

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Outdoor or Indoor Air Handling Unit with electronic commutated motor integrated in the fan, indirect gas heater, direct evaporative cooler and unit control system.
- B. Unit accessories, intake hood, down turn plenum, motorized dampers, filters and roof curb.
- C. Controls for standalone unit or building management system and sequence of operation.

1.2 SUBMITTALS

- A. Product Data: Provide products and assemblies required. Indicate water, drain, gas and electrical rough in connections.
- B. Submit manufacturer's shipping and lifting instructions.
- C. Operating and Maintenance Instructions: Include manufacturer's descriptive literature, operating instructions and maintenance.

PART 2 – PRODUCTS

2.1 AIR HANDLING UNIT DESCRIPTION

- A. System description: Provide a packaged air handling unit with factory installed direct evaporative cooling module, indirect gas heating module and complete control system factory mounted on rails for roof curb or perimeter support mounting. Unit is designed for 100% makeup air replacement or return air option. Unit is built in modular sections with a continuous perimeter base frame, double wall construction with no insulation in the airstream.

2.2 UNIT CONSTRUCTION

- A. Base: The unit is built on a 14 gauge formed G90 galvanized base bolted together. The top of the base is provided with a closed cell gasket to form a seal between the base and the modular sections. Integral lifting points are provided to allow for ease of lifting.
- B. Casing: The unit casing consists of a 1" square tube extruded aluminum framing system for maximum strength and minimal deflection. The casing consists of 20 gauge inner and outer panels of aluminized steel (option; 304 Stainless steel) to form a double walled unit. Each panel has 1" thick 2.8# density mineral wool insulation to provide a R8 insulating factor. Insulation directly in the airstream is not acceptable.
- C. Access: Unit is designed to have hinged or lift out panels with handles to allow full access to all components requiring service and maintenance without compromising the integrity of the unit. All panels are secured to the unit frame with rivet nuts and bolts that require tool to open, a closed cell gasket is secured to the frame to insure a weathertight seal.

2.3 SUPPLY FAN SECTION

- A. Fan: Supply fan must include an electronic commutated (EC) motor and integral control electronics based on ebmpapst Radipak or equal. The fan is a high efficiency plenum type backward incline impeller, low noise emissions and entire motor and impeller dynamically balanced for low vibration so that internal isolation is not required. Separate fan and motor

assemblies must be direct drive statically and dynamically balanced as a complete assembly, prior to installation into the air handler. Belt driven fans are not acceptable and must not be used.

- B. Motor: The integrated fan and motor assembly by GreenTech. Motor has maintenance free bearings and brushless commutation. AC motors are not acceptable. Motor includes built in optimized electronic communication for high operational efficiency at part load and minimum 10:1 modulation range with a 0-10vdc control signal. All motors must include outdoor rated fittings, alarm relay, control and communication.

2.4 HEATER SECTION

- A. Heater: The heater shall be modular and is complete with an indirect gas fired 409SS tubular heat exchanger with in shot burners, spark ignition, self-diagnostic control, and variable speed induced draft fan to provide 5:1 (Option; 10:1) modulating turndown for fine temperature and efficiency control. Heater is ETL listed to ANSI standard Z83.8. The heater efficiency shall be 80% + efficient through the complete firing range.
- B. Heat Exchanger: The heat exchanger has integral formed dimples to provide high efficiency without the use of turbulators. A direct ignition control system with LED fault indicator provides reliable light off, systems that utilize pilots or hot surface ignition are not acceptable.
- C. Efficiency: Heater is designed to maintain the proper air/fuel ratio at all times to insure complete combustion and designed efficiency. When there is an altitude adjustment the combustion pressure set point adjusts the inducers performance to match the heaters air/fuel curve from the reduced gas pressure at the manifold. Heaters that do not utilize this technology are not acceptable.

2.4.1 DAMPERS

- A. Dampers: Unit shut off and control dampers are to be opposed blade, low leakage type certified by AMCA to Standard 500-D-07, Class 2 for air and leakage performance. Dampers are to be constructed of extruded aluminum for both the frame and airfoil blades, galvanized dampers are not acceptable. The blades have thermoplastic rubber edge seals and the jambs and gears are reinforced polypropylene. Actuators must be direct coupled to a square control pin on the damper. Control linkage and jackshafts are not acceptable.
- B. Actuators: Damper actuators are 24 volt, direct coupled to the damper control pin, with end switch and spring return, Actuators are wired back to the main control panel in conduit.

2.4.2 DIRECT EVAPORATIVE SECTION

- A. Evaporative Cooling: The direct evaporative cooling section shall be constructed from 20 gauge, single wall aluminized steel, with vacuum formed PVC sump and header. The water connections consist of a 3/8" makeup water and 3/4" drain and overflow connections which are stubbed out the unit base on the same side.
- B. Evaporative Media: The evaporative media shall be Munter's CELdek (GLASdek UL fire rated) with Green Guard listing to meet Title 24 emission standards. Media is 12" deep with saturation efficiency of 88% at 500 FPM face velocity. Media must be sized for a maximum of 500 FPM.
- B. Sump Pump: A premium cooler pump, designed for mounting inside the sump vertically with stainless steel shaft and plastic body. Pump motor to have sealed bearings, and double shaft seal. Continuous duty pump is thermally protected and able to operate dry without damage.
- C. Internal Piping: Piping system to be constructed of PVC pipe with bleed valve, float type fill valve and combination overflow and drain connections. Water distribution to be via large

cross impingement orifices to prevent clogging and promote even water distribution across the media.

2.4.3 DX COOLING

- A. DX Coil: The DX coil shall have a galvanized frame with 1.5" flanges, tubes are 5/8"OD copper with, 0.020" tube wall and 0.006" aluminum fins, (3,4,5 or 6) rows with carbon steel connections with 0.5" FPT vent and drain on the end caps.
- B. Coil section: The coil section walls roof and floor are constructed from 20 gauge, insulated double wall, aluminized steel. A removable panel is provided to allow coil access and removal. Coils are mounted in galvanized racks and screwed in place. The condensate pan is constructed from 20 gauge 304 stainless steel and shall be designed to extend past the cooling coil a minimum of ¼ the coil fin height. The pan is double sloped with condensate drain stubbed out the side casing for trapping by the installing contractor.

2.4.4 CONTROLS

- A. Unit controls: The unit must be complete with an open protocol DDC controller set up for stand-alone function or connection to a BMS system. Unit mounted and wired controls shall be factory programmed with pre-set parameters that can be field adjusted or controlled with the optional equipment touch remote. Monitor points include fan status, airflow status, ambient temperature, discharge temperature, space temperature, filter status, sump conductivity, cooling status, and heater status. Controller uses BACnet as the native language with open protocol for LONworks, Modbus and N2
- B. Remote Panel: Unit shall be provided with a standalone remote control panel and include a switch for off, vent, heat and cool, temperature selector switch and alarm lights for burner lockout, and dirty filters. Remote panel is 24 volt and is shipped loose for field mounting and wiring by installing contractor.

2.4.5 OPTIONS & ACCESSORIES

- A. Provide unit with a double wall, insulated turndown plenum with extended base for roof curb mounting. Casing shall be same as section 2.2B
- B. Intake air hood sized for 500 FPM face velocity and is complete with a ½" x ½" bird screen and 1" (2" option) deep washable filters. Hood is constructed with the same material as the unit.
- C. Final Filters: 2" deep MERV 8 (11 option) pleated media mounted in a v-back arrangement up stream of the supply fan.
- D. Roof curb: Unit is provided with a 14" high, flat full perimeter roof curb with 1"x4" wood nailing strip is shipped knocked down for assembly at the site by the installing contractor.
- E. Automatic Fill/Drain and Freeze Protection: (Option) Provide units with automatic 2-way drain valve and 3-way makeup valves shipped loose for mounting below the roof or roof mounted with weather covers by installing contractor. Valves are set to dump down the sump based on time of day setting or ambient sensor set at 40 degrees programmed in the unit controller During winter the sump and water line should be drained and cleaned.
- F. Option; Programmable equipment touch and room sensor with digital screen to allow selection of factory allowed preconfigured control parameters. Equipment touch is shipped loose for installation by the controls contractor.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Coordinate installation of units with architectural, mechanical, and electrical work.
- C. Provide initial start-up and shut down by factory trained service personnel during first year of operation.
- D. Mount roof top unit on a factory fabricated roof mounting frame. Provide watertight enclosure to protect ductwork and utility services. Install roof mounting frame level.
- E. All drain stub outs must be properly trapped and run to a drain in accordance with local codes.
- F. Unit must not be used for temporary heating or cooling, during construction. Unit must have all services and ductwork connected and the complete start up sheets filed in and on file no later than 14 days after completion for manufacturer's warranty to be in effect. If the startup sheets are not received the unit warranty is void.