Vertiv™ PowerSwitch 7000
GUIDE SPECIFICATIONS
Automatic Static Transfer Switch
160 A to 630 A

1.0 GENERAL

1.1 Summary

These specifications describe the requirements for an automatic static transfer switch. The Vertiv™ PowerSwitch 7000 is a solid-state, three-pole or four-pole, dual-position transfer switch designed to switch automatically and manually between two synchronized AC power sources.

The input power shall be supplied from two different AC power sources, which are nominally of the same voltage level, phase rotation and frequency. The primary purpose of the PowerSwitch 7000 is to allow uninterrupted transfer from one source to the other in case of the failure of one source or by manual initiation for test or maintenance. The switching action shall not connect the two sources of power together which would allow back feeding of one source to the other. The PowerSwitch 7000 shall allow for either source to be designated as the preferred source. The switch will automatically transfer to the preferred source and remain so until manually initiated to transfer or until the selected source fails. The PowerSwitch 7000 shall be furnished with key-interlocked static switch isolation and bypass rotary switches to each source, which allow uninterrupted manual transfer to and from either source for maintenance.

1.2 Standards

The PowerSwitch 7000 shall be CE or UKCA marked, and agency verified via UL for Static Transfer Systems.

The specified system shall be designed, manufactured, tested and installed, as applicable, in accordance with:

- Institute of Electrical and Electronics Engineers (IEEE)
- IEC 62310-1
- ISO 9001
- National Electrical Code (NEC)
- IEC 60364 series
- National Electrical Manufacturers Association (NEMA)
- National Fire Protection Association (NFPA 70)
- American National Standards Institute (ANSI)

The PowerSwitch 7000 shall comply with the latest Electromagnetic Compatibility (EMC) emission limits for Category Class 3 computing devices and the emission limits of IEC 62310-2.

The PowerSwitch 7000 shall safely withstand without mis-operation or damage the immunity levels for Category C3 disturbances of IEC 62310-2, including:

- Transient voltage surges on either AC power input.
- Electrostatic discharges (ESD) up to 4 kV direct contact and 8 kV via air.

- Electromagnetic fields from portable transceiver that are not within 1 m (3 ft.) of the unit.

1.3 Definitions

- **STS** – Static Transfer Switch
- **SCR** - Silicon Controlled Rectifier
- **MTBF** - Mean Time Between Failure is the actual arithmetic average time between failures of the critical AC output bus.

1.4 System Description

1.4.1 Number of Switched Poles

The STS shall be a four or three-pole, double-throw, solid-state, automatic transfer switch that is fed from two AC power sources.

1.4.2 Design Requirements

1. **Voltage:** Input/output voltage specifications of the STS shall be 380/400/415 volts, three-phase, 60/50 Hz, 4/3-wire plus ground.
2. **Output Load Capacity:** Specified output load capacity of the STS shall be 160/250/400/630 A. The STS shall be continuously rated to carry a full 100% load.

1.4.3 Modes of Operation

One of the STS input sources shall be designated as the preferred source, while the other is the alternate source. Selection of which input source is preferred shall be user selectable from the operator control panel. All transfers shall be a fast break-before-make with no overlap in conduction from one source to the other.

The STS of eight (4P) or six (3P) pairs of SCR connected in an AC switch configuration. The SCRs are continuously rated to carry 100% of the STS rated load while operating within the STS specifications.

The STS logic power shall automatically power up when connected to the power source. The control panel shall be active as long as one input to the STS is energized. The STS shall be supplied with factory default settings; mechanical trim pots shall not be used for calibration or adjusting settings. All settings must be adjustable; the settings shall be adjusted/configured from the LCD display.

1. **Normal Mode:** The unit is fed by two sources with the output connected to the load. In normal operation, the load shall be connected to the preferred source if all phases of the preferred source are within the acceptable limits. The transfer voltage limits shall default to ±10% of the nominal input voltage for steady state conditions, with low voltage transfer limits having an inverse time relationship that is within the IEEE Std. 446 computer voltage tolerance envelope. Upon failure of the preferred source, the load shall be transferred to the alternate source. After the preferred source returns to within the acceptable voltage limits for at least the preset adjustable retransfer time delay (typically 3 seconds) and is in phase with the alternate source, the load shall be retransferred automatically to the preferred source. The automatic retransfer to the preferred source can be disabled if so selected by the user from the operator control panel. Provided the preferred source is qualified, in the event the alternate source fails, the STS will always transfer to the preferred source, regardless of the automatic retransfer setting.
2. **Load Current Inhibit (also called Ipeak or Peak Current Overload):** The STS shall sense the load current and, if the load current exceeds an adjustable preset level deemed to represent a load inrush or fault condition, the STS shall disable the automatic transfer even if the voltage on the selected source exceeds the transfer limits. The load current transfer inhibit shall be user selectable between (automatically/manually) reset after the current returns to normal to allow for continued protection against a source failure.

3. **Manual Transfer (Optimized Transfer Disabled)**: The STS shall allow manually initiated transfers between the two sources, providing the alternate source has proper phase rotation and is within acceptable voltage and frequency limits and phase tolerances with the preferred source. Allowable phase differences between the sources for manually initiated transfers shall be adjustable from the operator control panel. The STS shall be capable of tolerating transfers up to 30 degrees out of phase for emergency conditions. The user-adjustable phase synchronization window shall be limited to ±30 degrees. If the transfer is manually initiated, the STS shall transfer between the two sources without interruption of power to the load greater than 1/4 cycle or less provided that both sources are available and synchronized within the user-adjustable phase synchronization window. For sources where the two frequencies are not the same (as would be the case between a utility and standby generator source), manually initiated transfers shall be delayed by the STS until the two sources are within the user-adjustable phase synchronization window.
4. **Manual Transfer (Optimized Transfer Enabled):** The STS shall allow manually initiated transfers between the two sources, providing the alternate source has proper phase rotation and is within acceptable frequency limits, is within acceptable voltage and frequency limits at any phase angle difference. When a manual transfer is initiated, the STS will perform an optimized transfer such that the flux linkage is balanced when transferring between sources. The transfer time is typically less than one line-cycle, and the load voltage is maintained within the Information Technology Industry Council (ITIC) voltage classification.
5. **Emergency Transfer (Optimized Transfer Disabled):** In an effort to maintain power to the load, upon loss of the source that the load is connected to, the STS shall automatically transfer to the other source within ¼ cycle typical, (depending on the load, phase difference between sources, and type of source failure) overriding any retransfer time delays or other inhibits except load overcurrent providing that the other source is available.
6. **Emergency Transfer (Optimized Transfer Enabled):** The STS shall perform an optimized transfer such that the flux linkage is balanced when transferring between sources, when any source anomaly that exceeds certain voltage thresholds is detected. The transfer time is typically less than one line-cycle and the load voltage is maintained within the ITIC voltage classification. By balancing the flux linkage, the STS minimizes any saturation current should a downstream transformer be connected.
7. **SCR Failure:** The STS shall continuously monitor the status of the SCR switching devices for proper operation. In the event of a shorted SCR on the source powering the load, the STS shall automatically alarm the condition and provide a shunt trip signal which shall be wired to an upstream feeder breaker. In the event of a shorted SCR on the other source, the STS shall automatically alarm the condition and provide the shunt trip signal. In the event of an open SCR, the switch shall automatically alarm the condition and transfer to the other source. All open and shorted SCR alarm conditions shall be latched and require the system to be repaired and reset to restore normal operation.
8. **System Bypass:** The STS shall be furnished with key-interlocked maintenance bypass switches that allow the STS power, controls and monitoring electronics to be bypassed to either input source for maintenance without interruption of power to the load. The packaging of the STS shall have all electronics isolated from the input, output and bypass connections to allow servicing of any components without access to hazardous voltages when the unit is in maintenance bypass.
9. **Rotational/Regenerative Loads:** When a rotational load, such as a motor, is connected to the output of the unit, the time to detect a source fail and ultimately transfer to the alternate source can extend beyond the previously outlined timeframe. Regardless, the critical bus voltage is always maintained within the ITIC standard. Recommend contacting Vertiv for guidance if connecting to a rotational/regenerative load to the STS.

1.4.4 Performance Requirements

1. **Nominal Input/Output Voltage:** 380/400/415 volts 3-phase, 3/4-wire-plus-ground

2. **Default Voltage Range:** +10%, -10% of nominal
3. **Nominal Frequency:** 50/60 Hz
4. **Maximum Continuous Current:** 160/250/400/630 amps
5. **Source Voltage Distortion:** Up to 10% THD with notches and ringing transients
6. **Surge Protection:** Sustains input surges without damage per criteria listed in ANSI C62.41 Category B3
7. **Sensing and Transfer Time:** Refer to Modes of Operation section for details.
8. **Overload Capability:**
    - 125% for 10 minutes
    - 150% for 1 minutes
    - 500% for 10 seconds
9. **Short Circuit Withstand Capability (3-cycles)**:

	380 V to 415 V
160 A to 630 A	35 kA (Fused)

1.4.5 Environmental Conditions

1. **Storage Temperature Range:** -30 °C to 70 °C (-22 °F to 158 °F)
2. **Operating Temperature Range:** 0° to 40°C (32 °F to 104 °F)
    - **400 A convection unit:** 0 °C to 25 °C (32 °F to 77 °F) without derate (more info in Section 2.1.4)
3. **Relative Humidity**: 0 to 90% without condensation
4. **Operating Altitude:** Up to 1200 m (4000 ft.) above sea level without derating. Above 1200 m (4000 ft.), output current is derated by 18% per 1000 m (6% per 1000 ft.).
5. **Storage/Transport Altitude:** Up to 12200 m (40000 ft.) above sea level
6. **Audible Noise:** Less than 70 dBA at 1.5 m (5 ft.) with audible alarm off

1.4.6 Reliability

MTBF

The STS shall be designed for high reliability and high availability with an MTBF exceeding 1000000 hours. To the fullest extent practical, redundant circuits and components shall be used to eliminate single points of failure.

Power Supply

Redundant power supplies shall be provided to prevent any single-point power supply failure mode. The STS shall have two separate power supplies mounted on separate boards so a power supply can be replaced while the load is on bypass. There shall be two separate DC buses, one from each power supply, to provide redundancy throughout the controls.

Logic

The STS control logic shall be administered by both the central control board as well as each gate drive board. The STS shall have one gate drive board per source, per phase and neutral totalling 8 boards for a 4-pole system (6 boards only required when 3-pole is required, and the neutral is not switched). The control board as well as the gate drive boards shall utilize a DSP processor for high-speed logic

computation. The control structure shall utilize redundant communications, one FSI communication bus for high-speed data transmission, and a CAN bus for backup communication and redundancy. The control and gate drive boards shall be continuously monitoring the active source input to the STS, and in the case of a fault, each board shall have the intelligence to detect such fault and not prevent transferring to the other source.

Components

All electrical components requiring normal maintenance or repair shall be replaceable without de-energizing the load, assuming that at least one source is available. Solid-state switching devices shall be packaged to allow safe repair of the switching devices without having to de-energize the load. All control and logic components shall be mounted separate from the power components.

Access

The STS shall be designed for front access only. The STS shall be designed so all installation, repairs and maintenance can be done from the front or top of the unit. The STS shall be designed to minimize the exposure of hazardous voltages to allow safe servicing of the unit while the load is energized. Barriers shall be used on and around customer connections to protect personnel during maintenance.

1.5 Documentation

1.5.1 Equipment Manual

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

1.5.2 Proposal Submittals

Submittals with the proposal shall include:

- A system one-line diagram.
- Outline drawing including weights, dimensions, heat dissipation and recommended service clearances.
- Location and detailed layouts of customer power and control connections.
- Description of equipment to be furnished, including deviations from these specifications.

1.5.3 Delivery Submittal

Submittals upon STS delivery shall include a complete set of submittal drawings and a QR code shall be labelled on the door with a soft copy of the installation, operation and maintenance manual. These shall include a functional description of the equipment with block diagrams, safety precautions, instructions, step-by-step operating procedures and routine maintenance guidelines, including illustrations.

1.5.4 Spare Parts

A list of recommended spare parts shall be furnished upon request.

1.6 Warranty

The manufacturer shall provide a warranty against defects in material and workmanship for 12 months after initial system startup or 18 months after ship date, whichever occurs first. (Refer to the Warranty Statement for details, Warranty Information | Vertiv Critical Infrastructure.

1.7 Quality Assurance

1.7.1 Manufacturer Qualifications

A minimum of five years' experience in the design, manufacture and testing of STS systems is required. The specified system shall be completely 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), transfer the STS and metering calibration the STS. The system shall be designed, manufactured and tested according to world-class quality standards. The manufacturer shall be ISO 9001 certified.

1.7.2 Factory Testing

Before shipment, the manufacturer shall fully and completely test the STS to assure compliance with the specifications.

2.0 PRODUCT

2.1 Fabrication

2.1.1 Materials

All materials of the STS shall be new, of current manufacture, high grade and free from all defects and shall not have been in prior service except as required during factory testing.

The maximum working voltage, current and di/dt of all solid-state power components and electronic devices shall not exceed 75% of the ratings established by their manufacturer. The operating temperature of solid-state component subassembly shall not be greater than 75% of their ratings.

2.1.2 Wiring

Wiring practices, materials and coding shall be in accordance with the requirements of IEC 60364 (low-voltage electrical installations). All wiring shall be in accordance with both national and local electrical code/normative. All bolted connections of busbars, lugs and cables shall be in accordance with requirements of the National Electrical Code and other applicable standards. All electrical power connections are to be torqued to the required value and marked with a visual indicator.

Provision shall be made for power and control cables to enter or leave from the top or bottom of the STS.

2.1.3 Frame and Enclosure

The STS, comprised of solid-state, three/four-pole, dual-position transfer switch, key-interlocked static switch isolation and bypass switches, shall be housed in a single free-standing NEMA type 1 enclosure and meet IP20 requirements. The frame shall be constructed of galvanized steel and frame members are screwed together to provide a strong substructure. Doors and removable exterior panels shall be a minimum of 16GA steel and be powder-painted the manufacturer's standard color textured enamel finish paint. A key-lock hinged front door shall provide access to the switches. A tool shall be required to remove exterior panels that expose hazardous voltages. All removable panels shall be grounded to the frame for safety and EMI/RFI protection. The cabinet shall be structurally designed to handle forklifting from the base.

Removable conduit/cable termination plates shall be provided in the top and bottom of the unit for termination of two source input and/or output conduits, raceways or cables.

The complete STS shall have maximum dimensions of 915 mm x 830 mm x 2000 mm (36 in. x 32 in. x 78.7 in.) (W x D x H). The STS can be tipped 15 degrees in any direction without falling over.

2.1.4 Cooling (160 A to 630 A)

The STS shall utilize forced air cooling of the heat sinks for 400 A to 630 A units. All fans shall be redundant so that a single fan failure will not cause the temperature to increase beyond acceptable limits. Individual sensors are located on heat sinks for alarm and shutdown. Heat rejection shall be through screened protective openings in the top of the unit. Air filters shall be washable and shall be in the front panel and do not require a tool for replacement.

The STS shall utilize natural convection cooling of the heat sinks for 160 A to 250 A units. Heat rejection shall be through screened protective openings on the top of the unit.

The STS shall utilize natural convection cooling for 400 A units if the operating temperature of the application is not greater than 25 °C (77 °F). Heat rejection shall be through screened protective openings on the top of the unit.

2.1.5 Grounding

The STS shall operate from sources that are solidly grounded or impedance-grounded (for 480 V and below). The unit shall not be used on corner-grounded delta systems.

2.2 Components

2.2.1 Rotary Switches

The STS shall be equipped with five rotary switches. These switches shall be IEC rated for use at the system voltage. Three of these switches shall provide for total isolation of the solid-state switching devices with an input switch for each source and a load isolation switch. Two of the switches shall provide for maintenance bypassing of the solid-state switching devices to either input source. Key interlocks shall be provided on the switches to prevent improper maintenance bypassing of the solid-state switch. A bypass switch cannot be closed unless the switch is connected to the same input source, and only one bypass switch can be closed at a time. All switches shall be equipped with N.O. and N.C. auxiliary switches for monitoring of the switch positions.

2.2.2 Silicon Controlled Rectifiers (SCRs)

The STS shall consist of eight (4P) or six (3P) pairs of SCRs connected in an AC switch configuration. The SCRs shall be brick-type and rated to carry the full 100% rated load. The SCRs shall be rated to prevent hazardous device failure in power systems with available fault currents listed under Section 1.4.

2.2.3 Control Panel

The STS shall be provided with a microprocessor-based Human Machine Interface (HMI) to configure and monitor the STS. The HMI shall be located on the front door of the unit. The HMI shall be hinge mounted to the front door so HMI can be accessible while the front door is opened for maintenance. A backlit, menu-driven, full graphics, color touch-screen Liquid-crystal display (LCD) shall be used to display system information, status information, a one-line diagram of the STS, active alarms, alarm history information, startup and bypass instructions. No mechanical pushbuttons shall be used.

The mimic screen shall indicate the power flow, the status of all switches, the preferred source and the STS position (connected to source 1 or 2) as well as active alarms.

Pop-up boxes selected from the menu bar shall be provided for operator interface to the HMI for menu selection, control of the preferred source, manual transfer initiation, auto/manual retransfer selection and other system setpoints. In addition, an operator can silence and reset the audible alarm by touching the screen. To facilitate STS operation, help text, step-by-step startup, transfer and maintenance bypass procedures shall be displayed on the LCD screen. For manual transfers, a sync scope shall display the leading or lagging real-time phase difference between the two input sources.

The HMI shall be equipped with an USB port and Flash memory to allow the STS software to be upgraded by a factory-trained customer engineer without shutting down the load.

To facilitate diagnostics, an event log of the last 2048 alarm events shall be stored in non-volatile memory and displayed on the LCD. Each frame contains metering data, active alarms/faults and unit status. A system calendar and real-time clock shall be included to timestamp all stored events.

FSI communications shall be utilized for high-speed data and communication between the STS controls and the gate drive PCBAs. CAN bus shall be used to communicate between all other PCBAs, the HMI, as well as the options.

For remote monitoring, an Vertiv™ Liebert® IntelliSlot™ RDU120 card shall provide present switch status information, alarm history information and the history of status screens that are triggered upon a major alarm event.

Metering

The following metering parameters shall be displayed:

- Input AC voltage for both sources, line-to-line for each phase
- Input AC voltage for both sources, line-to-neutral for each phase

- Input AC current for both sources for each phase and neutral
- Input frequency for both sources
- Output AC voltage for both sources, line-to-line for each phase
- Output AC voltage for both sources, line-to-neutral for each phase
- Output AC current for both sources for each phase and neutral
- Output Total kVA
- Output Total kW
- Output kW for each phase
- Percent load
- Output power factor per phase
- Number of switch transfers
- Synchronization phase angle
- Inlet and exhaust temperature
- Inlet and exhaust humidity
- SCR heatsink temperatures

All voltages and currents shall be measured using true-RMS techniques for accurate representation of non-sinusoidal waveforms associated with computers and other electronic loads. The metering parameters shall have a full-scale accuracy of ±0.5%.

Alarm Messages

Active alarms shall be monitored and displayed simultaneously as part of the LCD event panel. The following alarm messages shall be displayed:

CAN Communication Failure	FSI Communication Failure	Communication Bus Error
Power Supply S1 Failure	Power Supply S2 Failure	Comms Misconfiguration
System Shutdown - LEPO	System Shutdown - REPO	Remote Transfer Lockout
Transfer Inhibited	Auto Retransfer Inhibit	Fan [1-8] Speed Failure
Fan Power Input 1 Fail	Fan Power Input 2 Fail	Invalid Phase Rotation
Input Contact [1-8] Alarm	S1 Slow Undervoltage	S1 Overvoltage
Breaker Accessory Error	S2 Slow Undervoltage	S2 Overvoltage
Input S1 Failure	S1 Fast Undervoltage	Phase A/B/C Overcurrent
Input S2 Failure	S2 Fast Undervoltage	Neutral Overcurrent
SCR Phase A/B/C Backfeed Voltage	Frequency Deviation	Phase A/B/C Peak Overcurrent
SCR Phase A/B/C Overtemperature	Open Phase A/B/C SCR	Shorted Phase A/B/C SCR
SCR Neutral Overtemperature	Open Neutral SCR	Shorted Neutral SCR
Configuration Sync Error	Load on Alt Source	Load On S2 Bypass
Load On S1 Bypass	No Initial Comms	

An audible alarm shall be activated when any of the alarms occurs. All alarms shall be displayed in text form.

2.3 Accessories (Optional Components and Services)

2.3.1 Optimized Transfer (Available for 3-wire configurations only)

The STS shall be furnished with an optimized transfer control algorithm. This algorithm shall optimize the STS transfer timing such that the volt-seconds applied to a downstream transformers primary is balanced, thus sufficiently minimizing peak saturation current drawn by the downstream transformers.

In addition to controlling the transformer primary current and flux, the optimized transfer control algorithm must maintain the load voltage within the CBME/ITIC Standards during the transfer. To maintain load voltage after the preferred source is turned off, the control algorithm must be able to pulse-fire the alternate source SCRs to minimize load discontinuity and voltage disruption.

The STS must maintain the above specification under the following conditions:

1. Loss of source
2. Loss of a single phase
3. Voltage drops
4. Phase-to-neutral short
5. Phase-to-phase short
6. Power factor load range of 0.75 to 1.0 leading or lagging
7. Out-of-phase conditions from +180 to -180

2.3.2 Power Quality Package

Waveform Capture

When the Power Quality Package is enabled, the STS shall capture waveforms during every transfer event. Waveform captures shall capture 7 cycles recorded per transfer (3 cycles prior to the event, 1 cycle for the transfer, and 3 cycles post event). Waveform capture shall have 128 samples per cycle resolution.

Waveforms shall be viewable on the HMI and can be exported as a **.csv** file. Filtering shall be enabled to be used to see each phase per source and output Display shall correctly size waveforms by frequency to enhance viewing. Waveform capture shall store up to 200 capture events.

2.3.3 Programmable Relay Board

A Programmable Relay Board with eight sets of isolated Form C contacts shall be provided to indicate a change of status of any alarm condition. Any alarm can be programmed onto any channel or channels. Up to two programmable relay boards can be installed in the STS. Programming is performed through the touch screen display. Each contact shall be rated 1 A at 30 VDC or 250 mA at 125 VAC.

2.3.4 Input Contact Isolator Board

An Input Contact Isolator Board with eight relay inputs (normally open dry contacts) shall be provided for owner alarm messages. The owner, through the touch screen display, can program the alarm messages.

2.3.5 Vertiv™ Liebert® IntelliSlot™ RDU120

The STS shall be supplied with a Vertiv™ Liebert® IntelliSlot™ RDU120 Card for remote communication using two of the following protocols: HTTP/HTTPS, Velocity Protocol, Email, SMS, SNMP v1/v2c/v3, BACnet IP/MSTP and Vertiv™ Liebert® Modbus TCP/RTU output. The Vertiv™ Liebert® IntelliSlot™ RDU120 shall support a 1 GB ethernet network interface. A serial RS-485 two wire connector shall be supplied.

NOTE: Two of the 3rd party protocols (SNMP, Modbus, or BACnet) may be configured and used simultaneously. Vertiv™ Liebert® Modbus RTU and Vertiv™ Liebert® BACnet MSTP cannot both be enabled simultaneously.

2.3.6 Cybersecurity

The STS shall be IEC 62443-4-2 and UL2900-1 cybersecurity certified via qualification of the Vertiv™ Liebert® IntelliSlot™ RDU120. Secure SNMP shall be supported via SNMP v3. The secure boot implementation shall prevent unauthorized tampering of the installed software. Centralized access and authorization management shall provide an additional layer of security via remote authentication protocols – RADIUS, TACACS+, and LDAP/AD. Port-based network access control (PNAC) shall be supported via 802.1x.

2.3.7 Remote Source Selection

The STS shall be furnished with Remote Source Selection board to remotely select the preferred source. Closure of one of the two N.O. dry contacts (by others) shall cause the selected source to be the preferred source to which the STS will connect the load as long as the source is available in the same manner as the local source transfer selection. If both input contacts are closed, the current selected preferred source shall be retained. If the unit preferred source selection and remote source selection shall be active at the same time, the STS follows the last request for a preferred source change, regardless of whether it was from the local or remote source select controls.

2.3.8 Password Lockout

Password protection shall be used to lock out of the touchscreen display to prevent manual transfers and configuration changes. When locked out, the touch screen becomes a read-only display and a password is required to do manual transfers or change settings. The alarm silence button shall not be disabled when in the lockout position. This is a standard feature in all units.

2.3.9 Seismic Floor Anchors

The STS shall be provided with seismic floor anchors to fasten the unit to a concrete floor to meet seismic IBC SDS 1.54, IEC EN-60068-3-3 level II, and Telcordia Zone 3 requirements.

2.3.10 Floor Stand

A Floor Stand shall be furnished to level the unit and to provide bottom cabling access without relying on a raised floor for support. The nominal height of the floor stand shall be 457 mm (18 in.), 610 mm (24 in.),
762 mm (30 in.), 914 mm (36 in.).

2.3.11 Certified Test Report

A certified copy of the factory test report shall be provided for each unit.

2.3.12 Factory Witness Test

The owner and/or the owner's representative shall attend a factory test of each unit. The factory will perform its standard witness test to demonstrate that the unit meets the STS specification.

2.3.13 Export Crating

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

3.0 EXECUTION

3.1 Field Quality Control

The following inspections and test procedures shall be performed by factory-trained field service personnel during the STS startup.

3.1.1 Visual Inspection

- Inspect equipment for signs of damage.
- Verify installation per drawings.
- Inspect cabinets for foreign objects.
- Verify neutral (if used) and ground conductors are properly sized and configured.
- Verify all printed circuit boards are configured properly.

3.1.2 Mechanical Inspection

- Check all accessible control wiring connections for tightness.
- Check all accessible power wiring connections for tightness.
- Check all accessible terminal screws, nuts and spade lugs for tightness.

3.1.3 Electrical Inspection

- Check all Power fuses for continuity.
- Confirm input voltage and phase rotation is correct.
- Verify control transformer connections are correct for voltages being used.

3.2 Manufacturer's Field Service

3.2.1 Service Personnel

The STS manufacturer shall directly employ a global service organization, consisting of factory-trained field service personnel dedicated to the startup, maintenance and repair of UPS and power equipment. The organization shall consist of regional and local offices.

The manufacturer shall provide a fully automated national dispatch center to coordinate field service personnel schedules. One toll-free number shall reach a qualified support person 24 hours/day, 7 days/week, 365 days/year. If emergency service is required, response time shall be 20 minutes or less.

An automated procedure shall be in place to ensure that the manufacturer is dedicating the appropriate technical support resources to match escalating customer needs.

3.2.2 Replacement Parts Stocking

Parts shall be available through an extensive network to ensure round-the-clock parts availability.

Recommended spare parts shall be fully stocked by local field service personnel with backup available from the national parts center and the manufacturing location. The national parts center Customer Support Parts Coordinators shall be on call 24 hours/day, 7 days/week, 365 days/year for immediate parts availability. Parts from the national parts center shall be shipped within 4 hours on the next available flight out and delivered to the customer's site within 24 hours.

3.2.3 STS Maintenance Training

Maintenance training courses for customer employees shall be made available by the STS manufacturer. This training is in addition to the basic operator training conducted as a part of the system startup.

The training course shall cover STS theory, location of subassemblies, safety and STS operational procedures. The course shall include control, metering and feedback circuits to the Printed Circuit Board (PCB) level. Troubleshooting and fault isolation using alarm information and internal self-diagnostics should be stressed.

3.2.4 Maintenance Contracts

A complete offering of preventive and full-service maintenance contracts for the STS shall be available. An extended warranty and preventive maintenance package shall be available. Factory-trained service personnel shall perform warranty and preventive maintenance service.

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 document SL-20610.