



Williams Applied Group – C4-510 East Memorial Road, Oklahoma City, OK 73114 – 405.286.4407

Division 15 – Mechanical – **Integrated Piping System**

Section 15761

Integrated Piping System - Terminal Units – Terminal units shall be suitable for application in service/domestic hot water and cold water system. The system design substantially reduces materials requirements for the project by utilizing common distribution for both service water and HVAC. Both hot water and cold water domestic systems shall be connected to the fan coil for heating and cooling. Return piping design shall be direct; with or without economizer design, as shown on the plans. The domestic cold water shall be totally isolated from the mechanical system chilled water in accordance with local codes, which would include a double wall, stainless steel heat exchanger or local code approved isolation of refrigerant from the domestic water supply. Terminal units shall include onboard control board with built in daily purge cycle on both heating and cooling valves in accordance with EPA guidelines LCR (lead and copper rule); all components shall meet ANSI standards limit for TAC (Total Allowable Concentration) and SPAC (Single Point Allowable Concentration) for lead.

Part 2- Products

2.01 CONCEALED and CABINET STYLE FAN COIL UNITS

- A. Horizontal, Vertical, Standard or High Performance Terminal Units:
 1. Basic Unit: Furnish and install Williams Applied Group Model LHR Horizontal, HHR, CVB, ERB Concealed or Cabinet Style version Direct Drive IPS Terminal unit or approved equal where indicated on plans and in the specifications. Units shall be completely factory assembled including valve package tested through the complete assembly and shipped as one piece. Units shall include chassis, return air plenum, coil, and insulation, low-flow high-latent Chilled Water Coil and / or Heating Water coils, removable positive sloped 1500 hour salt spray certified condensate trays with external insulation, and filter. Units shall be ETL, UL, or CSA-US listed in compliance with UL/ANSI Standard 1995, and certified as complying with the current edition of ARI 440.
 - a. IPS Terminal units complete with IPS valve packaged brazed to coil must be pressure tested as a complete assembly prior to shipment by the manufacturer at 350 psig compressed air.
 - b. Unit shall be fabricated of heavy gauge galvanized steel panels able to meet 125 hour salt spray test per ASTM B-117; except condensate tray which shall be epoxy powder coated to meet 1500 hour salt spray test per ASTM D1654, ASTM D714.



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- c. Ceiling mounting shall be to 90 degree opposed slots, die cut into unit top panel integrated with side panel to ensure entire unit is supported, and has withstood seismic events exceeding Richter Magnitude 6.0 or greater; with isolators and threaded rod as described in the documents.
 - d. All concealed units shall have a minimum 1" duct collar on the discharge. Plenum units shall have a minimum 1" duct collar on the return.
 2. Cabinet Insulation: All exterior panels shall be insulated with 1/2" thick, 1.5 pound per cubic foot, dual density fiberglass insulation rated for a maximum air velocity of 3600FPM. Insulation shall conform to UL 181 for erosion and NFPA 90A and 90B for flame spread (25) and smoke developed (50) rating per ASTM E-84 and UL 723 and CAN. /ULC, S102-M88.

OPTION: ½" foil face insulation conforming to UL181 for erosion, NFPA 90A and 90B for flame spread (25) and smoke developed (50) rating per ASTM E-84 and UL 723 and Can./ULC. Foil insulation shall meet or exceed the requirements stated above, and in addition, meet ASTM Standards C665 and C-1136 for biological growth in insulation.

OPTION: Provide Elastomeric Closed Cell Foam Insulation in lieu of standard. Insulation shall conform to UL 181 for erosion and NFPA 90A for fire, smoke and melting, and comply with a 25/50 Flame Spread and Smoke Developed Index per ASTM E-84 or UL 723. Additionally, insulation shall comply with Anti-microbial Performance Rating of zero, no observed growth, per ASTM G21. Polyethylene insulation is not acceptable. NOT recommend in high humidity applications.
 3. Coils: ½ inch O.D. (minimum) seamless copper tubes with .016" tube wall thickness in a low flow high delta T design.
 - a. All cooling and heating coils shall optimize rows and fins per inch to meet the specified capacity at 10 degree delta T in cooling and 20 degree delta T in heating.
 - b. All coils shall be hydrostatically tested at 350 PSIG air pressure under water, and rated for a maximum of 300 PSIG working pressure at 180°F maximum water temperature. Coils shall be retested as part of a complete unit.

OPTION: Coil casing shall be fabricated from 304 Stainless Steel.



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- c. All coils shall be provided with a manual-air vent fitting to allow for coil venting.

OPTION: Provide automatic air vents in lieu of manual-air vents.

- d. Cooling and heating coils shall be in the common coil casing, heating coil shall be furnished in the re-heat position.

- 4. Self-Draining Condensate Pan: Primary condensate drain pan shall not hold water but divert condensate out of unit; shall be single wall, heavy gauge galvanized steel, epoxy powder coated to meet 1500 hour salt spray test per ASTM D1654, ASTMD714, less than 1500 hour certified, or shall be minimum type 304 stainless steel.
 - a. The drain pan shall be externally insulated with closed cell foam insulation. The insulation shall carry no more than a 25/50 Flame Spread and Smoke Developed Rating per ASTM E-84 and UL 723
 - b. Fungi resistant per ASTM G21/C1338, bacteria resistant per ASTM G22 and mold growth per UL 181.
- 5. PSC motor blower assembly: Unit fan shall be a dynamically balanced, forward-curved, DWDI centrifugal type constructed of heavy gauge zinc coated galvanized steel for corrosion resistance.
 - a. The fan assembly shall be easily removable for servicing. The entire fan assembly shall be able to come out of the unit by removing two wing nuts and unplugging the motor. The blower assembly must remove to the rear of the unit on concealed ceiling units.
 - b. Cabinet unit fan assemblies shall be easily serviced through an access panel provided.

(Optional: Brushless DC Motor: Brushless DC or electronically commutated (ECM) DC motor with permanent magnet rotor. Brushless DC motor shall be furnished with an integral microprocessor based controller that includes sensorless constant flow operation by automatically adjusting to performance in response to system pressure changes at the design CFM output based on preset three speed logic (alternate: ComforTrac Logic and a completely variable 0-10Vdc signal).

- a. Motor shall be characterized for the individual unit and pre-programmed to deliver variable CFM at variable system pressure by



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automatically adjusting to the speed-torque curve of the motor. Speed tapped motors are not acceptable.

1. (Alternate: ComforTrac™ Design CFM shall start at medium speed and based on Input from the factory supplied unitary controller and room sensor/thermostat/humidity sensor “track” the load in the space.)
 2. (Alternate: Factory supplied controller shall be BTL Certified open BacNet compatible. Motor shall be direct mounted to blower with heavy gauge wire frame and rubber isolators, automatic reset thermal overload protection.
 3. Voltage as listed on schedule.
6. Filters: All plenum and exposed units shall be furnished with a minimum 1” nominal glass fiber throwaway filter. Filters shall be sized to prevent air bypass. Plenum filters shall be easily removable from the bottom or rear of the unit without the need for tools.
- OPTION: Self-seal MERV 7 progressive density 2 ply panel filter.
- OPTION: 2” MERV 13, nano-substrate enhanced pleated filter.
7. Electrical: Units shall be furnished with single point power connection. Provide an electrical junction box with terminal strip for motor and other electrical terminations. The factory-mounted terminal wiring strip consists of a multiple position screw terminal block to facilitate wiring terminations for the electric control valves and thermostats.
8. Factory Mounted Hydronic Piping Package: Shall be factory brazed and tested ASTM B 88, Type L copper tube with wrought-copper fittings and 15% silver Sil-Fos™ or equivalent brazing material; no-lead.
- Valve shall be Caleffi or Belimo 2-way or three way valve meeting current ANSI std. 61 for in-line components, Annex F.
- a. Label piping to indicate service, inlet, and outlet.
- Option: Two-way, modulating (variable GPM) characterized port ball type control valve for chilled-water coil rated at 200 psig close-off pressure – standalone – no communications, leaving air temperature sensor – Williams SmartValve).



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Option: Two-way, modulating (variable GPM) characterized port ball type control valve for hot-water heat coil rated at 200 psig close off pressure).

- b. Two-Piece Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600 psig minimum CWP rating and blowout-proof stem.

Option: Piping package shall consist of 0-10Vdc fully proportional characterized ball valve, LAT controlled to ComforTrac™ SmartLogic. The units shall be self-balancing which does not eliminate the requirement to balance main piping loops. The control valve shall eliminate the requirement for automatic flow control valves, strainers and test ports at the unit. The system water quality is determined by the requirements of the domestic system, the fan coil units only system affect is temperature change, the water is re-circulated, maintaining minimal flow in the system to avoid stagnation or dead legs. The **Terminal** units must be sized for the domestic water temperature as appears on the schedule.

- a. DESIGN REQUIREMENTS: The individual terminal units shall be selected with a high latent, low flow high delta T coil design. The local logic supplied by the manufacturer of the terminal unit shall certify the following:
 - c. Design capacity at 10 degree delta T, with 50 degree Fahrenheit entering cold water temperature and 140 degree entering hot water as detailed in schedule.
 - d. Coil in cooling shall maintain latent capability

Option: LAT control shall be variable to track load; water flow only).

Option: Control logic shall include function to gradually increase unit capacity in response to increased room loads based on differential to set point and the rate the space is satisfied.)

Option: Control shall accept setback of temperature input from BMS.

OPTION: Dehumidification options require alternate control.

- 10. Basic Unit Controls: On board controller shall provide purge cycle daily for both hot and cold water supply and allow application of all 24 volt thermostats suitable for fan coil application.



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- a. Control voltage transformer. Verify control features with manufacturer.
- b. Wall mounted thermostat with the following features: Mode switch, fan on-auto switch, cooling set point adjustment, heating set point adjustment, temperature sensor, degree F or C indication.

Option: BACnet Direct Digital Controller: KMC BACnet, 4 x 4, AHU Controller: Factory supplied controller shall be BTL Certified Open BacNet with the following capabilities factory preset, but field changeable: Unoccupied settings, unit supply-air discharge temperature settings, space humidity set point, dead-band settings, data trend logging, BTU metering capability, controller shall have volatile-memory backup.)

(Alternate: Hydronic Cooling Coil Operation:

- a. Occupied Periods: Blower soft start to 70% rated CFM and control valve will modulate (vary the GPM) to maintain programmed discharge air temperature and shall increase capacity, if required, until space temperature is satisfied. CFM will modulate down as the space temperature set point is approached and maintain LAT to increase Delta T.
- b. Unoccupied Periods: Blower soft start to 70% and control valve will modulate (vary the GPM) to maintain programmed discharge air temperature until unoccupied space temperature setting is satisfied. CFM will modulate down as the space temperature is approached.)

(Alternate: Hydronic Heating Coil Operation:

- a. Occupied Periods: Blower soft start to 50% of rated CFM and control valve will modulate (vary the GPM) to maintain programmed discharge air temperature and shall increase capacity, if required, until unoccupied space temperature setting is satisfied. Fan will modulate down as the space set point is approached and maintain LAT to increase Delta T.
- b. Unoccupied Periods: Blower soft start to 50% and control valve will modulate (vary the GPM) to



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maintain programmed discharge air temperature until unoccupied set point is satisfied. Fan will modulate down as the space set point is approached.)

(Alternate: Dehumidification Operation:

a. Humidity Control for Occupied Periods: In the Deadband on a call for dehumidification, the coil will go into sub-cooling mode to remove excessive moisture and deliver load neutral air to the controlled space. The unit will not over cool, the space will not over cool and the unit operation shall comply with the Florida Building Code 2004, Chapter 13 Florida Energy Efficiency for Building Construction, and ASHRAE 90.1.

b. Humidity Control for Unoccupied Periods: On a call for dehumidification, the coil will go into sub-cooling mode to remove excessive moisture and deliver load neutral air to the controlled space. The unit will not over cool, the space will not over cool and the unit operation shall comply with the Florida Building Code 2004, Chapter 13 Florida Energy Efficiency for Building Construction, and ASHRAE 90.1.)

Optional: BAS Interface Capabilities: With proper networking, can provide BACnet interface for central BAS workstation for the following functions:

- a. Adjust set points.
- b. **Terminal** unit start, stop, and operating status.
- c. Data inquiry, including supply- and room-air temperature and humidity.
- d. Occupied and unoccupied set points.