.032 in) in order to minimize wear on inner seal surfaces and to minimize cross leakage. Rotor shall be constructed of alternating layers of flat and corrugated media. Wheel construction shall be fluted or formed honeycomb geometry so as to eliminate internal wheel bypass. Wheel layers that can be separated or spread apart by airflow are unacceptable due to the possibility of channeling and performance degradation. The media shall be in accordance with NFPA or UL guidelines. The minimum acceptable performance shall be as specified in the drawing/submittals. The desiccant material shall be a 4A molecular sieve to minimize cross contamination. Silica gel and other pore size desiccants are not acceptable due to the possibility of cross contamination introduced by desiccant adsorption. The wheel frames shall consist of evenly spaced galvanized steel spokes, galvanized steel outer band and rigid center hub. The wheel shall allow for post fabrication wheel alignment. The wheel seals shall be a neoprene bulb seals or equivalent. Seals should be easily adjustable. Cassettes shall be fabricated of heavy duty reinforced galvanized steel. Cassettes shall have a built in adjustable purge section minimizing cross contamination of supply air. Bearings shall be inboard, zero maintenance, permanently sealed roller bearings, or alternatively, external flanged bearings. Drive systems shall consist of fractional horsepower AC drive motors with multi-link drive belts.

HUMIDIFIER

The tank and cover shall be 14-gauge stainless steel with Heli-arc welded seams. The burner assembly shall be AGA/CGA certified and tested. The humidifier shall be capable of modulating down to 10% of the maximum steam capacity. The gas train assembly complete with burner/mixing tube assembly, igniter, sight glass, flame rod electrode, gas manifold and gas valve. The heat exchanger shall be tubular stainless steel connected to a stainless steel flue box. The humidifier shall be capable of supporting tap, softened or DI/RO water. The unit shall contain the following features: water make-up valve control, auto drain/flush, end-of-season flush, low water cutoff, modulating steam control, aquastat freeze protection, surface skimmer, support legs, factory insulation, blocked flue safety, service access port and removable cleanout tray. A microprocessor-based controller shall be provided and be capable of both on/off and fully modulating (0-100%) control of humidifier outputs as well as control of all fill and drain functions. A keypad capable of either unit or remote mounting shall be provided as the controller. The keypad shall be capable of monitoring and/or controlling the following parameters: relative humidity set-point and actual space conditions, relative humidity set-point and actual duct conditions for variable air volume applications, relative humidity high limit set-point and actual conditions, total system demand in % of total humidifier capacity, total system output in lb./hr, auto drain/flush frequency

interval and duration, end-of-season drain status and system fault indicator. The unit shall be supplied with a stainless steel dispersion assembly complete with calibrated orifice tubelets. Provided assembly for connection between humidifier and dispersion tube assembly.

HEAT PIPE COIL

Heat pipes shall be constructed of 1" I.D. seamless, integrally finned aluminum tubing. Heat pipes shall be arranged in the heat pipe coil with a maximum of 2-1/8" on center on the face and 1-7/8" on center row to row. Heat pipe fin surface shall be integral to the heat pipe container wall and shall have a minimum of 0.017" mean fin thickness. Fins shall be tapered root to fin tip. Fin surface from the root to the fin tip shall have a minimum of 0.437" mean fin height. Heat pipes shall have a capillary wick structure integral to the heat pipe container wall. Heat pipes shall be of one piece construction. Two component heat pipes such as expanded tube to fin shall not be allowed. Heat pipe working fluids shall be R-134a or be selected on the basis of heat pipe operating temperature and compatibility with heat pipe container material. Heat pipe shall be individually processed, charged, hermetically sealed and factory tested. Heat pipe coils structural frame shall be fabricated from a minimum of 16 gauge galvanized steel. The heat pipe coil shall be supplied with a minimum of 2-inch wide flanges on all four sides both front and back. Intermediate supports shall be furnished as required. Heat pipe coils shall be provided with a partition to isolate the airstreams and prevent cross contamination. The partition shall be at the centre unless otherwise specified. The partition shall be fabricated from a minimum of 16 gauge galvanized steel and shall extend beyond the finned surface with 4-inch flanges. Both front and back are to be flush with the frame. End covers shall be provided to protect the heat pipe ends. End covers shall be fabricated from a minimum of 16 gauge galvanized steel. Additional specifications for other configurations available upon request.