Guide Specifications

Air Economizers

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. These specifications describe requirements for a system designed for cooling of data center equipment. The unit(s) shall be factory tested and shipped in two sections for field assembly complete with all components necessary to maintain temperature and optimal airflow independent of load variations within design limits. Units shal be UL & cUL/CE listed and manufactured in an ISO9001 certified manufactured plant. Units shall be designed for year-round, 24-hours/day service and outdoor installation requiring connection of only the following:

- Ductwork
- Water supply
- Water drain
- Power feed(s)
- Optional remote display interface with connection to a BMS with Modbus protocol

1.2 DESIGN REQUIREMENTS

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

- The cooling system shall be in _____(city/country)
- Cooling system shall be capable of providing _____l/s (CFM) at _____Pa (n. WC) external static pressure
- The unit shall have a total and sensible cooling capacity of _____kW based on indicated CFM and _____ m (ft) elevation
- Data center supply air condition of _____°C (°F) dry bulb and _____°C (°F) wet bulb
- Data center return air condition of _____°C (°F) dry bulb and _____°C (°F) wet bulb
- The system shall have an annualized COP of _____based upon _____ load factor for the indicated location and operating conditions
- The system is to be equipped with _____ Volt, 3-phase, _____Hz power supply

1.3 SUBMITTAL

A. Submittals shall be provided with the proposal and shall include the following:

- Overall dimensions of the unit
- Electrical requirements and capacity data
- Piping connection drawings (typically)
- Electrical connection drawings (typically)

1.4 QUALITY ASSURANCE

A. The unit shall be factory tested prior to shipment. Testing shall include complete pressure and leak testing to ensure system integrity, Hi-pot test, and controls calibration and setting. Each unit is to be shipped with a complete test report to verify completion of factory testing procedure. Refer to dedicated sections for required certifications.

B. The system shall be inspected for quality control before shipment.

C. The unit shall be UL Listed to UL 1995 and CSA C222 No. 236 as well as CE marked.

1.5 TERMS OF WARRANTY

A. The product shall be free from defects in materials and workmanship for a period of one year from the date of product start-up when start-up is performed by the authorized personnel in the factory and occurs within six months of the shipment date.

1. Warranty

   a. With factory start-up, parts and labor warranty shall be provided against defects for a period of twelve (12) months from the date of shipment from the factory
   b. Without factory start-up, parts-only warranty shall be provided against defects for a period of twelve (12) months from date of shipment from the factory

PART 2 - PRODUCTS

2.1 SYSTEM

A. Modes of Operation

1. Air-to-Air Heat Exchange

a. The indirect air economizer uses sensors to determine the ambient air temperature and automatically switch between dry mode and wet mode. Air-to-air heat exchange is the dry mode and only requires the power of the fans to move the air (extremely energy efficient). The energy efficient outside air fan modulates airflow across the heat exchanger to maintain the IT supply air setpoint. All water in the system is drained during dry operation to prevent freezing.
b. Ambient air passes over the outside of the heat exchanger, cooling the hot IT air flowing inside heat exchanger tubes.

2. Indirect Evaporative Cooling (IEC)

a. The indirect air economizer uses sensors to determine the ambient air temperature and automatically switch between dry mode and wet mode. Indirect evaporative cooling is the wet mode and allows for economizing in hot, dry climates. Unevaporated water is collected in the basin and recirculated through the water system. The conductivity meter in the basin maintains a specific cycle of concentration. All water in the system is drained during dry operation to prevent freezing.
b. Heat is removed from the IT air by evaporating water on the outside of the heat exchanger channels.
c. Water is supplied evenly over the heat exchanger channels via spray nozzles.
d. The adjustable IT supply air setpoint is maintained.
e. When ambient air temperature drops below 44°C (40°F) the system water is drained to prevent freezing. The system water will also be drained after 24 hours (user adjustable setting) of continuous dry mode operation.

3. Trim Cooling

a. Trim cooling is available in two options: Refrigerant (DX) or Chilled Water (CW). If ambient conditions do not allow evaporative cooling to meet the supply air setpoint, the proportional refrigerant circuit or the chilled water circuit will start automatically at a varying capacity to help cool to the setpoint. The refrigerant circuit is sized to handle 50% of the nominal rated load of 250/500 kW. At least 50% of the cooling will always be handled by the IEC heat exchanger.

4. Direct Expansion (Optional)

a. The trim cooling coil (DX or CW) is located downstream from the IEC heat exchanger.
b. DX option is available in one (1) or two (2) compressor versions for 250-kW units.
c. Variable speed compressors with variable-frequency drives (VFD) allow for optimal efficiency and staging. The “Soft Start” feature of the VFD reduces inrush starting current by over 60%.
d. Supplements evaporative or air-to-air heat exchange cooling to maintain the supply air setpoint able to handle 50% of full load.
e. Uses R410a refrigerant.

5. Chilled Water (Optional)

    a. Available in 2-way valve or 3-way valve configurations
    b. Internal piping and valves will be insulated in the factory
    c. Chilled-water coil size can vary based on trim cooling need and inlet chilled water temperature and water flow rate

6. Water Saver Mode

    a. If **Water Saver** mode is enabled, water system operation is suspended when dry operation is sufficient for the cooling demand. This may be a higher ambient air temperature than the default 44°C (40°F) transition to dry mode. The consequence of using **Water Saver** mode is a higher outdoor air (OA) fan speed with the resulting higher energy consumption. By default, **Water Saver** mode is disabled.

7. Water Ride Through

    a. With the **Water Operation Reserve Time** feature, the level of water in the water basin is maintained automatically to ensure minimum water level to start the circulating pump/s as well overflow prevention up to a maximum capacity (6738 liters (178 gals)). **Water Operation Reserve Time** mode provides a constant water level in the basin in case of a loss of the main water supply. This provides continual wet operation of the unit in short periods of water loss.

B. Serviceability

1. The two main electrical panels are located internally within the service vestibule of the unit out of the weather. The return air filters, IT fans, compressors, and VFDs are located within this same space. Access to the unit main power connection and disconnect and lower section power distribution are located outside the service vestibule on the lower section.
2. The service vestibule shall have factory-installed lighting to facilitate service requirements while in this area.
3. The service vestibule shall have magnetic door switches which shut down unit operation when the interior access door is opened.
4. The outer and inner service vestibule doors shall have inspection windows to facilitate unit operation while running. The windows allow ambient light into the vestibule as well as visual surveillance of personnel within the service vestibule.
5. There shall be a power shut down switch located within the service vestibule to shut the unit down if the inner door is closed and the unit is being commanded to run locally or by the BMS system.
6. The IEC heat exchanger core shall be field disassembled for cleaning or to replace individual tube bundles. The seal design allows for reassembly and sealing of the tube bundle headers to prevent IT air or outdoor air leakage.
7. 500kW units shall be individually isolated between modules to facilitate servicing requirements while the adjacent unit is in operation.
8. 250kW units need 1 m (32 ft) at the ends of the unit for duct attachment to the unit duct connection. The service access requirement is at the service vestibule door side of the unit and 1.6 m (5.2 ft) of open space is required. Units facing each other can share this common open space.
9. 500kW units need 1 m (3.2 ft) at the ends of the unit for duct attachment to the unit duct connection 1.6 m (5.2 ft) of open space is required on both sides of the 500-kW unit. Units facing each other can share this common open space.

C. Shipping

1. The unit shall be factory tested and shipped in (2) sections: Top (IT air) and bottom (ambient air inlet)
2. The outdoor air fans shall be factory mounted on the top section.
3. The top and bottom sections shall ship on a standard flatbed trailer.
4. The top section shall have lifting eyes incorporated into the unit frame to facilitate vertical overhead lifting. The bottom section shall have designated lifting points for overhead lifting.
5. The unit will have the option to be lifted in sections to its installation placement or the top and bottom sections can be attached together on the ground and lifted as an entire unit from the top section lifting eyes.

2.2 CONSTRUCTION

A. Frame

1. Shall be constructed with a self-supporting frame with sectional lifting eyes in galvanized steel with epoxy powder coat (color RAL9022).
2. The frame shall be constructed with formed steel sections joined with structural rivets.
3. The bottom section shall be designed to support the operational weight of the unit when properly installed.

B. Exterior Panels

1. Shall be galvanized steel welded panels with cross bracing finished in epoxy powder coat (color RAL9022).
2. Access panels shall have a with single locking handle with dual cam locking mechanism for easy access.
3. Access doors shall have a mechanism built into the large exterior doors with locking latches at the bottom and non-locking at the top.
4. The unit shall have fiber reinforced plastic roof and compartment flooring panels with integrated skid resistant surface.
5. The outdoor air intake shall have welded wire mesh grilles with optional ambient air filtration G2/EU2.
6. The unit shall have double liner construction, 22-mm thick insulated panel internal air sleeve for IT air containment with air gap separation from exterior panels for maximum averaged R-value of 16.

C. Evaporative Water Circulating Pumps (Optional)

1. The water circulating pump shall be a single-stage, glanded centrifugal pump
2. The circulating pump shall have low vibration and noise.
3. The pump shall have independent bellows, mechanical seal, and cavitation reducing impeller.
4. The pump shall have corrosion-proof pump housing made of plastic with Victaulic® connections.
5. The pump shall have an independent drain connection to facilitate water removal during the drain cycle.
6. The unit shall have the capability of an optional dual pump configuration for redundancy.
7. The optional dual pump configuration shall allow for service isolation of a failed pump while the system is in operation.
8. Water distribution for the evaporative system shall be constructed with copper tubing.

D. Water Basin

1. The basin shall be a non-corrosive evaporative water basin with freeze protection and an automatic conductivity control system with a water holding capacity of 6738 liters (178 gallons).
2. Automatic water leveling system shall be adjustable to allow temporary water ride through from water outages for up to 30 minutes.

3. The unit shall have serviceable integrated 20 mesh strainers located in the basin bottom to protect the evaporative water pump inlet.
4. For weight reduction, the unit basin and catch trays shall be made from ABS plastic.
5. Basin drain shall be at the lowest point of the basin to ensure proper drainage and connected to a Normally Open valve for freeze protection.
6. The basin shall have a built-in overflow port that connects to the factory system drain downstream from the drain valve.
7. The basin shall contain built-in splash guards to prevent water waste from splashing.
8. The unit shall provide a removable frame support structure that facilitates basin removal in the field.

E. Chemical-Free Water Treatment System (Optional)

1. The chemical-free water system is a complete electrodynamic field generator system employing electrodynamic field generation.

   a. Incoming water needs to be from a potable water supply meeting the below requirements.

	US EPA Secondary Standards (SMCL)	Recommended Best Practices for Potable Make-up Water Quality	
pH	6.5 - 8.5	6.8 - 7.8	
Total Dissolved Solids (TDS)	500	100	ppm
Total Hardness	-	80 - 100	ppm as CaCO3
Chlorides	250	20 - 30	ppm
Sulfates	250	30 - 40	ppm
Silica	-	< 5	ppm
Other metals (iron, aluminum, etc.)	Refer to Reference	should not exceed regulated limits	
Turbidity	-	zero	

2. Field-Generator Control Panel

   a. The factory mounted NEMA 4 metal enclosure, shall be a powder-coated steel enclosure.
   b. The control panel shall be certified and labeled to UL 508A and CSA 222 14-95.
   c. An internally mounted circuit breaker shall be used to provide safety system shutoff for servicing.
   d. Maximum power required for electrodynamic field generator system shall be 150 watts.
   e. Power factor must be greater than 0.70.
   f. System must be able to operate continuously without water in the reaction chamber.
   g. Unit shall be equipped with an automatic switching universal power supply for 85 to 260 VAC input at 47 to 63 Hz.
   h. To compensate for possible signal strength loss due to changes in location or operating conditions, the control panel must incorporate an automatic self-tuning program (Auto-Seek™). This self-tuning program will assure the water flowing through the reaction chamber always sees maximum signal.
   i. Alarm relay with SPDT dry form C contact monitored by the controller:

1. Contacts are rated for a minimum of 5 amps at 30 VDC or 10 amps at 250 VAC.
2. Relay is to be energized when electrodynamic field generator system is performing properly.

j. Alarm relay will verify the following system operating status conditions:

1. Primary Power Status: e.g., Loss of utility power, tripped circuit breaker, or unit unplugged.
2. Secondary Power Status: e.g., Severed or removed reaction chamber signal cable connection, or failure of one or more coils to properly AutoSeek™.
3. Control Panel Processor Board Operation Status: e.g., Board overheating, electronic failure

k. The shielded signal cable shall have eight conductors to power four independent coils in the reaction chamber.
l. NEMA-4 construction is required for the control panel.
m. Electronic signals shall be generated by use of digital technology under microprocessor control A combination of AC and DC pulses will be controlled by factory programming of the microprocessor.
n. Control panel shall include local digital display and push buttons for the entry of data and monitoring signal to assist in troubleshooting and operation of system.
o. Signal character and strength shall be field adjustable only upon entering of proper security code

3. Reaction Chamber

a. Pipe Material

1. 2 in. thru 2.4 in. FRP, Sch 40 with 150# factory installed flanges
2. All reaction chambers must be tested at the factory to assure no water leaks.

b. The reaction chamber must be water proof suitable for submersible installation and protection in all weather conditions
c. A permanently attached submersible signal cable with locking 8-conductor weatherproof connector is provided to mate with control panel.
d. The reaction chamber is provided with a minimum of four electrically independent signal coils (typically three for AC signals and one for DC signals).

F. Water Connections

1. Water Inlet

a. The water inlet shall be a 42-mm (1 5/8-in. factory-supplied, field-brazed union for a 250-kW unit. The 500-kW unit has two (2) 42-mm (1 5/8-in.) factory-supplied, field-brazed unions.
b. The water inlet field piping shall come from the unit service access side through a gland plate or directly underneath the unit.
c. Incoming water needs to be from a potable water supply.
d. Recommended inlet water flow is 16 – 19 L/s (25 – 30 GPM).
e. Maximum inlet water pressure 55 Bar (85 PSIG).
f. The inlet water temperature should be at or below ambient temperature. No warm water sources should be used.
g. The customer inlet water piping to the unit should be equipped with freeze protection. The unit factory inlet water piping shall have factory-installed freeze protection.

2. Condensate (Optional)

    a. If the unit has trim cooling as part of the design, there will be two (2) condensate hoses that should be connected between the condensate pan and the water collector tray.
    b. The unit will ship with two (2) factory-supplied, field-installed hoses with hose clamps. The hoses are secured with the clamps to the drain pan adapters and pass through the water collection mesh panel to rest on the basin collection wing.

3. Basin Drain

    a. The basin drain is a 54-mm (2 1/8-in.) factory-supplied, field-brazed union for a 250-kW unit. The 500-kW unit has two (2) 54-mm (2 1/8-in.) factory-supplied, field-brazed unions.
    b. The basin drain field piping shall come from the unit service access side through a gland plate or directly underneath the unit.
    c. The basin drain piping outlet should be connected to an open drain.

G. Electrical Connections

1. Field-Supplied Main Power
    a. The main power voltage shall come into the main electrical box through three (3) gland plates

        1. Front of the electrical box
        2. Back of the electrical box
        3. Bottom of the electrical box

    b. 500-kW unit have separate power supplies per 250-kW section.
    c. Single power and essential / non-essential power configurations shall have rotary type unit mount disconnect switches.
    d. Dual power w/ source changeover (SCO) shall have motor driven unit mounted disconnect switches. The dual power w/SCO also has an incoming shunt trip push button to trip open both A and B power supply disconnects
    e. All power configurations shall meet UL1995 & IEC60204 design requirements.

2. Upper-to-Lower Section Field-Connected Main Power Connections

    a. Main power between the upper and lower section of the unit shall be accomplished via bulkhead mounted housing connectors with double locking lever.
    b. The bulkhead mounted housing connectors shall be rated for outdoor use and have a IP65 rating.
    c. The bulkhead mounted housing connectors shall be rated for use from -40 C to 125C.
    d. The bulkhead fittings shall have a flammability rating according to UL94 of V-0.
    e. The bulkhead mounted housing shall be ROHS compliant.

3. Customer Wiring Connections

    a. Customer connections are landed in the lower section electrical box through gland plates on the electrical box side. These include the following:

        1. Customer network connection (CAT5/RJ45)
        2. Customer provided service compartment lighting
        3. Modbus RTU wiring
        4. Customer digital I/O
        5. Unit outputs

    b. 500-kW unit has two (2) separate sets of customer connections: one (1) set per 250-kW section

4. Upper-to-Lower Section Field Connected Analog I/O, Digital I/O, and Communication Connections

    a. Per 250-kW unit there are five (5) connectors on the electrical box side that are made once an upper and lower section are joined.
    b. Per a 500-kW unit there are two (2) sets of five (5) connectors.
    c. The connectors are rated for outdoor use and have a IP66 rating.
    d. The connectors are rated for use from -40°C to 125°C (-40°F to 257°F).
    e. They have a flammability rating according to UL94 of V-0.
    f. The bulkhead mounted housing shall be ROHS compliant.

5. 500-kW, Field-Installed, Outdoor-Air, Fan-Speed Signal Cable

    a. To sync all outdoor air fans on a 500-kW unit and telemetry readings, a field-installed cable is placed across the roof of two (2) 250-kW sections.
    b. The connectors are rated for outdoor use and have a IP66 rating.
    c. The connectors shall be rated for use from -40°C to 125°C (-40°F to 257°F).
    d. They have a flammability rating according to UL94 of V-0.
    e. The bulkhead mounted housing shall be ROHS compliant.

H. Indirect Air Polymer Heat Exchanger

1. The IEC heat exchanger shall be an updraft air-to-air heat exchanger, UL900 class II compliant, with thermally bonded tubes to headers. The IEC shall be sized to handle 100% of the supply and heat rejection CFM.
2. Horizontal tubes shall be used as the primary IEC surface. Tubes shall be constructed of a corrosion resistant polymer with internally extruded ribbing for enhanced heat transfer. The polymer material shall be fire and smoke retardant, meeting UL94 V-O standards.
3. The tubes and headers shall be constructed from the same polymer material to ensure consistent expansion and contraction rates to eliminate the risk of cracking and deformation of the sealing surfaces.
4. The IEC shall be tested and approved to UL 900 Class II. When sprayed for indirect evaporative cooling, water leakage from heat rejection side to supply side shall be less than 379 l (0001 gal) per 4719 L/s (10,000 CFM) of primary air.
5. Tubes shall be elastic in design, flexing slightly as the heat rejection fan regulates airflow to facilitate shedding of dissolved solids buildup.
6. All IEC surfaces shall be non-metallic, suitable for continuous operation in temperatures up to 65°C (150°F)

7. The IEC shall be tested in accordance with ASHRAE Standard 84-1991, “Method of Testing Air to Air Heat Exchangers”, ARI Standard 1060, “Rating Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment”, and ANSI/ASHRAE Standard 143-2000 “Method of Test for Rating Indirect Evaporative Coolers”
8. The internal flutes of the IEC are positioned horizontal with enough air velocity to drain any water in the tubes toward the condensate drain in the unlikely event of condensation within the IEC tube bundle.
9. The IEC core shall be constructed with sectional tube bundles. Each tube bundle will incorporate a seal design for both IT and outdoor air streams.
10. Each IEC core bundle shall have built-in handles for ease of removal.
11. The IEC core bundles shall have the ability to be field dis-assembled, cleaned or replaced and reassembled.

I. IT Supply Air Fans

1. Each 250-kW unit shall be equipped with four (4) backward-curved, electronically commutated fans.
2. Each 500-kW unit shall be equipped with eight (8) backward-curved, electronically commutated fans.
3. Each supply air fan shall deliver a maximum of 13,864 m³/hr (8,160 ACFM) for a total 250-kW unit airflow of 55,455 m³/hr (32,640 ACFM) and 500-kW unit airflow of 110,911 m³/hr (65,280 ACFM).
4. Based on “straight-thru” airflow configuration of the unit, the amount of allowable external static pressure (ESP) is 249 pa (10 in. WC) for the standard IT fan selection
5. Fans shall be equipped with maintenance-free ball bearings.
6. Fans shall be located upstream of the IEC heat exchanger.
7. Module access doors that isolate internal airflow shall have safety switches that shut down fans upon opening the door.
8. The fans will have guards in place to prevent injury of personnel from moving fan blades while in the service vestibule.
9. One of the four (4) fans will be monitored for pressure drop to calculate total airflow through the unit.

J. Outdoor Air Fans

1. Each 250-kW unit shall be equipped with four (4) axial, outside air, electronically commutated fans.
2. Each 500-kW unit shall be equipped with eight (8) axial, outside air, electrically commutated fans.
3. Each fan will have a IP66 bulkhead connector for power and control for ease of removal.
4. A 500-kW unit will have a IP66 bulkhead connector to sync OA fan speeds between modules.
5. Each outside air fan shall deliver a maximum of 8,495 m³/hr (5,000 ACFM) for a total 250-kW unit airflow of 33,980 m³/hr (20,000 ACFM) and 500-kW unit airflow of 67,960 m³/hr (40,000 ACFM).
6. Standard OA fan selection is designed for zero external static pressure.
7. The OA fans are modulating, acoustic-composite axial fans with sickle blades made from composite material.
8. The fans are equipped with airflow optimization chimneys for higher efficiency and lower acoustic impact.
9. Outside air fan shall be equipped with maintenance-free ball bearings.
10. Fans will be located on the top of the upper section of the unit.

K. Controller

1. Control

    a. One (1) external touch-screen display per 250-kW/500-kW unit with height adjustment.
    b. IT air temperature regulation by means of an exclusive control algorithm.
    c. Advanced antifreeze protection and water basin system management.
    d. Compressor timing and protection if present.
    e. Pump rotation (if dual pump option present) on timed basis or equal run time requirement or from notification of failure from the primary pump.

f. Integrated USB connection for data downloading.
g. Optional controls ride-thru feature allows for instant air economization cooling.
h. The controller shall sense ambient temperatures and automatically switch between cooling modes based on the optimum energy or water efficiency based on customer preference.
i. Variable-speed IT supply air fans shall be controlled from an analog signal based on a PID loop maintaining containment pressure.
j. Variable-speed outside air fans shall modulate to provide enough cooling to maintain the supply air setpoint to the data center and a pressure transducer shall sense discharge pressure of the DX circuit and maintain a minimum head pressure requirement.
k. Module controller shall allow for a water-saving function to reduce annual water consumption. Controller shall allow the module to stay in DRY mode for a longer period by increasing outside air fan speed.
l. Integrated Modbus protocol to connect unit to most common Building Management Systems and Data Center Information Manager systems.

L. Filters (Optional)

1. Optional G4/EU4/MERV8 IT air filters located in the unit service vestibule in a front-loading filter rack assembly upstream to the indirect air core IT filters can be upgraded to high efficiency filtration MERV13/F7.
2. IT filter health will be monitored via a differential pressure switch.
3. Total of twelve (12) filters per 250-kW unit which are 784 (309) x 492 (194) x 95 (374) mm (in.); twenty-four (24) filters per 500-kW unit
4. Optional outdoor air can be filtered with MERV4/G2/EU2 filtration prior to entering the unit outdoor air intake.

M. DX System Variable-Frequency Drive (Optional)

1. Each refrigeration circuit shall be equipped with a variable-frequency drive (VFD) to control a brushless scroll compressor. The maximum number of refrigerant circuits per 250-kW unit is two (2.) The maximum number of refrigerant circuits per 500-kW unit is four (4).
2. The VFD shall be variable from 25 Hz to 100 Hz for infinite capacity control of the DX circuit(s).
3. The VFD shall provide the compressor with overcurrent protection.
4. The VFD shall regulate compressor operation to maintain proper oil circulation through the DX system.
5. The VFD shall reduce compressor in-rush current (LRA) by up to 60% to reduce electrical infrastructure requirements.
6. The VFD operation/alarms codes will be communicated to the controller.

N. Brushless Scroll Compressors (Optional)

1. Each 250-kW unit shall include up to 125-kW DX cooling which is factory piped, evacuated, and charged
2. The refrigerant used shall be R410A.
3. DX system can be either single or dual circuited driven by VFDs with a 4-to-1 turn down for capacity control.
4. Refrigeration circuit conforms to PE 97/23/EC standards and includes all refrigerant components: filter drier, sight glass, receiver and electronic expansion valve, and pressure sensors and safety switches.

O. Evaporator Coil(s) (Optional)

1. Each 250-kW unit shall be equipped with a cooling coil mounted downstream from the heat exchanger constructed of expanded copper tubes to aluminum fins able to withstand working pressures to UL 1995 standard of 42Bar (620 PSIG).

2. Coil assembly shall include 16-gauge galvanized steel casings with a support mounting structure that permits coil removal through side access.
3. Coil shall include a heavy gauge, stainless steel drain pan to provide for condensate removal when the coil operates under a start-up condition. The water collected will be directed toward the basin.

P. Chilled-Water Trim Coil (Optional)

1. Factory installed internal chilled-water coil with expanded copper tube to aluminum fins.
2. Coil shall include a heavy gauge, stainless steel drain pan to provide for condensate removal when the coil operates under a start-up condition. The water collected will be directed toward the basin.
3. Factory-installed, chilled-water valve can be either 2-way or 3-way valve pressure rating is up to 10 bar (150 PSIG).
4. Coil assembly shall include 16-gauge galvanized steel casings with a support mounting structure that permits coil removal through side access
5. Chilled-water piping will be factory insulated with air bleeders to facilitate air removal from the chilled-water loop.

Q. Heat Reclaim Coil (Optional)

1. Heat reclaim coil feature shall be factory mounted upstream from the indirect air economizer heat exchanger to maximize heat recovery from the IT space.
2. Factory-installed internal heat reclaim coil with expanded copper tube to aluminum fins.
3. Coil assembly shall include 16-gauge galvanized steel casings with a support mounting structure that permits coil removal through side access.
4. Using the heat reclaim coil restricts other forms of trim cooling in standard-sized units.

R. Mist Eliminator

1. Each 250-kW unit shall be equipped with a mist eliminator media that is factory installed on the heat rejection air side of the heat exchanger to eliminate water loss through the outdoor air discharge.
2. Mist eliminator media shall be constructed of rigid, UV resistant PVC, corrosion and scale resistant, suitable for operating at temperatures up to 46°C (115°F) continuously.

S. Evaporative Spray Nozzles

1. Low pressure, brass spray nozzles used to provide 65° angle spray coverage on the indirect air heat exchanger.
2. No tools required for removal of the spray heads for easy cleaning in the field.
3. The water spray manifold will be factory constructed with copper piping.

PART 3 - EXECUTION

3.1 SITE Preparation

A. During the design of the installation site, consideration should be given to the following factors: ease of access for service personnel, loading factors, and accessibility of piping, wiring, and ducting. The unit should be placed next to, or on top of, the building with the utility connections being the closest to the physical building. This will reduce length of run of piping and wiring. A service platform, or equivalent, should be provided to allow for easy service access to the unit.

B.

3.2 SERVICE ACCESS

A. Service access shall be provided via the ends of the unit to facilitate duct connections to the unit and the access door side of each 250-kW unit to facilitate service operations and access to the display interface. For a 250-kW unit, 1.6 m (5.2 ft) of open space needs to be maintained on the service access side of the unit.

B. For a 500-kW unit, the same clearance on the ends for ducting connection and 1.6 m (5.2 ft) service clearance on each side of a 500-kW unit needs to be maintained.

3.3 RECEIVING THE UNIT

A. The cooling system shall be completely tested and inspected prior to shipment.

3.4 LIFITING THE UNIT

A. The unit shall have the option to be lifted in two (2) pieces or as a single stacked upper and lower assembly.