Guide Specifications

Uniflair LE ™ Water-Cooled and Energy Saving Direct Expansion (DX) Cooling Systems

THIS GUIDE SPECIFICATION IS WRITTEN IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS INSTITUTE (CSI) MASTER FORMAT. THIS SECTION MUST BE CAREFULLY REVIEWED AND EDITED BY THE ARCHITECT OR THE ENGINEER TO MEET THE REQUIREMENTS OF THE PROJECT. COORDINATE THIS SECTION WITH OTHER SPECIFICATIONS SECTIONS IN THE PRODUCT MANUAL AND WITH THE DRAWINGS. WHERE REFERENCE IS MADE THROUGHOUT THIS SECTION TO "PROVIDE", "INSTALL", "SUBMIT", ETC., IT SHALL MEAN THAT THE CONTRACTOR, SUBCONTRACTOR, OR CONTRACTOR OF LOWER TIER SHALL "PROVIDE", INSTALL", "SUBMIT",ETC., UNLESS OTHERWISE INDICATED. THIS SECTION IS WRITTEN TO INCLUDE THE 2004 MASTER FORMAT AND THE 1995 MASTER FORMAT VERSIONS. WHERE APPLICABLE THESE ITEMS ARE BRACKETED AND, IN EACH CASE, UNLESS OTHERWISE INDICATED, THE FIRST CHOICE APPLIES TO THE 2004 MASTER FORMAT AND THE SECOND CHOICE APPLIES TO THE 1995 MASTER FORMAT.

PART 1 - GENERAL

1.1 SUMMARY

A. The environmental control system shall be designed specifically for precision temperature and humidity control applications. It shall automatically monitor and control cooling, heating, humidifying and dehumidifying, as well as filtering functions for the conditioned space. The system shall be built to the highest quality engineering and manufacturing standards and shall be floor mounted and configured for either (downflow) or (upflow) discharge of conditioned airflow with either (front), (bottom), and (rear) return airflow. The draw through air pattern shall provide uniform air distribution over the entire face of the cooling coil.

1.2 DESIGN REQUIREMENTS

A. The system shall be described in the following specification as manufactured by Schneider Electric

- Model:_____
- Total cooling capacity: _____ kW (MBH)
- Reheat capacity: _____ kW (MBH)
- Sensible cooling capacity: _____ kW (MBH)
- Return air temperature: _____ºC (ºF) DB
- Return air temperature: _____ ºC (ºF) WB
- Humidity: _____% RH
- Air quantity: _____ L/s (CFM)
- External Static Pressure _____Pa (in. WC)
- Humidifier capacity: _____ kg/hr (lbs/hr)
- Electrical supply: _____ V, _____ ph, 60 Hz

1.3 SUBMITTAL

A. Submittal are provided with the proposal and shall include the following: capacity data, electrical data, physical data, and electrical and mechanical piping connections.

PART 2 - PRODUCTS

2.1 CABINET AND FRAME CONSTRUCTION

A. The structure of the unit shall be characterized by a metal framework and internal parts made from hot zinc plated sheet steel.

B. These profiles are connected together by structural rivets designed to ensure sturdy assembly and which are capable of withstanding severe transportation and handling conditions. The units are also equipped with internal panels for shutting off the compartments affected by airflow; these internal panels are made from hot zinc plated sheet metal and ensure the following:

1. Reduction in the noise transmitted through the paneling
2. Air tightness even without external panels so that the units can also operate with the doors open during servicing
3. The possibility of inspecting the internal elements without interfering with the operation of the unit and, more importantly, with the unit in operation

C. The external panels shall be 1-mm thick, coated on the external side with RAL 9003 epoxy-polyester paint, which guarantees long-term durability. The front panels are attached to the framework by means of rapid coupling fasteners. The external panels are double-walled, lined with fiberglass heat-insulating material 15 mm (0.59 in.) in thickness and 20 kg/m^3 (.00073 lbs/ $in.^3$) of density.

2.2 FAN/BLOWER SECTION

A. Electronically Commutated Fans

1. Shall be plug/type, single inlet, and are dynamically balanced. The drive package is direct drive, electronically commutated (EC), and variable speed. The fans shall be located to draw air over the coil to ensure even air distribution and maximum coil performance.

   a. TD/U*V0511: The single fan motor shall be 3.8 hp being able to generate a nominal 5946 CMH (3500 CFM) at 50.0 Pa (0.20 in. WC) external static pressure.
   b. TD/U*V0921: The single fan motor shall be 4 hp being able to generate a nominal 8155 CMH (4800 CFM) at 50.0 Pa (0.20 in. WC) external static pressure.
   c. TD/U*V1121: The dual fan motor shall be 4 hp being able to generate a nominal 12 062 CMH (7100 CFM) at 50.0 Pa 0(.20 in. WC) external static pressure.
   d. TD/U*V1422: The dual fan motors shall be 4 hp each being able to generate a nominal 15 630 CMH (9200 CFM) at 50.0 Pa (0.20 in. WC) external static pressure.
   e. TD/U*V1622: The dual fan motors shall be 4 hp each being able to generate a nominal 15,800 CMH (9300 CFM) at 50.0 Pa (0.20 in. WC) external static pressure.
   f. TD/U*V1822: The dual fan motors shall be 4 hp each being able to generate a nominal 15 800 CMH (9300 CFM) at 50.0 Pa (0.20 in. WC) external static pressure.
   g. TD/U*V2242: The triple fan motors shall be 4 hp each being able to generate a nominal 20 388 CMH (12,000 CFM) at 50.0 Pa (0.20 in. WC) external static pressure.
   h. TD/U*V2542: The triple fan motors shall be 4 hp each being able to generate a nominal 20 388 CMH (12,000 CFM) at 50.0 Pa (0.20 in. WC) external static pressure.
   i. TD/U*V2842: The triple fan motors shall be 4 hp each being able to generate a nominal 20 388 CMH (12,000 CFM) at 50.0 Pa (0.20 in. WC) external static pressure.

2.3 RETURN AIR FILTERS

A. The standard return air filters shall be MERV 8 per ASHRAE Standard 52.2.

1. Return air filter shall be 95-mm (3.7-in.) deep, pleated, and replaceable from the front of the unit.

B. The optional air filter shall be MERV 13 per ASHRAE Standard 52.2.

1. Return air filter shall be 95-mm (3.7-in.) deep, pleated, and replaceable from the front of the unit.

2.4 UNIFLAIR LE CONTROLLER WITH 7-IN. LCD TOUCH SCREEN DISPLAY

A. The microprocessor controller shall utilize proportional/integral/derivative (PID) logic as a precision control method, allowing for custom tuning of control variables to achieve desired system response.

1. Shall manage unit operation
2. The controls shall be composed of the following components.

    a. Microprocessor control board housed inside the electrical cabinet.
    b. Seven-inch LCD touch screen display (color) externally mounted and viewed from the front of the unit.

3. The microprocessor control board shall contain the settings and programs of all the stored operating parameters which can be used, viewed, and set on the user display interface (touch screen display).
4. The user interface (7-in. LCD touch screen display) shall be externally mounted, password protected, and menu driven.
5. The user interface (7-in. LCD touch screen display) shall allow modification of adjustable parameters.

B. Network Management Card

1. The unit shall include a network management card embedded in the touch screen display (user interface) to provide management through a computer network TCP/IP (MODBUS, SNMP, StruxureWare, or Web).
2. Management through the network shall include the ability to change setpoints and view and clear alarms.

C. User Interface (LCD Touch Screen Display)

1. The user interface shall consist of the following:

    a. Seven-inch LCD touch screen display to move between screens and change parameters.
    b. Network Management Card

2. The microprocessor board is connected to the user interface (display) by a mini-HDMI cable.

D. Controller System Functions

1. Temperature and Humidity Control based on adjustable setpoints.
2. Alarm signaling local or via remote
3. Alarm History, logs 100 recent events with date and time stamp
4. Alarm signal contacts configured on the User Interface (Touch Screen Display)
5. "Automatic Restart" after power is restored
6. Remote unit on/off
7. Two levels of password protection

    a. Settings Menu
    b. Service Menu

8. Clock/date functionality
9. Hour Meter calculates operating hours and start up cycles of major components
10. View status of all unit components and sensors connected to the control board.
11. Manage LAN Network with the potential of programming (one (1) unit) rotating or (two (2) stand-by) units and operating these units "Setback Mode" settings based on average temperature.
12. "Manual Override" function shall allow manual control of the main components without excluding possible remote control.
13. Communication with a supervision system using the RS485 serial board, LON FFT10 by TREND and PCOWEB.
14. Symbols appear on the user interface (touch screen display) to show status of unit and components.
15. Potential of setting a dual setpoint for temperature (in both cooling and heating) and humidity (both when dehumidifying and humidifying), which can be modified from a remote terminal.

E. User Interface (Touch Screen Display) Menu

1. Language Selection: The user interface (touch screen display) shall display the language that has been defined by the regulation program selected in the flash memory options (EN = English, SP = Spanish, FR = French).
2. Imperial Measurement Selection: Shall display options for conversion of the following parameters:

    a. Celsius to Fahrenheit
    b. Bar to PSI
    c. Pascal to inches H_2O

3. Program Identification: Shall display the firmware configuration of the system.

    a. Firmware revision number
    b. Firmware revision date
    c. Product family

4. Status Screen(s): The user interface (touch screen display) shall display essential information of the system state.

    a. Overview Screen

        1. Displays room temperature and the percentage of humidity.
        2. Displays the information regarding unit status.
        3. Displays active alarms.

    b. Home Screen: Used to navigate to other screens.
    c. Alarms Screen: Used to display active alarms.

d. About Screens: Used to display software version, bios, boot, and unit serial number.
e. On/Standby Screen: Used to put the system into operation or standby mode.
f. Set Points Screen: Used to adjust the setpoint values
g. Configuration Screen: Used to configure (cooling unit is pre-set in the factory: any changes will require a pass code).

    1. The unit parameters
    2. Display (Imperial or Metric)
    3. Factory system defaults
    4. Network connectivity

h. Logs Screen: Used to display the event log and export log data.

F. Setpoints

1. Temperature and humidity setpoints shall be pre-set at the factory so the control functions correctly, maintaining standard conditions in the room. This screen shall display the following:

    a. Return Air Setpoint
    b. Return Air Temperature Sensitivity
    c. Humidification Setpoint, Relative Humidity
    d. Humidification Proportional Band Relative Humidity
    e. Dehumidification Setpoint, Relative Humidity
    f. Dehumidification Proportional Band Relative Humidity
    g. Heat Setpoint
    h. Heating Sensitivity
    i. Second Heat Setpoint
    j. Setpoint External Offset Temperature Range Start
    k. Setpoint External Offset Temperature Range End Delta
    l. Supply Air High Temperature Alarm
    m. Setpoint External Offset Voltage Range Start
    n. Setpoint External Offset Voltage Range End
    o. Offset Setpoint Anti-Hunt Time

2. Sleep Mode Settings: Shall allow a standby unit to activate and take control of the room conditions. The activation from "Sleep Mode" shall be programmed according to desired environmental conditions. This "Sleep Mode" shall be used in a "Cooling Assist Mode" in conjunction with grouping to allow a standby unit in the group to activate when the following is not met:

    a. Cooling Setpoint
    b. Heating Setpoint
    c. Fan Cycle
    d. Fan Cycle Time
    e. Dehumidification Setpoint
    f. Humidification Setpoint

3. Counter/ Run Hour Meter Settings: Shall enable setting the maintenance intervals for the components of the unit, establishing a threshold for operation hours. When a component reaches the limit, the microprocessor shall signal the maintenance request on the user interface (touch screen display).

4. Alarm Relay Settings: Shall enable a status change of the alarm signal contact type (N.C. or N.O) for Alarm "A" and "B".
5. LAN (Grouping) Settings: Uniflair LE microprocessor shall enable through the user interface (touch screen display) the automatic management of a local network (LAN) connected to more than one (1) unit, (up to maximum of ten (10)), of which some are in primary operation and other units are in standby mode, (up to maximum of two (2) units can be in standby mode.
6. Stand-by Rotation Alarms: This screen shall be displayed if the local network is configured and is used to manage the start-up of the stand-by unit when an alarm is activated.
7. Network Settings: Shall enable the setting the network information for the NMC (Network Management Card).

    a. TCP/IPv4
    b. TCP/IPv6

8. Manual Control: Shall assist maintenance and checks or in cases of emergency; the following individual components can be activated manually and independently of the control process:

    a. Unit Fan (Unit Start-up)
    b. Compressor(s) 1/2/3/4
    c. Dehumidification Function
    d. 1st Stage Electrical Heater
    e. 2nd Stage Electrical Heater
    f. Activate 0/1 analog output
       * The safety devices shall be active during manual operation.
    g. Alarms/Events

        1. Event Log: Shall save status information and a message with a date and time stamp for each alarm, event, or system configuration change.
        2. Syslog: Shall be used to export event logs from the unit to a connected server.
        3. Description of Alarm Events: Shall be displayed on the user interface (LCD touch screen Display).

            - High/Low Temperature Threshold Exceeded
            - High/Low Humidity Threshold Exceeded
            - Supply Air Temperature Threshold Exceeded
            - Return Air Sensor Error Detected
            - High/Low Airflow
            - Humidifier
            - Smoke/Fire Detected
            - Electric Heater Over Temperature
            - Electronic Expansion Valve Error
            - High/Low Refrigerant Pressure
            - Primary/Secondary Power Source Unavailable
            - Dual Circuit Expansion Board Error Detected
            - Digital 2/4/6 Input
            - Supply Air Sensor Error Detected
            - Air Filter Clogged
            - Water Detected
            - Humidity Sensor Error Detected
            - Hot Water Sensor Error Detected
            - EEPROM Error Detected
            - Wrong Password Error

2.5 SCROLL COMPRESSOR(S)

A. The Schneider Electric Uniflair LE Direct Expansion (DX) systems shall utilize scroll compressors. The scroll compressors shall be mounted with anti-vibration support inside a dedicated mechanical space, which shall be separated from the air flow of the system, (exception shall be TU models) to ensure ease of maintenance inspection during operation.

1. Scroll compressor shall have the following standard features:

    a. Crankcase Heaters (Factory Mounted)
    b. Integrated Overheat Protection
    c. High Pressure Switch Protection

2.6 REFRIGERANT (R-410A)

A. The refrigeration system shall be designed to use R-410A.

2.7 ELECTRONIC EXPANSION VALVE (EEV)

A. Direct Expansion (DX) systems shall use electronic expansion valves.

2.8 WATER REGULATING ACTUATOR

A. Water cooled units shall use proportionally controlled actuators to control condenser water flow to the brazed plate heat exchanger.

B. The microprocessor shall control the modulating action of the 2-way (or optional 3-way) valve to give accurate responses to refrigerant discharge pressure.

C. The actuator shall have the ability to be manual overridden.

D. Three-way valves shall have an orifice to maintain a constant pressure drop through the entire valve stroke to minimize pressure differentials between flow to the coil and through the bypass port.

2.9 WATER REGULATING VALVES

A. Water-cooled systems shall utilize 2-way or 3-way valves to regulate the amount of water supplied to the brazed plate heat exchanger in response to refrigerant discharge pressure.

B. Valve shall have a pressure rating of 2758 kPA (400 psig).

2.10 BRAZED PLATE HEAT EXCHANGERS

A. Water cooled systems shall have a brazed plate heat exchanger made from type-304 stainless steel.

B. Pressure rating for the brazed plate heat exchanger shall be 3102 kPA (450 psig).

2.11 EVAPORATOR COIL

A. The evaporator coil shall be designed with a large front surface area in order to have an elevated SHR and a low air-velocity speed to prevent condensation carryover issues. The evaporator coil shall be made from copper tubes mechanically expanded on aluminum fins, complete with a hydrophilic coating to reduce the surface tension between the water and the metal fin surface promoting sheeting of the condensation and avoiding the risk of condensation carryover.

B. The evaporator coil shall be built with two circuits, which are linked together to maximize the surface area of the coil regardless of which circuit is operating.

C. The evaporator condensate drain pan shall be constructed of stainless steel.

2.12 FLUID-COOLED SYSTEMS

A. Water-Cooled Systems

1. The water-cooled system shall consist of an evaporator section including evaporator coil, blower package, controls, electrical section, scroll compressor, and stainless steel brazed plate exchanger with head pressure 2- or 3-way regulating valve (optional).
2. Refrigeration shall be evacuated and charged with R-410A refrigerant from the factory.
3. Maximum system water pressure shall be 2758 kPA (400 psig).

B. Energy-Saving Systems

1. The energy-saving system shall have an economizer coil that is designed to reduce operating cost during mid to low ambient temperatures.
2. Economizer coil shall be copper tube, aluminum fin coil interlaced with the DX evaporator coil. Interlaced water and DX sections of the coil decrease associated pressure drops of the coil and increase the available coil surface, increasing coil efficiency.
3. Economizer coils shall be rated at ____kW (____BTU/hr) sensible cooling capacity with 7.2ºC (45ºF) entering water temperature. The economizer coil shall require ____l/s (___GPM) of chilled water and the pressure drop shall not exceed ____kPA (____ft H_20) when in the economizer mode of operation.

C. Fluid Coolers

1. Shall be designed for standard ambient temperature operations of 35ºC (95ºF) with optional high ambient temperature operations of 40ºC (105ºF).
2. Shall be described as exchanger with copper tubes and aluminum fins, complete with low speed axial fan(s) to reduce the sound pressure level.
3. Frame shall be made of galvanized steel with epoxy powder coat with weather-resistant capabilities.
4. Electrical enclosure shall be weatherproof with a main disconnect mechanically interlocked with the electrical panel.
5. Axial fans shall be fused and have heavy-gauge, vinyl-coated, steel wire fan guards.
6. Axial fan management shall be standard modulating type with phase cutting regulation for correct operation through factory testing.
7. Shall have a system which controls fan operation during winter months, taking advantage of free-cooling capacity (Uniflair LE Energy-Saving Units only).
8. Shall be labeled with ETL electrical certifications.

D. Pump Packages

1. Shall consist of two close-coupled centrifugal TEFC pumps mounted and wired on a heavy-duty skid with industrial enamel finish, and rated for outdoor applications. Shall have an NEMA four (4) electrical box enclosure that will house the electrical components, contactors, overloads, push button (start/stop), switches, and lights mounted and wired with a manual lead/lag switch.
2. Shall have a 57 l (15 gallon) expansion compression tank with Airtol fittings, and a flow switch shall be supplied for field installation.
3. Each pump shall be sized for ____l/s (____GPM) at _____m (_____ft) external head and operate on ____V, ___ph, 60-Hz power.
4. Pump packages shall include the following:

a. Auto-switchover for lead/lag control
b. Programmable lead/lag time clock
c. General pump alarm with alarm light and push button reset
d. Current sensing relay

2.13 OPTIONAL COMPONENTS

A. Humidification

1. Steam generating humidifier shall be able to modulate capacity.
2. Steam generating humidifier shall be self-contained, steam-generating type, factory piped and wired, with automatic solid-state control circuit.
3. The humidifier controller shall communicate directly to the microprocessor and provide complete status and control at the user interface (touch screen display).
4. Humidifier canisters shall be disposable.

B. Heating Options

1. Hot-Water Heat (not available for models 2242, 2542, and 2842)

   a. The hot water coil shall be made with copper tubes and aluminum fins in a single row with a air bleed valve for venting air from the coil from the hot water loop positioned at the highest point of the coil and accessible from the front.
   b. The hot water coil shall have a 3-way modulating valve with an actuator controlled directly by the microprocessor to ensure close temperature control.

2. Electric Heat

   a. Shall consist of a aluminum finned heating elements, complete with manual reset over temperature thermostat to cut off the power supply to the heater and activate an alarm in the event of overheating.
   b. The electric heat is shall be divided into stages to allow for reduced electrical consumption. These stages result in excellent temperature regulation according to the needs of the room.
   c. The finned heater elements shall be high-efficiency in order to maintain a lower power density on the surfaces, therefore limiting overheating of the heater elements and increasing their durability.

3. Hot-Water and Electric Heat Combination

   a. When "Hot-Water Heat" is used in combination with electric heat, hot water heat shall take priority over the electric heat.

4. Hot Gas Heat (not available for models 2242, 2542, and 2842)

   a. Air-cooled systems shall be supplied with a factory installed copper tube and aluminum fin hot gas heat coil.
   b. The coil shall consist of a factory piped and wired 3-way heat reclaim regulator, check valve and controlled by the microprocessor.

5. The "Heat Option" has two functions:

   a. Heating the air to bring it up to the room set point

b. Reheating during the dehumidification phase, in order to bring the temperature of the air to the room setpoint. The installed heating capacity is therefore capable of maintaining the dry bulb temperature in the room during operation in dehumidifier mode.

C. Condensate Pump

1. High-Temperature Condensate Pump

a. Shall be available for applications which include a humidifier and have a capacity of 1158 LPH (306 GPH) at 14.6 m (48 ft.) with a maximum lift of 18.2 m (60 ft.).
b. The pump shall be designed with an integral dual float switch, pump, motor assembly, and a one-gallon reservoir. The secondary float shall generate a signal to the local alarm and shut the unit down upon a high-water condition.
c. The pump shall be rated for 230/460 VAC with a 9.5 mm (3/8 in.) ID discharge line size at an entering water temperature of 100°C (212°F).
d. The condensate pump shall be shipped loose for field installations.
e. The condensate pump shall be powered from within the unit via a terminal block located in a junction box inside the unit.

D. Water Detection Options (Tape or Spot)

1. Tape Water Leak Detection Sensor: Shall include a control module to be installed inside the electrical panel and an external water sensor to be field installed. The maximum wiring distance is 500 m (1640 ft). The water detector sensors can be configured to stop the unit from running upon activating a water detection alarm.
2. Spot Water Detection Sensor: Shall include a control module to be installed inside the electrical panel and an external water sensor to be field installed. The maximum wiring distance is 500 m (1640 ft). The water detector sensors can be configured to stop the unit from running upon activating a water detection alarm.

E. Smoke Detector / Firestat Factory Installed

1. Smoke/Firestat Option

a. Shall have a Smoke and Fire Sensor comprising a control module to be installed inside the electrical panel and an external sensor. The smoke/fire stat shuts the unit down and provides a visual and audible alarm at the user interface (LCD touch screen display).

2. Remote Fire and Smoke Relay

a. Shall provide a 24V relay for external connection of the smoke or fire sensor. The fire stat shuts the unit down and provides a visual and audible alarm at the user interface (LCD touch screen display).

F. Communication Options

1. TCP/IP serial adapter: This field-installed serial adapter card shall plug directly into the microprocessor and allow communication between the microprocessor and the customer network or supervision system via a single Ethernet connection in BACNet IP (pCoWeb), SNMP, Modbus IP, and TCP/IP simultaneously.

2. RS485 serial adapter: Field-installed serial adapter card that shall plug directly into the microprocessor to allow communication via an RS485 connection between the microprocessor and the supervision system of the customer using modus RTU or Johnson Controls Metasys protocol.
3. LON serial adapter: Field-installed serial adapter card that shall plug directly into the microprocessor to allow communication between the microprocessor and the LON supervision system of the customer.
4. RS232 serial adapter: This is a field installed serial adapter card that shall plug directly into the microprocessor to allow communication between the microprocessor and a supervision system modem via an RS232 connection.

G. Floor Stands

1. Floor Stands shall be fabricated from steel offered in standard applications and available in custom and fixed heights. The floor stand height shall be _____ mm. (in.).

    a. Stand legs shall be adjustable by +/-44.45 mm (1.75 in.).

2. Seismic Floor Stands

    a. Shall be in fixed heights of 305 mm (12 in.), 457 mm (18 in.), 610 mm (24 in.) and 914 mm (36 in.).
    b. Shall be seismically tested and rated to a force of Sds = 2.5 g. Anchorage to the structure was assumed to be 2.5 in. HILTI kwikbolt TZ expansion anchors with 51 mm (2 in.) embedment into a 102-mm (4-in.) thick, nominal weight concrete slab with the strength of fc'= 4000 psi.

H. Dampers

1. Motorized Dampers

    a. The motorized damper shall be 151 mm (5.95 in.) in height.
    b. The damper shall have a motorized actuator that receives a 0-10V signal from the microprocessor.
    c. The motorized damper shall be factory mounted and wired on top of the cooling unit.

2. Gravity Dampers

    a. The gravity damper shall be 151 mm (5.95 in.) in height.
    b. The gravity damper shall be factory mounted on top of the cooling unit.
    c. The gravity damper shall be only available for upflow units.

I. Sub-bases

1. Sub-base(s) shall be 200-mm (8-in.) high for piping and cable entry under the unit. The external panels are 1-mm (0.039-in.) thick and are coated on the external side with RAL 9003 epoxy-polyester paint for long-term durability. The side panels shall have knockouts for piping and electrical control wiring entry connections.

J. Front Supply Plenums

1. Front Supply Plenum shall be 500-mm (20-in.) in height and provide air discharge in the room using adjustable grilles.

a. The external panels shall be 1-mm (0.039-in.) thick and are coated on the external side with RAL 9003 epoxy-polyester paint for long-term durability. The external panels shall be double walled and lined internally with 15-mm (0.59-in.) thick, 20 kg/m^3 (0.00072 lb/in.^{3}) of density, fiberglass, heat-insulating material.

K. Top Return Plenums

1. Return Plenum shall be 500-mm (20-in.) or 305-mm (12-in.) in height and installed on top of the unit. The 305-mm (12-in.) plenum shall be stackable up to 1120 mm (48 in.). The external panels shall be 1-mm (0.039-in.) thick and are coated on the external side with RAL 9003 epoxy-polyester paint for long-term durability. The external panels shall be double walled and lined internally with fiberglass heat-insulating material 15-mm (0.59-in.) thick, 20 kg/m^3 (0.00072 lb/in.^{3}) of density.

PART 3 - EXECUTION

3.1 INSTALLING COOLING UNITS

A. General

1. End user shall install cooling units in accordance with the manufacturer unpacking and installation instructions and guidelines. Install units plumb and level and securely attached in locations indicated. Maintain manufacturers recommended service clearances.

B. Electrical

1. End user shall install and connect electrical devices furnished by manufacturer that are field installed per installation instructions and wiring diagrams supplied with the equipment. Ensure the electrical schematic of the system is submitted to electrical contractor for reference.

C. Piping Connections

1. Equipment mechanical connections shall be installed per installation documentation provided by the manufacturer. Ensure the mechanical piping schematic of the system is submitted to the mechanical contractor for reference. All equipment piping and connections shall meet local code requirements as well as field leak-checking procedures.

3.2 FIELD QUALITY CONTROL

A. End user shall start-up cooling units per guidance provided with manufacturer operation and maintenance documentation. Test controls and operation of the system to demonstrate compliance with the site requirements and specifications.