Vertiv™ Liebert® SmartRow™ DCR
Self-Contained, Fully-Integrated, Row-Based Infrastructure
Part of the Liebert® SmartRow™ Platform
Guide Specifications

1.0 GENERAL

1.1 Summary

This specification defines the characteristics and requirements of the Liebert® SmartRow™ DCR, an adaptive, scalable, modular infrastructure system that includes integrated IT equipment racks, environmental controls, power distribution and fire suppression and is designed for the support of IT systems and electronic equipment.

Optional system configurations shall include 20kW (N+1) or 36kW (N) environmental controls, infrastructure management, and monitoring systems.

1.2 Standards

The Liebert® SmartRow™ DCR is designed in accordance with the current revision of the following agency standards. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.

- UL 60950-1: Information Technology Equipment, Second Edition
- EIA 310-D standard for 19" racks and hole spacing
- NEMA Type 1 / IEC IP10 enclosure
- NFPA No. 2001 - Clean Agent Fire Extinguishing Systems
- NFPA No. 72 - National Fire Alarm Code

1.3 System Description

1.3.1 Design Requirements – Major Components

The Liebert® SmartRow™ DCR shall consist of modular architecture to facilitate an adaptive and scalable infrastructure system. System modules shall be designed as integrated components of a complete stand-alone system and shall allow flexibility for capacity growth and expansion. System modules shall be designed in accordance with data center best practices, including hot air and cold air separation; high-efficiency dedicated cooling and integrated monitoring, control and fire suppression.

Design Requirements – DCR Control Panel and Fire Suppression System

The Liebert® SmartRow™ DCR shall include an integrated DCR Control Panel and Fire Suppression System. This module shall contain the fire detection and suppression system, fire strobe light and audible horn, the power/fire control interface, fire suppression system abort / manual release switches and the load distribution center. The DCR Control Panel and Fire Suppression System shall provide power to the Liebert® SmartRow™ DCR fire suppression system and to an automatic emergency airflow system. The DCR Control Panel and Fire Suppression System shall be furnished with an Emergency Power Off (EPO) provision for the Liebert® SmartRow™ DCR, Vertiv™ Liebert® PDX, Vertiv™ Liebert® PCW controls and optional UPS systems. The load distribution center can be used to distribute power to powered loads inside the Liebert® SmartRow™ DCR.

- **Power Distribution**: To provide power to powered loads inside the Liebert® SmartRow™ DCR, the load distribution center shall be field-configurable to support connections from optional centralized, free-standing 3PH UPS systems; or connections to optional 1 PH rack-mounted UPS systems; and connections to optional Rack PDU systems.
- **Fire Suppression**: The Vertiv™ Liebert® SmartRow™ DCR shall include an integrated, self-contained Fike SHP-Pro clean agent system utilizing ECARO-25 (HFC-125) as the fire extinguishing agent. For Canadian Systems a self-contained Potter PFC 4410 Control panel clean agent system shall be leveraged still utilizing ECARO-25 (HFC-125) as the fire extinguishing agent. The fire suppression system shall include all detection and control equipment, agent storage container, ECARO-25 agent, system actuation equipment, discharge nozzle, pipe and fitting, manual release and abort station, audible and visual alarm device, auxiliary devices and controls, shutdowns, alarm interface, sealed battery, and caution/advisory sign. Commissioning and functional checkout and user training shall be performed by manufacturer-qualified personnel.

1.3.2 Design Requirements - Liebert® SmartRow™ DCR Environmental Controls

The environmental control system shall be a factory-assembled Liebert® SmartRow™ DCR, Vertiv™ Liebert® PDX (Air – Cooled or Water/Glycol cooled system) or Vertiv™ Liebert® PCW (Chilled Water cooled system). Standard 60Hz units shall be CSA (NRTL-C) certified to the harmonized U.S. and Canadian product safety standard, CSA C22.2 No. 236/UL 1995 for Heating and Cooling Equipment and are marked with the CSA c-us logo. The system shall be designed for draw-through air arrangement to ensure even air distribution to the entire face area of the coil. The Liebert® SmartRow™ DCR, Liebert® PDX, Liebert® PCW units must be specifically installed facing the front or rear of the DCR system. Liebert® SmartRow™ DCR Environmental Control systems shall be configurable as follows:

- **20kW (N)** Liebert® **SmartRow™ DCR, Liebert® PDX / Liebert® PCW**: The Liebert® SmartRow™ DCR, Liebert® PDX / Liebert® PCW primary configuration shall have a nominal cooling capacity of 20kW @ 85°F (29.4°C) return air (based on the nominal 5-ton Liebert® SmartRow™ DCR, Liebert® PDX / Liebert® PCW) and shall consist of a high-efficiency digital scroll compressor (not applicable to Liebert® PCW), Vertiv™ Liebert® iCOM™ control with Touch Screen Display and downward discharge airflow.
- **Optional 20kW (N+1) Cooling Configuration**: The Liebert® SmartRow™ DCR shall be available in an optional 20kW (N+1) cooling configuration that shall consist of two (2) Liebert® PDX / Liebert® PCW units. The total nominal cooling capacity of the Liebert® SmartRow™ DCR 20kW (N+1) cooling configuration shall be 20kW @ 85°F (29.4°C) return air (based on the nominal 5-ton Liebert® SmartRow™ DCR, Liebert® PDX / Liebert® PCW). The Liebert® SmartRow™ DCR, Liebert® PDX / Liebert® PCW units shall be connected to each other via the Liebert® iCOM™ control to create a private network that will allow Unit-2-Unit (U2U) communications for redundant operation.
- **Optional 36kW (N) Cooling Configuration**: The Liebert® SmartRow™ DCR shall be available in an optional 36kW (N) cooling configuration that shall consist of two (2) Liebert® PDX / Liebert® PCW units. The total nominal cooling capacity of the dual cooling unit configuration shall be 36kW @ 85°F (29.4°C) return air (based on the nominal 5-ton Liebert® SmartRow™ DCR, Liebert® PDX / Liebert® PCW). The Liebert® SmartRow™ DCR, Liebert® PDX / Liebert® PCW units shall connect to each other via the Liebert® iCOM™ control to create a private network that will allow Unit-2-Unit (U2U) communication for dual cooling unit operation.
- **Base and Top Plenums**: The Liebert® SmartRow™ DCR shall be furnished with base (supply) and top (return) airflow plenums designed to integrate to the Liebert® PDX / Liebert® PCW and the DCR Racks, resulting in a closed airflow architecture design and room-neutral heat loading.

- **Emergency Ventilation Fans**: The Vertiv™ Liebert® SmartRow™ DCR shall be furnished with an integrated emergency ventilation fan system with gravity dampers to provide emergency airflow to powered IT equipment inside the Liebert® SmartRow™ DCR Racks. The emergency ventilation fan system shall activate when a high temperature condition (98^{0}F) is sensed inside the Liebert® SmartRow™ DCR or when there is a loss of primary cooling from the Liebert® PDX or Liebert® PCW unit(s). It shall be powered via the 15A breaker factory installed in the load distribution center.

1.3.3 Design Requirements –DCR Racks

- **Networking Racks:** The Liebert® SmartRow™ DCR shall include (1) 42U x 800mm wide x 1230 mm deep DCR networking rack. Liebert® SmartRow™ networking racks are pre-configured and optimized to support networking equipment and large amounts of cabling. They are based on the DCE rack platform and will be furnished with four rack PDU brackets and two rows of cable management fingers in the front of the racks. These will be factory installed to reduce assembly time and labor exposure.
- **Server Racks:** The remaining racks will be 42U x 700mm wide x 1230 mm deep DCR server racks. These are also based on the DCE rack platform, and they will be furnished with (2) factory installed rack PDU brackets in the rear of the racks. The pre-configured, factory integrated equipment racks minimize on-site deployment time and labor while increasing consistency and proper operation of the Liebert® SmartRow™. Racks at either end of the row use solid side panels to ensure proper airflow management and are clearly labeled to ensure they are properly located during installation.

Both rack types will be equipped with EIA 310-D-compliant rack-mount EIA rails to accommodate powered loads inside the Liebert® SmartRow™ DCR. Each rack will also be furnished with, a bag of (6) velcro strips for rack PDU cable management, vertical airflow brush kits on the front EIA rails and (1) factory installed Vertiv™ Liebert® 2T sensor & probes. The Liebert® SmartRow™ DCR Racks shall be fully factory-assembled and shall include all appropriate design provisions to integrate with the DCR base (supply) and top (return) airflow plenums.

1.4 Electrical Requirements – AC Input

1.4.1 AC Input - Liebert® SmartRow™ DCR

The Liebert® SmartRow™ DCR shall be furnished with an integrated 3PH, 5-wire, 30-pole load distribution center rated at 120/208VAC and 225A; or an optional 1PH, 4-wire, 30-pole load distribution center rated at 120/208VAC & 125A. A main CB (225A 3PH or 125A 1PH) with shunt-trip assembly shall be an option for either load distribution center in the Liebert® SmartRow™ DCR. The load distribution center provides power to IT loads, electronic equipment, and the Liebert® SmartRow™ DCR control logic and fire suppression circuits.

The user shall have the option of powering the load distribution center from a user-supplied, 3PH UPS; or powering directly from commercial power that is fed to user-supplied, rack-mounted UPS system(s) within the Liebert® SmartRow™ DCR rack(s). The Liebert® SmartRow™ DCR Control Logic, Emergency Ventilation Fans, and Fire Suppression System shall be powered from the load distribution panel via two (2) manufacturer-provided 120VAC, 15A branch breakers. During normal operation, nominal power consumption to the Liebert® SmartRow™ DCR Control Logic and Fire Suppression system is 2.74A at 120VAC. A single Liebert® SmartRow™ DCR Top Plenum and integrated emergency ventilation fan assembly is supplied per each Liebert® SmartRow™ DCR rack. During an emergency or over-temperature condition, the emergency ventilation fan assembly will draw an additional 1.82A per rack. For configurations that exceed 7 racks, an Emergency Ventilation Fan Power Expansion kit is supplied to ensure the necessary power supply is provided for proper operation.

Load Distribution Center

The electrical input / output connections between the load distribution center and the powered loads or optional UPS system(s) shall be:

1. **Centralized 3PH UPS:** The UPS supplies conditioned power to the load distribution center. The UPS output configuration shall be 3-PH, 5-wire, 120/208VAC. The load capacity of the UPS shall be determined by the IT load / electronic equipment requirements. Connections from the UPS to the load distribution center and from the load distribution center to the individual DCR rack PDU's shall be user-supplied.
2. **Rack-mounted 1PH UPS:** There are several different ways to configure your load distribution center when utilizing a 1PH UPS.

   When utilizing a rack mounted Vertiv™ Liebert® GXT4 UPS, the load distribution center is powered via a 1PH, 5-wire, and 120/208VAC source. The load capacity of the UPS shall be determined by the IT load / electronic equipment requirements. Connections to and from the rack mounted UPSs are user supplied. In the rack-mounted UPS configuration, power to the Vertiv™ Liebert® SmartRow™ DCR control logic circuit, and fire suppression system (two 15A breakers in the load distribution center) must be provided via user-supplied connections from the rack mounted UPS.
3. When utilizing a rack mounted Vertiv™ Liebert® APS UPS, input power is routed to the input of the UPS. The Liebert® APS UPS output is then routed to the load distribution center which provides power to the Liebert® SmartRow™ DCR control logic circuit, and fire suppression system via two 15A breakers in the load distribution center. The load capacity of the UPS shall be determined by the IT load / electronic equipment requirements. Connections from the UPS to the load distribution center and from the load distribution center to the individual Liebert® SmartRow™ DCR rack PDU's shall be user-supplied.

Optional Secondary/Redundant Load Distribution Center

When the Liebert® SmartRow™ DCR is configured in a 20kW (N+1) or 36kW (N) configuration, the user may select an optional secondary/redundant 1PH or 3PH load distribution center to provide redundancy to IT loads / electronic equipment. The secondary load distribution center will feature a 3PH, 5-wire, 30-pole load distribution center rated at 120/208VAC and 225A; or an optional 1PH, 4-wire, 30-pole load distribution center rated at 120/208VAC & 225A. When a secondary/redundant load distribution center is used, the DCR control logic and fire suppression system remains powered by the primary load distribution center.

1.4.2 AC Input - Liebert® SmartRow™ DCR, Liebert® PDX / Liebert® PCW Cooling System and Heat Rejection

Electrical input to the Vertiv™ Liebert® PDX / Vertiv™ Liebert® PCW cooling system shall be via separate, dedicated circuits and based on the Liebert® PDX / Liebert® PCW configuration specified at the time of order.

Please note, Pumps, Drycoolers, Condensers, heater pads, & other heat rejection solutions are not powered from the Liebert® SmartRow™ DCR.

Refer to the Liebert® PDX and Liebert® PCW System Design Manual (SL-19810) for Liebert® PDX / Liebert® PCW input voltage selections and requirements.

1.4.3 Environmental Requirements

The Liebert® SmartRow™ DCR shall be designed for use in a clean environment, free from moisture, flammable liquids, gases and corrosive substances. Install and operate this product in an indoor environment that is maintained year -round at an ambient temperature between 35°F and 85°F (1.6°C to 29°C) and a relative humidity between 50°F and 85°F dry bulb and less than 60°F dew point. It is not suitable to install outdoors or in unconditioned spaces.

Operational Clearance Requirements

- **Height**: The Vertiv™ Liebert® SmartRow™ DCR height is 9' 1" (2763mm) for installation. (Includes the height of top mounted emergency fan). The emergency fan system may be extended into a drop ceiling if additional clearance is required. To deliver the rated airflow necessary to exhaust hot air in a high temperature situation, the clearance distance required from the discharge opening of the emergency fan module to the nearest surface is 16" (406 mm).
- **Depth**: Liebert® SmartRow™ DCR has a depth of 4' (1231mm).
- **Width**: Installation width shall vary according to the system configuration. Liebert® SmartRow™ DCR's consisting of three (3) standard DCR Racks and (1) Liebert® SmartRow™ DCR, Liebert® PDX / Liebert® PCW has a footprint width of 10'2" (3099mm). Each additional rack requires 2'4" (700 mm). An additional Liebert® PDX / Liebert® PCW unit requires 3' (899mm).

Service Requirements

Liebert® SmartRow™ DCR's shall require a minimum of 3' (914mm) service clearance at the front of the Vertiv™ Liebert® PDX / Vertiv™ Liebert® PCW & Control Panel & Fire suppression system; or provisions to allow for the temporary removal of site obstructions to accommodate service access to the unit.

2.0 PRODUCT

2.1 Vertiv™ Liebert® SmartRow™ DCR Control Panel and Fire Suppression System

2.1.1 Construction

The DCR Control Panel and Fire Suppression System shall be constructed of formed and welded 16 ga. steel and shall be finished in powder-coat black (RAL 7021). The DCR Control Panel and Fire Suppression System shall be fully factory-assembled and shall include the following components:

Fire Detection and Suppression System

1. The fire system shall be controlled by a microprocessor-based SHP PRO control system manufactured by Fike Corporation and shall be furnished with a sealed, non-spillable 12AH standby battery.
2. Canada Systems: The fire system shall be controlled by a microprocessor-based Potter Model PFC-4410RC control system and shall be furnished with a sealed, non-spillable 12AH standby battery
3. Each system shall have its own supply of ECARO-25 clean agent. The system design shall be central storage utilizing a fast-acting rupture disc valve. Each container shall have a pressure gauge to provide visual supervision of the container pressure. The pressure gauge shall be color coded to provide an easy, visual indication of container pressure.
4. Distribution piping and fittings shall be installed within the Liebert® SmartRow™ DCR in accordance with the manufacturer's requirements, NFPA 2001 and approved piping standards and guidelines. All distribution piping shall be installed by specifically qualified individuals using accepted practices and quality procedures.
5. The system shall be actuated by a photoelectric duct detector mounted in the top return air plenum and installed in accordance with the guidelines stated in NFPA 72. When the detector senses combustion, the system shall activate the audible horn and visual strobe. After a 30-second delay, the system shall release the suppression agent and automatically activate the EPO.
6. The emergency power off (EPO) shall be a push-button type latching switch with a protective cover. The EPO switch shall require field connection to Vertiv™ Liebert® PDX / Vertiv™ Liebert® PCW(s) and any optional UPS systems for shutdown of all power to high-voltage equipment.
7. The system shall be furnished with an electric/manual release switch that provides a means of manually discharging the ECARO-25 clean agent system when used in conjunction with the Fike SHP PRO Control System. Manual actuation shall bypass the time delay and abort functions, shall cause the system to discharge and shall cause all release and shutdown devices to operate in the same manner as if the system had operated automatically.
8. The Abort Station shall be a Fike P/N 10-1639 and shall be located next to the manual switch.
9. The audible visual pre-discharge alarm unit shall be a Gentex P/N 904-317-002 Strobe device, or equal.
10. The system shall be furnished with on-site commissioning which shall be performed by an authorized local Fike service agent.
11. Refer to the Flagship Fire specification, ECARO-25TM Fire Suppression System with Impulse Valve & SHP Pro Control Panel, for additional details.

Load Distribution Center

The load distribution center shall be housed in a NEMA Type 1 / IEC IP20 indoor enclosure and include copper bus construction. The frame shall be constructed of formed and welded 16 ga. steel to provide a strong substructure. The unit shall have hinged door. The unit shall have top and bottom input/output cable access with a total of (3) total knockouts – (3) .87" dia.; and (2) pilot holes to aid in creating attachments for the load center main inputs. All service shall be capable of being performed with access to the front. Retrofitting additional power distribution cables shall require access to the front of the unit only. The hinged door shall provide access to all circuit breakers. The unit shall be naturally convection-cooled. The convection cooling method shall allow continuous full-load operation. The color of the exterior door and panels shall be powder-coat black (RAL 7021).

Additional branch circuit breakers shall be user-supplied, square -D bolt-on (QOB) type, or square – D plug in (QO) type. The panel board shall include separate, isolated neutral and safety-ground bus bars.

2.2 Vertiv™ Liebert® PDX / Vertiv™ Liebert® PCW Environmental Control – All Systems

2.2.1 Liebert® PDX / Liebert® PCW

The Liebert® PDX / Liebert® PCW for the Vertiv™ Liebert® SmartRow™ DCR, shall have a nominal cooling capacity of 20kW @ 85°F (29.4°C) return air (based on the nominal 5-ton Liebert® PDX / Liebert® PCW), and consist of a high efficiency digital scroll compressor (not applicable to Chilled Water models), Vertiv™ Liebert iCOM™ with a touch screen display, and down discharge air flow.

Optional operating characteristics of the Liebert® PDX / Liebert® PCW to be specified at time of order shall be:

- Cooling system operating voltage: (460V/60Hz or 208V/60Hz or 230V/60Hz)
- Cooling type: (air-cooled, chilled water, or water / glycol)
- Heat Rejection: (Micro Channel (MC) condenser with or without Vertiv™ Liebert® Lee Temp Kit, or Fan Cycling Drycooler & Pump Package)
- Electrical and piping connection entry (top entry or bottom entry)

2.2.2 Cabinet and Frame Construction

The Liebert® PDX / Liebert® PCW in the Liebert® SmartRow™ DCR exterior panels shall be 20-gauge steel and powder-coated with black color paint to protect against corrosion. The exterior panels shall be insulated with 1/2" to 1" (12.7 to 25.4mm), 1-1/2 lb. (0.68 kg) insulation. Front and side panels shall have captive, quarter-turn fasteners. The cabinet shall be designed so that all components are serviceable and removable using the front the unit.

2.2.3 Fan and Motor Section

The unit shall be equipped with one plug fan: integral direct driven fan with backward-curved blades and electronically commutated DC motors, commonly referred to as *EC fan*. The fan speed shall be automatically regulated by the Liebert® iCOM™ through all modes of operation. The fan shall have a dedicated motor, fault monitoring circuitry and speed controller, which shall provide a level of redundancy. The impeller shall be made of aluminium and dynamically balanced. The EC fan shall be located within the unit. The EC fan shall also provide greater energy savings than forward-curved centrifugal fans and variable speed drives. The filter shall be deep-pleated, 2" (51mm) thick with a MERV 8 rating efficiency based on ASHRAE 52.2-2007. A filter clog switch shall be included. Mesh type, cleanable filters shall be unacceptable.

2.2.4 Digital Scroll Compressor with Sound Jacket

The compressor shall be an R-410A scroll-type with variable capacity operation from 20-100%, commonly known as a digital scroll. The compressor solenoid valve shall unload the compressor to provide variable capacity operation. The compressor shall have a suction gas-cooled motor, EPDM vibration isolators, internal thermal overloads, automatic reset high pressure switch with lockout after three failure occurrences, rotalock service valves, low pressure transducer, and crankcase heater. The compressor shall be removable and serviceable from the front of the unit. The crankcase heater and a discharge check valve shall be provided for additional system protection from refrigerant migration during off cycles. The compressor sound jacket shall reduce the level of sound emitted from the compressor. It shall consist of a 3/8 inch closed cell polymeric 4.5 - 8.5 lb/ft^3 density jacket that encloses the compressor.

2.2.5 Vertiv™ Liebert® iCOM™ Control with 9” Color Touch Screen Display

The Liebert® iCOM™ shall be microprocessor-based with a 9” color touchscreen display and shall be mounted in an ergonomic, aesthetically pleasing housing. The display shall be viewable while the unit panels are open or closed. The controls shall be menu-driven. The system shall display user menus for active alarms, event log, graphic data, unit view/status overview (including the monitoring of room conditions, operational status in percentage of each function, date and time), total run hours, various sensors, display setup and service contacts. A password shall be required to make system changes. Service menus shall include set points, standby settings (lead/lag), timers/sleep mode, alarm setup, sensor calibration, maintenance/wellness settings, options setup, system/network setup, auxiliary boards, and diagnostics/service mode. The Liebert® iCOM™ shall be capable of accommodating one (1) Vertiv™ Liebert® 2T Rack Sensor per DCR rack.

Refer to the Liebert® PDX / Liebert® PCW Guide Specification, document number SL-19810GS, for additional Liebert® iCOM™ control processor characteristics.

2.2.6 Disconnect Switch, Locking Type

A locking-type fused disconnect switch shall be mounted in the electrical panel and shall be capable of disrupting the flow of power to the unit. The locking type shall consist of a main unit switch operational from outside the unit. The high voltage electric panel compartment shall be accessible only with the switch in the off position. The locking disconnect shall be lockable in support of lockout/tag out safety programs.

2.2.7 Sensors

The Vertiv™ Liebert® PDX / Vertiv™ Liebert® PCW unit shall be furnished with (1) LT410 Point Leak Sensor, factory wired, field mounted in the base plenum – thermal unit. Each Vertiv™ Liebert® SmartRow™ DCR rack shall be furnished with a factory installed Liebert® 2T Rack temperature sensor (two probes per rack) to reduce assembly time and labor expense. The sensors shall be capable of being wired in a daisy chain configuration to the Liebert® PDX / Liebert® PCW return air temperature and humidity sensor.

2.2.8 Condensate Pump

The Liebert® PDX / Liebert® PCW unit shall be furnished with (1) condensate pump, field mounted in the base plenum – thermal unit. The condensate pump shall be complete with dual integral float switch, pump, motor assembly and reservoir. The secondary float shall send an alarm signal and shut down the cooling unit upon a high-water condition.

2.2.9 Humidifier and Reheat

The Liebert® PDX / Liebert® PCW is not furnished with humidifier or reheat systems because the Liebert® SmartRow™ DCR is a closed loop architecture.

2.3 Vertiv™ Liebert® SmartRow™ DCR, Vertiv™ Liebert® PDX / Vertiv™ Liebert® PCW – System Options

The Liebert® SmartRow™ DCR, Liebert® PDX / Liebert® PCW shall be supplied in the following configurations with options as specified at the time of order. Refer to the Liebert® PDX / Liebert® PCW guide specifications SL-19810GS, available at the Liebert Web site: https://www.vertiv.com/

Optional design requirements of the Liebert® PDX / Liebert® PCW to be specified at time of order shall be:

2.3.1 Direct Expansion Self-Contained Systems

Air-Cooled Self-Contained Systems

1. MC Condenser (sized for 95°F, 100°F, or 105°F outdoor ambient)
2. Vertiv™ Liebert® Lee-Temp Kit with heater pad (Optional)

Water/Glycol Cooled Self – Contained Systems

1. Fan cycling Drycooler (sized for 95°F, 100°F, or 105°F outdoor ambient) with single pump control with ¾ HP pump package.

2.3.2 Liebert® SmartRow™ DCR Base (Supply Air) Plenum and Top (Return Air) Plenums

The Liebert® SmartRow™ DCR supply and return air plenums shall be constructed of formed and welded 16 gauge steel and finished in powder-coat black (RAL 7021). All supply and return air plenums shall be individually sized to match the Liebert® PDX / Liebert® PCW in the Liebert® SmartRow™ DCR, and the specific DCR Racks as selected at the time of order. One set of supply and return air plenums shall be supplied for each DCR rack and for each Liebert® PDX / Liebert® PCW cooling system.

2.3.3 Liebert® SmartRow™ DCR Base (Supply Air) Plenum

Liebert® SmartRow™ DCR base (supply air) plenums shall be furnished with adjustable leveling feet, all appropriate gasket materials, and edge guards. The plenum gasketing that will contact the racks and the thermal units shall be factory installed to enable easier assembly for the customer. Remaining gasketing and edge guards shall be field-installed. The base (supply air) plenums shall be insulated and furnished with one user-adjustable air balancing damper to control the amount of airflow from the Liebert® PDX / Liebert® PCW system(s) entering the front of each DCR rack.

Liebert® SmartRow™ DCR base (supply air) plenums shall be furnished with cable pass-through openings, removable end panels to allow for expansion, and a separate atmospheric damper which shall automatically enable the supply of ambient room air to the DCR rack during emergency operation. The base (supply air) plenums for the thermal units shall also include a factory installed back draft damper to prevent the short cycling of air within the system.

2.3.4 Liebert® SmartRow™ DCR Top (Return Air) Plenum

The Liebert® SmartRow™ DCR top (return air) plenums shall route heat from powered rack mounted loads back to the Liebert® PDX / Liebert® PCW(s) in the Liebert® SmartRow™ DCR. The Liebert® SmartRow™ DCR top (return air) plenums shall be furnished with all appropriate gasket materials, edge guards, & lobster claws (4) per plenum for effective cable management. The plenum gasketing that will contact the racks & the thermal units shall be factory installed to enable easier assembly for the customer. Remaining gasketing and edge guards shall be field-installed. Each top (return air) plenums shall be furnished with an integrated, self-contained Emergency Fan system, rated at 1,000 CFM at 120VAC. These fans provide emergency airflow to powered loads inside the Liebert® SmartRow™ DCR Racks and reject heat to the outside of the Liebert® SmartRow™ DCR. The emergency fan system shall activate when a high temperature condition (98°F) is sensed inside the Liebert® SmartRow™ DCR or during a loss of PDX/PCW cooling.

Vertiv™ Liebert® SmartRow™ DCR top (return air) plenums shall be furnished with cable pass-through openings, removable end panels to allow for expansion, and with adjustable sleeves for ceiling discharge interface. They have been designed to provide routing for both power and network cables through the front & back of the plenums respectively. Each of the DCR emergency fan units shall be integral to the top (return air) plenums and shall be available in a top-mounted orientation.

2.4 Liebert® SmartRow™ DCR Racks

2.4.1 Frame Type

The Liebert® SmartRow™ DCR rack frame shall be constructed as a welded steel frame, folded 5-times for maximum strength and rigidity, and promote flexible mounting options and adjustable rear rail positioning. The frame shall include depth markings for ease of EIA rail alignment. The frame shall support 3000 lbs. (1,361kg) static weight load, 2500 lbs. (1,334kg) dynamic (non- transit) weight load. The Liebert® SmartRow™ DCR Racks shall be furnished with (2) pairs of 42U, 19" EIA 310E-compliant rack mount rails to accommodate powered loads inside the Liebert® SmartRow™ DCR. All mounting rails shall be constructed of 12 gauge sheet steel, finished in powder-coat black (RAL 7021) with color-contrasting RU position labels on both sides of each rail marking 1U increments. The front EIA mounting rails shall be factory-installed & set back 8.4" for proper airflow.

2.4.2 Cabinet Enclosure

Each Liebert® SmartRow™ DCR rack shall be fully factory-assembled with doors, split side panels, top plate modified for top (return air) plenum interface, base modified for base (supply air) plenum interface, and all appropriate gaskets and sealing provisions for hot and cold air separation.

Network Racks 800mm Wide

These racks will be factory installed with (4) fixed full height rack PDU mounting brackets; (2) mounted in the front, (2) mounted in the rear, and (2) cable fingers mounted in the front. The overall dimensions of this DCR rack including doors and panels shall be:

- Width: 31.5" (800mm); 19" EIA rack-mount
- Height: 42U, 77.6" (1,972mm); 42U usable space
- Depth: 48.4" (1,230mm)

Server Racks 700mm Wide

These racks will be factory installed with (2) fixed full height rack PDU mounting brackets; (2) mounted in the rear, vertical airflow brush strips, and cable entry brushes on the side panels of the racks not on the end of the rows. The overall dimensions of this DCR rack including doors and panels shall be:

- Width: 27.6" (700mm); 19" EIA rack-mount
- Height: 42U, 77.8" (1,975mm); 42U usable space
- Depth: 48.5" (1,231mm)

Doors

Front and rear doors shall be furnished with a three-point latch system with key lock insert for security, and shall be constructed of 16 gauge (1.5mm) sheet metal and finished in powder-coat black (RAL 7021). The front door shall be a gasketed single front sheet metal door with a full-height, scratch- and impact-resistant clear acrylic insert to allow for external viewing of rack mounted equipment. The rear doors shall be gasketed split solid steel doors.

Sensors

Each Liebert® SmartRow™ DCR rack shall be furnished with (1) factory-installed 2T temperature sensor. The sensors shall be capable of being wired in a daisy chain configuration back to the thermal unit.

3.0 OPTIONS - VERTIV™ LIEBERT® SMARTROW™ OFFERING

3.1 Rack Power Distribution Units – PDU (Optional)

Liebert® SmartRow™ DCR rack PDU options shall be field-installed on either the furnished PDU brackets, vertical frame members or in zero-U internal spaces. All rack PDU's shall include an input power cord with appropriate input plug connection and appropriate circuit breaker protection. Liebert® SmartRow™ DCR Rack PDU options shall be:

3.1.1 Vertiv™ Liebert® MPX

The Liebert® MPX Adaptive Rack PDU shall provide scalable and modular power distribution and remote management support. The modular design shall consist of hot-swappable output power modules, reconfigurable input power modules, an MPX PRC (Power Rail Chassis) to distribute power and communications to all modules and offer provisions to physically mount the Liebert® MPX in a rack. The system shall support Web and SNMP management for systems connected to an Ethernet network, remote monitoring and control to the receptacle level; and monitoring of environmental input options, including temperature and humidity.

AC Power

The rated power range of the Liebert® MPX shall be up to 30 amps, 1PH, 3-wire, 120VAC or 208VAC; or up to 60 amps, 3PH, 208/120VAC.

Measurement Accuracy

Measured accuracy of parametric data shall be:

- AC Voltage, Amps: + 1%
- kW, kW-h, kVA: + 2%
- Temperature & Humidity: + 2%

Environmental Operating Range

Rated operating temperature of the Liebert® MPX shall be 41°F - 131°F (5°C - 55°C) for altitudes up to 10,000 ft (3,000 meters) above sea level.

Refer to the Liebert® MPX Guide Specifications, document number SL-20834, for additional system specifications. The document can be found at https://www.vertiv.com/

3.1.2 Vertiv™ Liebert® MPH2

The Liebert® MPH2 system delivers power distribution, monitoring and/or receptacle control to plug/cord-connected sensitive electronic equipment. The product is part of the Vertiv™ Rack PDU platform, a family of rack power distribution systems designed to manage power from the critical source all the way to each individual receptacle. It offers remote monitoring and control capabilities as well as environmental monitoring options, multiple input power selections and output configurations.

AC Power

The rated power range of the Liebert® MPH2 shall be up to 30 amps, 1PH, 3-wire, 120VAC or 208VAC; or up to 60 amps, 3PH, 208/120VAC; or 60 amps, 3PH, 415/240VAC.

Measurement Accuracy

Measured accuracy of parametric data shall be:

- Voltage: ±1% +0.1V
- Current: ±1.5% + 0.01A from 1% to 10% of unit rating; ±1% +0.01A from >10% to 125% of unit rating

Environmental Operating Range

- Ambient Temperature
  - Operating: 32A or Less Input Models: 32°F to 140°F (0°C to 60°C)
  - Operating: 40A and 48A Input Models: 32°F to 122°F (0°C to 50°C)
  - Storage: -13°F to 185°F (-25°C to 85°C)
- Relative Humidity
  - 10 to 90% non-condensing
- Altitude
  - 6,562 ft. (2,000m) without power derating when operated within the temperature range specified in Section 1.5, Item A

Refer to the Liebert® MPH2 Guide Specification, document number SL-20832, for additional system specifications. The document can be found at https://www.vertiv.com/

3.2 Vertiv™ Liebert® SmartRow™ DCR Monitoring

3.2.1 Vertiv™ Liebert® vNSA Network Switch (Optional)

A network switch is required for unit-to-unit communications in redundant cooling configurations, allowing the units to communicate and function as a team and facilitating lead/lag operation. The Liebert® vNSA switch or equivalent is required in redundant or higher capacity configuration. The Liebert® vNSA8 network switch meets all Vertiv™ Liebert® PDX / Vertiv™ Liebert® PCW communication requirements. The Liebert® vNSA network switch is designed for connecting multiple Ethernet-ready devices and comes in various models: Vertiv™ Liebert® vNSA8 iCOM™, Vertiv™ Liebert® vNSA16 iCOM™, Liebert® vNSA8, Liebert® vNSA16. The vNSA8 may have a Liebert® iCOM™ display mounted on the front.

3.2.2 Vertiv™ Liebert® IS-UNITY-DP and Web-Based Management Communication

1. Unity cards deliver Web, Vertiv™ LIFE™ Services Support, Vertiv Protocol, SNMP, BACnet IP/MSTP, Vertiv™ Modbus TCP/RTU, Email, Text Messaging, and Telnet communication and control capabilities for a variety of Liebert power and thermal management units. The platform supports 10/100 Mbit Ethernet, IPv4 and IPv6, HTTP/HTTPS for device webpage access, Vertiv Protocol for communicating with Vertiv™ *Trellis*™, Vertiv™ Liebert® SiteScan™, and Vertiv™ Liebert® Nform software applications, and LIFE™ Services support for Remote Service Delivery applications. Vertiv™ Liebert® SN sensors may also be connected to the Unity cards for monitoring environmental conditions around the units
2. **Liebert® PDX / Liebert® PCW:** Each Liebert® PDX / Liebert® PCW in the Liebert® SmartRow™ DCR, shall be furnished with (1) Vertiv™ Liebert® IntelliSlot Unity Card (IS-UNITY-DP) to deliver real-time SNMP and Web-management communication capabilities.
3. **Vertiv™ Liebert® UPS (Optional):** Liebert® IntelliSlot UNITY Card family delivers SNMP, Telnet and Web-management capability for enhanced communications and control of Liebert® UPS.
4. **Vertiv™ Liebert® Rack PDU (Optional):** The Liebert® RPC2 (Rack PDU Card) is a network interface card that provides network connectivity to the Vertiv™ Liebert® MPX and Vertiv™ Liebert® MPH2 Rack PDU's to provide network monitoring and control capabilities. Available options include a handheld or remote mounted display to view monitoring data and Liebert® SN sensors that may be connected to monitor temperature, humidity, door contacts and digital inputs.

3.2.3 Vertiv™ Liebert® Nform (Optional)

Liebert® Nform enables data center monitoring for any SNMP device that supports a network interface. The Critical Infrastructure Management software shall centrally monitor and manage distributed equipment using the customer's existing network infrastructure. The system shall provide the Critical Infrastructure Management and Monitoring for critical infrastructure systems as specified. The system shall have an architecture that allows up to 10,000 managed devices, including Liebert and third-party devices, in a single-server installation.

3.2.4 Vertiv™ Liebert® SiteScan™ Web (Optional)

Liebert® SiteScan™ Web shall provide Critical Facilities Monitoring for critical infrastructure systems as specified. Open protocol support shall include:

- Java
- HTTP(s)
- XML/SOAP
- SNMP v.1
- BACnet PTP / MSTP / IP
- Modbus ASCII / RTU/ via Serial or Network interfaces IP slave only

3.2.5 Vertiv™ Liebert® SiteLink Module (Optional)

The Liebert® SiteLink-E is a 32-bit microprocessor-based communications device that provides an interface for up to 12 Liebert Unit Controllers (IGM's). Liebert® SiteLink-E communicates to either the Liebert® SiteScan™ monitoring system or to a third-party software program utilizing a designated open standard protocol (e.g., Modbus or BACnet). Liebert® SiteLink-E modules shall be available with (12), (4), or (2) EIA-422 ports.

3.2.6 Environmental Discrete Outputs Card - Vertiv™ Liebert® ENV-DO or Vertiv™ Liebert® iCOM™ DO (Optional)

Liebert Environmental Discrete Output interface cards provide 16 individual contact-closure outputs for status and major alarm conditions of microprocessor-controlled Liebert Environmental Control systems.

3.3 Enclosure Options

Enclosure options shall be field-installed and shall include all necessary installation instructions.

3.3.1 Floor Anchors

The Floor Anchor kit may be used to secure the Vertiv™ Liebert® SmartRow™ DCR base supply air plenum to the floor with user-supplied hardware, as required per site.

3.3.2 Telescopic Tool-Less Shelf

The pullout shelf shall be a solid shelf that attaches to the EIA server rails. The shelf shall be 0.04" (1mm) sheet steel construction, finished in powder-coat black (RAL 7021) and support up to 110 lb. (50kg), evenly distributed.

3.3.3 Fixed Tool-Less Shelf

The fixed tool-less shelf shall be a vented shelf that attaches to the EIA server rails without requiring tools. The shelf shall be 0.04" (1mm) sheet steel construction, finished in powder-coat black (RAL 7021) and support 275 lb. (124kg), evenly distributed

3.3.4 L-Shaped Depth-Adjustable Support Rails

The L-Shaped Depth-Adjustable Support Rail shall include two horizontally positioned 90° “L” rails that extend between the front and rear EIA mounting rails. The rails shall be 0.08" (2mm) galvanized sheet steel and support up to 110 lb. (50kg), evenly distributed.

3.3.5 Blanking Panels

Tool-less blanking panels shall be available in 1U and 2U sizes and shall mount onto the EIA rails without tools to prevent airflow to unused portions of the server rack and enhance airflow through the rack equipment. The blanking panels shall be formed of black, injection molded plastic.

3.3.6 Mounting Hardware Packages

The mounting cage nuts package for rack mounting shall include spring-mounted cage nuts to fit with the EIA rail holes. Each package shall include 50 cage nuts (M5 threaded) and 50 matched screws.

3.4 Cable Management

All rack cable management options incremental to the factory installed Server and Network rack accessories. They shall be field-installed.

3.4.1 19" Cable Routing Panel with D-Rings

Cable Routing Panels with D-Rings shall be used for orderly management of fiber and copper cable through patch panels. These routing panels shall be constructed of 16 gauge steel, finished in black (RAL 7021).

3.4.2 19" Cable Trough

Cable troughs shall be used for securing cables in place in zero-U space or across the rack face in conjunction with Velcro straps; 16 gauge steel finished in black (RAL 7021).

3.4.3 Lobster Claw

A minimum of (4) claws per top plenum are included with each Vertiv™ Liebert® SmartRow™ DCR. They will be provided ship loose in quantities of 10. Lobster Claw cable management shall be heavy duty plastic rings, black, field-attached to the rack PDU Bracket/EIA rail and shall support a cable bundle approximately 2" (50.8mm) diameter. Lobster Claws shall be available in packs of 10 and 100. These shall be mounted by inserting them into rectangular cutouts in the rack PDU Bracket/EIA rail dimension and turning them clockwise 1/4 turn.

3.4.4 Velcro Straps

A minimum of (6) Velcro straps are included with each Liebert® SmartRow™ DCR. Velcro straps and heavy duty plastic attachment points shall be available in packs of 10 and 100. The attachment points shall be mounted by inserting them into the rack PDU Bracket/EIA rail dimension and turning clockwise 1/4 turn. The Velcro straps shall fit through slots in the attachment points. Each Velcro strap shall support a cable bundle approximately 5" (130mm) diameter.

3.4.5 18U Vertical Cable Fingers

This option is available in addition to the factory supplied fingers in the 800-wide rack. The Cable Fingers option shall permit routing cables in the void between racks in a cluster configuration. The cables can be strung through the fingers of the Cable Fingers and into an adjacent rack (via the cable pass through side panels). A rack shall accommodate two sets of the Cable Fingers installed one above the other in a cabinet. Full height Vertical Cable Fingers shall be deployable in the front, rear or both front and rear.

4.0 EXECUTION

4.1 Vertiv™ Liebert® SmartRow™ DCR Fire Suppression System Inspection and Checkout

After the Liebert® SmartRow™ DCR installation has been completed, the entire system shall be checked out, inspected and functionally tested by properly trained and qualified personnel, in accordance with the manufacturer's recommended procedures and NFPA standards.

All containers and distribution piping shall be checked for proper mounting and installation.

All electrical wiring shall be tested for proper connection, continuity and resistance to earth.

The complete system shall be functionally tested, in the presence of the owner or his representative, and all functions, including system and equipment interlocks, must be operational at least five (5) days prior to the final acceptance tests.

Each detector shall be tested in accordance with the manufacturer's recommended procedures, and test values recorded.

All system and equipment interlocks, such as door release devices, audible and visual devices, equipment shutdowns, local and remote alarms, etc., shall function as required and designed.

Each SHP PRO control panel circuit shall be tested for trouble by inducing a trouble condition into the system.

4.2 Training Requirements

Prior to final acceptance, the installing contractor shall provide operational training to each shift of the owner's personnel. Each training session shall include system SHP PRO Control Panel operation, manual and (optional) abort functions, trouble procedures, supervisory procedures, auxiliary functions and emergency procedures.

4.3 Installation of Liebert® SmartRow™ DCR, Vertiv™ Liebert® PDX / Vertiv™ Liebert® PCW Units

4.3.1 General

Install environmental control units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated and maintain manufacturer's recommended clearances.

4.3.2 Electrical Wiring

Install and connect electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's electrical connection diagram submittal to electrical contractor.

4.3.3 Piping Connections

Install and connect devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's piping connection diagram submittal to piping contractor.

4.3.4 Supply and Drain Water Piping

Connect water supply and drains to air conditioning unit. Provide pitch and trap as manufacturer's instructions and local codes require.

4.3.5 Field Quality Control

Startup environmental control units in accordance with the manufacturer's startup instructions. Test controls and demonstrate compliance with requirements.