Liebert Datawave™

GUIDE SPECIFICATIONS
100 - 200 kVA Magnetic Synthesizer
Power Conditioning System

1.0 GENERAL

1.1 SUMMARY

These specifications describe requirements for a complete power conditioning and distribution system, supplying computer-grade power to sensitive loads. The specified system shall provide isolation, regulation, noise and transient suppression, distribution, control and monitoring of AC power. It shall include all equipment to properly interface the AC power source to the intended load.

1.2 STANDARDS

The specified system shall be designed, manufactured, tested and installed in compliance with:

- American National Standards Institute (ANSI)
- Canadian Standards Association (CSA)
- Institute of Electrical and Electronics Engineers (IEEE)
- International Standards Organization Quality Standard ISO 9001
- National Electrical Code (NEC - NFPA 70)
- National Electrical Manufacturers Association (NEMA)
- National Fire Protection Association (NFPA 75)
- Underwriters Laboratories (UL)

The system shall be UL-listed as a complete system under UL 60950 Standard for Information Technology Equipment (UL listing applies to 60 Hz units only). 50 Hz units shall comply with EN and the European Low Voltage Directive and be CE marked.

The specified system shall comply with the latest FCC Part 15 EMI emission limits for Class A computing devices and the emission and immunity limits of EN50081-2/EN550022 Class A and EN50082-2.

The unit shall safely withstand the following conditions without misoperation or damage:

- Transient voltage surges on the AC power input as defined by ANSI/IEEE C62.41 for Category B3 locations (high surge exposure industrial and commercial facilities).
- Electrostatic discharges (ESD) up to 10 kV at any point on the exterior of the unit.
- Electromagnetic fields from portable transmitters within 3 ft. (1m) of the unit.

1.3 SYSTEM DESCRIPTION

1.3.1 Electrical Requirements

Output capacity shall be [(100) (125) (150) (200)] kVA.

Input voltage shall be [(600) (480) (415) (400) (380) (240) (208) (____)] volts AC, [(60) (50)] Hz, three-phase, three-wire-plus-ground.

Output voltage shall be [(208/120) (380/220) (400/230) (415/240) (480/277) (600/346) (____)] volts AC, [(60) (50)] Hz, three-phase, four-wire-plus-ground, wye configuration.

1.3.2 Environmental Requirements

A. Storage Temperatures. The storage temperature range shall be -67° to +185°F (-55° to +85°C).

B. Operating Temperatures. The storage temperature range shall be 32° to 104°F (0° to 40°C).

C. Relative Humidity. Operation shall be reliable in an environment with 0% to 95% noncondensing relative humidity.

D. Audible Noise. The audible noise level of the specified system shall be less than 63 dBA at 5 ft. (1.5m).

1.4 DOCUMENTATION

1.4.1 Equipment Manual

The manufacturer shall furnish an installation manual with installation, startup, operation and maintenance instructions for the specified system.

1.4.2 Drawings

Wiring diagrams and drawings of major components shall be furnished.

1.4.3 Spare Parts

A list of recommended spare parts shall be supplied at the customer's request.

1.4.4 User's List

An in-service user's list shall be furnished upon request.

1.5 WARRANTY

The manufacturer shall provide a one-year warranty against defects in material and workmanship for 12 months after initial startup or 18 months after ship date, whichever occurs first (refer to the Warranty Statement for details).

1.6 QUALITY ASSURANCE

The specified system shall be factory-tested before shipment. Testing shall include, but shall not be limited to: Quality Control Checks, Hi-Pot Test (two times rated voltage plus 1000 volts, per UL requirements), Full Load Tests and Metering Calibration Tests. The system shall be designed and manufactured according to world class quality standards. The manufacturer shall be ISO 9001 certified.

2.0 PRODUCT

2.1 COMPONENTS

2.1.1 Frame Construction and Enclosure

The frame shall be constructed of welded steel to provide a strong substructure and ensure grounding integrity. The enclosure shall be designed with a welded steel base so that the unit can be moved by fork-lift equipment and set flat on the floor without the use of a floorstand. All service and system operation shall be capable of being performed with access to the front and right side. A tool shall be required to remove the exterior panels that access the hazardous voltage area of the unit. For grounding integrity, static protection and EMI shielding, outer panels shall be grounded to the frame with copper wire. Hinged lockable doors shall provide access for operation of the main input circuit breaker and output circuit breaker(s). Exterior panel color shall be [(manufacturer's standard color) (_____)].

(Units 150kVA and larger) The system shall be designed in a split (2) module system. The split-module system shall allow the two modules to be separated for shipping (to minimize handling difficulties), for reconnection at the installation site. All of the necessary wiring and hardware for interconnecting of the two units shall be factory-supplied.

The complete specified system shall have maximum dimensions of: Width, 66 in. (1676mm) [100-125 kVA systems], 104 in. (2642mm) [150-200 kVA systems]; Depth, 36 in. (914mm); Height, 76 in. (1930mm). Exterior panels shall be removable to allow the unit to fit through a 34-inch (864mm) doorway. The distributed floor weight shall be a maximum of 300 lbs/sq. ft. (1465 kg/sq. m). Multiple redundant cooling fans (n + 1) shall allow continuous full load operation at the maximum specified temperature without overtemperature.

2.1.2 Input Connections

2.1.2.1 Power

Terminals shall be provided for the incoming AC power and ground. The power connections shall be designed to accept wire sizes commensurate with the input circuit breaker:

125 - 250 A	#8 - 350 kcmil
300 - 600 A	(2) #2/0 - 400 kcmil
700 - 800 A	(3) 250 - 500 kcmil

2.1.2.2 Control

The low-voltage control input shall contain a terminal block with at least 21 positions for connecting all building interface alarms, controls, centralized monitoring and Remote Emergency Power Off (REPO) switches. The low-voltage control section shall also contain a 24 VDC, DPDT building interface relay for interfacing with environmental systems, alarm panels, etc. The relay contacts shall be rated for use at up to 10 amps at 240 VAC.

2.1.3 Main Input Circuit Breaker

The specified unit shall be equipped with a main input circuit breaker to provide overcurrent protection and a means for disconnecting power to the unit. The main input circuit breaker shall be a three-pole molded case circuit breaker sized for at least 125% of the specified full load input current and rated for 600 VAC. The minimum UL-listed interrupting rating for the main input circuit breaker shall be [(25,000) ( )] RMS symmetrical amperes at 480 volts AC. The main input circuit breaker shall include a 24 VDC shunt trip mechanism to interface with EPO switches and other system controls.

2.1.4 Magnetic Synthesizer

Power conditioning shall be accomplished by using a magnetic synthesizer. The magnetic synthesizer shall be a static electromagnetic 3-phase AC power regenerator and shall not contain mechanically moving parts, power semi-conductors or feedback control circuits.

2.1.4.1 Function

The magnetic synthesizer shall accept 3-phase 3-wire (delta configuration) input power and shall regenerate (synthesize) clean 3-phase 4-wire (wye configuration) output power. The synthesizer shall be a true 3-phase device which maintains the output voltage phase separation at 120 electrical degrees under

any load conditions. The sine wave output voltage shall be synthesized from six saturating transformer pulses for each half-cycle.

2.1.4.2 Transformers

All transformers shall be UL-recognized, dry type transformers, with UL class 200 insulation and all copper windings. All pulse transformers shall have two electrostatic shields for noise isolation.

2.1.4.3 Capacitors

The capacitors shall be metalized polypropylene capacitors for high reliability. The capacitors shall exhibit self-healing characteristics and shall be equipped with an integral, UL-recognized, pressure-sensitive interrupter. The interrupter shall provide short circuit current interrupting capability up to 10,000 amperes at 600 VAC. The capacitors shall be wired in a multi-redundant configuration so that individual capacitor failures will have a minimal impact on the operation of the magnetic synthesizer.

2.1.4.4 Performance Characteristics

The following shall be typical characteristics exhibited by the magnetic synthesizer.

A. Static Voltage Regulation (for any load condition, no load to full load): For nominal input voltage, the output voltage shall be within nominal to ±3%. For input voltage variation of +40% to -40% of nominal, the output voltage shall be within +5% to -5%.

B. Unbalanced Load: At nominal input voltage and with 100% load imbalance, output voltage shall be within +5% and -2%.

C. Overload: At nominal input voltage, while increasing the load from full load to 200% of full load, the output voltage shall be no less than -6% of nominal. The unit shall be capable of sustaining 200% load until activation of the overcurrent protection, typically 3 to 20 minutes.

D. Input Transients: No power disturbances shall be evident on the output when high-energy ringing transients are impressed on the input lines. The specified system shall protect against surges as defined by ANSI/IEEE Standards C62.41 and C62.45.

E. Electrical Noise Suppression: Common mode noise suppression shall be 120 dB minimum. Normal mode noise suppression shall be 120 dB minimum.

F. Unbalanced Input Voltage (Single-Phasing): Upon loss of one phase of input voltage, output phase voltages shall remain within +5.8% to -4% of nominal from no load to 60% load.

G. Short-Circuit Capability: The sustained short-circuit current shall be limited to 300% of full load. This current output shall be sustained without damage, until the overcurrent protection is activated.

H. Harmonic Distortion (No load to full load): The output voltage total harmonic distortion shall be less than 4%. Input voltage distortion shall not be added to the output voltage distortion.

I. Efficiency: At nominal input voltage, the efficiency of the system shall be:

93% at full load.

91.5% at three-quarter load.

89% at half load.

J. Input Power Factor: The input power factor of the magnetic synthesizer shall be nearly unity under all load conditions from half to full load. The full load input power factor shall be 0.96 lagging, or better. The input power factor shall be independent of the load power factor.

K. Input Current: The magnetic synthesizer shall draw linear input current from no load to full load. Input current distortion shall be less than 8% THD, independent of output current distortion.

L. Output Impedance: A 3-phase bank of capacitors shall be directly connected across the output of the magnetic synthesizer for low output impedance. The output capacitance shall attenuate load generated noise and transients, as well as supply the non-linear current requirements of modern computer equipment without causing excessive output voltage distortion.

2.1.4.5 Thermal Overload

The magnetic synthesizer shall be provided with additional thermal overload protection for the transformers. An alarm shall sound if any transformer temperature reaches 320°F (160°C). The system shall automatically shut down if any transformer temperature reaches 356°F (180°C).

2.1.4.6 Paralleling Capability

The magnetic synthesizer shall be capable of being paralleled with like units of the same or different capacity to make larger kVA systems or parallel redundant systems. Paralleling shall be accomplished with minimal circulating current and without the use of control circuitry for load sharing.

2.1.5 Manual Restart

A manual restart circuit shall allow for an orderly supervised startup after power failure. The control circuit shall automatically energize the shunt trip mechanism of the main input breaker upon sensing output voltage failure. A field-selectable auto-restart mode shall be provided to deactivate the manual restart if desired.

2.1.6 Emergency Power Off (EPO)

The local EPO shall include a fully guarded and illuminated EMERGENCY POWER OFF pushbutton. Pressing the EPO switch shall immediately shut down the system by activating the shunt trip of the main input circuit breaker. As part of the EPO circuit, an interface shall also be provided for connecting normally open or normally closed remote EPO switches to the EPO circuit. For flexibility in meeting shutdown control schemes, the local EPO (unit shutdown) circuit shall be isolated from the remote EPO (room shutdown) circuit. The remote EPO circuit shall be designed to allow direct connection of multiple units with single and/or multiple shutdown control contacts.

2.1.7 Computer-Grade Ground

A computer-grade, single-point ground shall be provided in accordance with the computer manufacturer’s recommendations, IEEE Std. 1100 and the requirements of the NEC. The synthesizer output neutral shall be solidly grounded in accordance with NEC article 250-26.

2.2 CONDITIONING-ALONE SYSTEM

[**NOTE:** Select either a Conditioning-Alone system (conditioning only) or a Self-Contained system (conditioning plus power distribution).]

The Conditioning-Alone System shall also include:

2.2.1 Main Output Breaker

The specified unit shall have a main output circuit breaker for overcurrent protection and a system disconnecting means. It shall be sized for 125% of the specified system full load output current in accordance with the NEC. The minimum UL-listed interrupting rating for the main output circuit breaker shall be 10,000 RMS symmetrical amperes at rated output voltage.

2.2.2 Output Power Connections

The specified unit shall contain five terminals for connection of the output AC power. The three output phase connections shall be to lugs mounted on the load side of the main output circuit breaker. The neutral and ground connections shall be power terminals. All output power terminals shall be designed to accept wire sizes commensurate with the circuit breaker rating, double-sized neutral and parity-sized ground conductors.

2.3 SELF-CONTAINED SYSTEM

[**NOTE:** Select either a Conditioning-Alone system (conditioning only) or a Self-Contained system (conditioning plus power distribution).]

The Self-Contained System shall also include:

2.3.1 Output Distribution Panelboards

The specified system shall contain four vertically mounted 42-pole, 3-phase panelboards for distribution to the intended loads. Each distribution panelboard shall be individually protected by a main panelboard circuit breaker. Each panelboard shall be individually enclosed with a separate cover which provides access to that panelboard without exposing other portions of the unit. The panelboard shall have a rating of 225 amperes, with an overall short-circuit current rating of 10,000 RMS symmetrical amperes. The panelboards shall provide a total of 120 single-pole branch circuit breaker positions. Each panelboard shall include separate isolated neutral and safety-ground bus bars for the neutral and safety-ground connections for at least 42 output circuits. Each neutral bus bar and wiring shall be rated for at least 1.73 times the full load rating of the panelboard to accommodate high neutral currents associated with single-phase nonlinear loads.

2.3.2 Branch Circuit Breakers

Each load shall be protected by an individual branch circuit breaker as shown on the plans. Each branch circuit breaker shall provide overcurrent protection and ON-OFF switching to the specified load. Single-pole, two-pole and three-pole [(plug-in) (bolt-in)] type branch circuit breakers up through 100 amperes shall be utilized. Each circuit breaker shall clearly indicate the ON, OFF and TRIPPED positions. All branch circuit breakers shall have a minimum interrupting capacity of 10,000 RMS symmetrical amperes at 120/240 VAC. Each branch circuit breaker shall be sized in accordance with the NEC and shall be UL/CSA listed. Branch circuit breakers shall have an associated directory label, located adjacent to the breaker, identifying the branch circuit number and the equipment being served.

2.3.3 Output Distribution Cables

The cable supplying each load shall consist of UL/CSA listed liquid-tight flexible metal conduit containing the required THHN copper-insulated power, neutral and parity-sized ground conductors. The flexible conduit shall be liquid-tight, insulated and shielded to minimize electrical or mechanical disturbances to the conductors. The length of each cable and the type of receptacle or termination shall be as specified on the detailed cable schedule. Each output distribution cable shall be permanently labeled at each end of the cable with the assigned circuit number and receptacle type, equipment identification and cable length. Each cable shall be thoroughly factory-checked and factory-tested. Tests shall include continuity, phase rotation and a Hi-Pot test at twice the rated circuit voltage plus 1000 volts. All output cables shall be wound on spools mounted on casters to facilitate handling and installation. Each cable shall be individually UL-listed and labeled.

2.4 BASIC MONITORING SYSTEM

[**NOTE:** Select either a Basic Monitoring system or a Power Monitoring system.]

The basic monitoring system shall have transformer overtemperature and Emergency Power Off (EPO) circuits. All indicators and controls shall be on the front door, along with identifying system number.

The transformer overtemperature circuit shall include an audible and visual alarm if internal transformer winding temperature reaches 320°F (160°C). A SILENCE switch shall be provided to silence the audible alarm. The transformer overtemperature circuit shall also trip the main input breaker to remove power automatically when any transformer winding temperature reaches 356°F (180°C).

2.5 POWER MONITORING SYSTEM

[**NOTE:** Select either a Basic Monitoring system or a Power Monitoring system.]

The specified system shall be equipped with a microprocessor-based Power Monitor Panel. The monitor panel shall gather and process information from electrical and environmental sensors, relays and switches both internal and external to the unit. The monitored parameters and alarms shall be displayed on the unit monitor panel and shall also be available for communication to a Liebert centralized site monitoring system using a two-wire, twisted-pair, low-voltage signal circuit having an RS-422 format for reliable communication up to 1000 meters. Additionally, the monitor panel shall be equipped with an RS-232 service port for adjusting parameters and performing diagnostics.

2.5.1 Monitored Parameters

The monitoring system shall monitor and display all of the following parameters:

- Input Voltages, Line-to-Line for all three phases
- Output Voltages, Line-to-Line for all three phases
- Output Voltages, Line-to-Neutral for all three phases
- Output Current for all three phases
- Output Neutral Current
- System Ground Current
- Output Frequency
- Output kVA
- Output kW
- Output Power Factor
- Percent Load

All three phases of the three-phase parameters shall be displayed simultaneously. All voltage and current parameters shall be monitored using true RMS measurements for accurate representation of non-sinusoidal waveforms typical of computers and other sensitive loads.

2.5.2 Alarm Annunciation

The monitoring system shall detect and annunciate by audible alarm and displayed alarm message the following conditions:

- Output Overvoltage
- Output Undervoltage
- Output Overload
- Neutral Overcurrent
- Ground Overcurrent
- Transformer Overtemperature
- Frequency Deviation
- Phase Sequence Error
- Phase Loss

All alarm thresholds for monitored parameters shall be adjustable by way of the service port to match site requirements. The factory setpoints for the alarms shall be as follows:

- Output Overvoltage — Output voltage exceeds +6% of nominal
- Output Undervoltage — Output voltage falls below -13% of nominal
- Output Overload — Output current exceeds 95% of full load amps
- Neutral Overcurrent — Neutral current exceeds 95% of full load amps
- Ground Overcurrent — Ground current exceeds 5 amps
- Frequency Deviation — Output frequency exceeds ±0.5 Hz of nominal

To facilitate troubleshooting, all alarms shall be stored in battery-backed (non-volatile) memory until reset to protect against erasure by a power outage. Alarms shall be able to be manually reset, either at the unit or through the centralized site monitoring system, after the alarm condition has been corrected.

2.5.3 Custom Alarm Annunciation

The monitoring system shall be capable of providing alarm annunciation for up to five contact closures (4 N.O., 1 N.C.). A custom alarm message of up to 20 characters shall be provided for each contact. Alarm messages shall be programmable by way of the service port to match site requirements.

2.5.4 Summary Alarm Contact

A Form C (1 N.O., 1 N.C.) Summary Alarm Contact shall be provided for remote alarm status. The contacts shall change state upon occurrence of any alarm and shall reset upon alarm silence.

2.5.5 Display

All monitored parameters and alarm messages shall be displayed on a 4 x 20 character, high visibility liquid crystal display (LCD) located on the unit front door within a decorative bezel. Included in the bezel shall be an Identifying Unit Number, Emergency Power Off (EPO) switch and an Alarm Present/Silence switch.

The Alarm Present/Silence switch shall be illuminated upon occurrence of any alarm and remain illuminated until all alarms are reset. The switch shall also be used to silence the audible alarm and reset inactive alarms.

2.5.6 Autoscan

For ease of operation, the monitoring system shall include an autoscan mode which provides continuous sequential display of all monitored parameters and active alarm messages. A Hold/Sequence switch shall be provided to interrupt the autoscan mode and allow manual selection of the displayed parameters.

2.6 ACCESSORIES (OPTIONAL COMPONENTS)

2.6.1 Main Input Junction Box

A junction box shall be provided for the main input power connections. The junction box shall contain terminal blocks for connection of the incoming AC power conductors and a parity-sized ground conductor. To allow installation under a standard raised floor system, the junction box shall have maximum dimensions of: Width, 16 in. (406mm); Length, 30 in. (762mm); Height, 6 in. (152mm). A main input cable assembly shall be provided for connection to the unit at installation. The cable shall be 10 feet (3m) long and consist of 194°F (90°C) copper conductors inside a UL/CSA listed liquid-tight, flexible metal conduit, sized in accordance with the NEC, based on the main input circuit breaker rating. For reliability and per NEC, no plug and receptacle connectors shall be used for the main input cable.

2.6.2 Transient Suppression Plate

The specified system shall have a transient suppression plate for the main input junction box to reduce effects of transients on the ground. The suppression plate shall measure one square meter.

2.6.3 Low-Voltage Junction Box

A separate watertight low-voltage junction box shall be provided to isolate low-voltage connections from main input connections. The low-voltage junction box shall contain a terminal block with at least twenty-one positions for connecting all building interface alarms and controls, centralized site monitoring communication circuits and all Remote Emergency Power Off (REPO) switches. The low-voltage junction box shall also contain a 24 VDC, DPDT building interface relay for interfacing with environmental systems, alarm panels, etc. The relay contacts shall be rated for use up to 10 amps at 240 VAC. To allow installation under a standard raised floor system, the junction box shall have the following maximum dimensions: Width, 8 in. (203mm); Length, 10 in. (254mm); Height, 4 in. (102mm). A low voltage control cable assembly shall be provided for connection to the unit and the junction box at installation. The low-voltage control cable shall utilize UL/CSA listed liquid-tight, flexible metal conduit measuring 10 feet (3m) long.

2.6.4 Lightning/Surge Arrester

The specified unit shall be equipped with a secondary-class surge arrester to divert high-voltage power surges quickly and safely to ground. The surge arrester shall be mounted ahead of all electrical components to provide maximum protection of the unit insulation and wiring. The surge arrester shall be capable of repeated operations. It shall consist of utility-grade metal-oxide varistors rated for up to 20,000 amps of surge current. The surge arrester shall be rated for a maximum FOW sparkover of 3200 volts with maximum discharge voltage of 2.2 kV at 1500 amperes, assuming a standard 8 x 20 microsecond waveform.

2.6.5 Bypass Switch

The unit shall be equipped with a bypass circuit for manually removing the magnetic synthesizer from the power path. The bypass circuit shall include a reserve input power connection, a reserve input breaker and a bypass switch. The unit shall contain power terminals for connection of the incoming AC power. The reserve input power connections shall be designed to accept a wire size commensurate with the reserve input breaker rating.

The reserve input breaker shall be a 3-pole molded-case circuit breaker, providing overcurrent protection and a means for disconnecting power to the bypass circuit. The circuit breaker shall be rated for 600 VAC and sized for 125% of the bypass circuit full load input current in accordance with the NEC. The minimum UL-listed interrupting rating for the reserve input circuit breaker shall be [(25,000) (_____)] RMS symmetrical amperes at 480 VAC. The reserve input circuit breaker shall include a 24VDC shunt trip mechanism to interface with EPO switches and other system controls.

The bypass switch shall be a UL-recognized 4-pole, double-throw, break-before-make switch rated for industrial use, with a continuous current rating of at least 125% of the full load output amps. The bypass switch shall switch the output phases and neutral simultaneously for complete isolation of the magnetic synthesizer. The switch shall allow the output to be powered from either the magnetic synthesizer or from the reserve input.

2.6.6 Reserve Input Junction Box

A junction box shall be provided for the reserve input power connections. The junction box shall contain terminal blocks for connection of the incoming AC power. The terminals shall accept wire sizes up to 2-500 kcmil. To allow installation under a standard raised floor system, the junction box shall have maximum dimensions of Width, 16 in. (406mm); Length, 30 in. (761mm); Height, 6 in. (152mm). A reserve input cable assembly shall be provided for connection to the unit at installation. The cable shall be 10 feet (3 meters) long and consist of the 194°F (90°C) copper conductors inside a UL/CSA listed liquid-tight, flexible metal conduit, sized in accordance with NEC, based on the reserve input circuit breaker rating.

2.6.7 Bypass Transformer

The bypass transformer shall be a delta-to-wye isolation transformer to provide isolation and voltage step-down in the bypass circuit. The transformer capacity shall be the same as the system capacity. The bypass transformer shall be a dry-type, three-phase, common-core, convection air cooled transformer. The transformer shall conform to UL1561, with 302°F (150°C) maximum temperature rise. All transformer windings shall be copper. The audible noise level of the transformer shall be 50 dBA maximum. The bypass transformer shall have 3.5 to 5% impedance, 0.5% maximum additive harmonic distortion and a full load efficiency of 97.5% minimum.

The bypass transformer shall be provided with six full-capacity compensation taps, two above nominal and four below nominal, at 2-1/2% increments to accommodate field adjustment to match the source voltage. These compensation taps shall be easily accessible by removal of one exterior panel. Tap changes include: two above nominal voltage (upper range limit of +5%), nominal voltage and four below nominal voltage (lower range limit of -10%). The bypass transformer shall be enclosed in a [(standard NEMA 1 enclosure) (decorative enclosure)].

2.6.8 Subfeed Output Circuit Breaker [available only on Self-Contained systems]

A three-pole [(225) (_____)] ampere, 240 volts AC rated molded case circuit breaker(s) shall be provided to protect a subfeed circuit(s) to an expansion cabinet or other load. The subfeed circuit breaker shall be rated for 10,000 RMS symmetrical amperes minimum interrupting capacity at 240 VAC and shall be powered ahead of the panelboard main breakers on the output of the unit. Each subfeed breaker shall include padlock-off provisions to allow circuit lockout for safety in accordance with OSHA lockout/tag-out requirements.

2.6.9 Remote Emergency Power Off (REPO) Switches

Provisions shall be available for adding multiple REPO switches to meet specific site needs and local codes. The REPO switch shall activate the shunt trip of the main input circuit breaker to shut down the system. Each REPO shall be a fully guarded, normally open, illuminated switch in a wall box. REPO switch shall have [(50) (100) (150)] feet of 3-conductor cable to connect to the specified system.

2.6.10 Phase Rotation Meter

A hand-held phase rotation meter shall be included to verify proper rotation of any three-phase circuit rated 600 VAC or less. It shall indicate ABC or ACB phase rotation.

2.6.11 Floor Pedestals

Floor pedestals shall be furnished to level the unit and to provide bottom cabling access without relying upon a raised floor for support. The nominal height of the floor pedestals shall be [(6) (12) (18)] inches with adjustment for ±3 inches.

2.6.12 Export Crating

Heavy-duty solid wood crating shall be provided to meet international requirements regarding package strength and special markings for overseas shipments.

3.0 EXECUTION

Factory startup, preventive maintenance and full service for the specified system shall be available and included upon request. The manufacturer shall directly employ a nationwide service organization of factory-trained field service personnel dedicated to the startup, maintenance and repair of the manufacturer’s power equipment. The manufacturer shall maintain a national dispatch center 24 hours per day, 365 days per year, to minimize service response time and to maximize availability of qualified service personnel.

NOTE: These Guide Specifications comply with the format outlined by the Construction Specifications Institute per CSI MP-2-1 and CSI MP-2-2. In correspondence, reference Liebert document SL-20209_REV01_10-07.