SECTION 26 33 53 - STATIC UNINTERRUPTIBLE POWER SUPPLY

PART 1 - GENERAL

1.1 DESIGN REQUIREMENTS - UPS MODULE

A. Voltage. Input/output voltage of the UPS:
   1. Rectifier Input: 208 volts, three-phase, 4-wire-plus-ground
   2. Bypass Input: 208 volts, three-phase, 4-wire-plus-ground
   3. Output: 208 volts, three-phase, 4-wire-plus-ground

B. Output Load Capacity. Provide output load capacity at unity factor.

C. Scalable Output Capacity. UPS rated output capacity will be determined by design engineer.

1.2 DESIGN REQUIREMENTS – BATTERY

A. Battery Cells: Valve-regulated, lead acid batteries.

B. Reserve Time: 15 minutes.

C. Recharge Time: to 95% capacity within ten (10) times discharge time.

1.3 PERFORMANCE REQUIREMENTS

A. Voltage Configuration for Standard Units: 208V, three-phase, four-wire plus ground.

B. Voltage Range: +15%, -20% of nominal without derating.

C. Inrush Current: UPS inrush current not to exceed 1.5 times rated input current. Maintenance bypass and distribution cabinet inrush current not to exceed 8 times rated input current.

D. Current Limit: 140% of nominal AC input current maximum.

E. Current Distortion: <3% reflected THD maximum at full load.

F. Surge Protection: Sustains input surges without damage per criteria listed in IEC 1000-4-5.

G. Voltage Regulation:
   1. ±1% three-phase RMS average for a balanced three-phase load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature and load power factor
   2. ±5% three-phase RMS average for a 100% unbalanced load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature and load power factor

H. Frequency Slew Rate: Selectable from 0.1Hz/sec to 3.0Hz/sec maximum for single unit.

I. Phase Balance:
   1. 120 degrees ±1 degree for balanced load
   2. 120 degrees ±1.5 degrees for 100% unbalanced load

J. Voltage Distortion:
   1. <1% total harmonic distortion (THD) for linear loads
   2. <5% THD for 100% nonlinear loads (3:1 crest factor) without kVA/kW derating

K. Load Power Factor Range: 0.7 lagging to 0.9 leading without derating.

L. Overload Capability:
1. 110% for 60 minutes
2. 125% for 10 minutes
3. 150% for 60 seconds

M. Voltage Transient Response: 100% load step, ±5.0%.

N. Transient Recovery Time: to within 5% of steady state output voltage within half a cycle.

O. Voltage Unbalance: 100% unbalanced load, ±5%.

P. Locate UPS in a conditioned space.

Q. Altitude: Provide UPS rating based on altitude derating factors.

1.4 MANUFACTURER QUALIFICATIONS

A. A minimum of 20 years' experience in the design, manufacture and testing of solid-state UPS systems is required. The system shall be designed and manufactured according to world-class quality standards.

1.5 PROVIDE FACTORY TESTING PRIOR TO PRODUCT SHIPMENT.

PART 2 - PRODUCTS

2.1 FABRICATION

A. Materials
1. Physically isolated control logic and fuses from power train components to ensure operator safety and protection from heat. All electronic components shall be accessible from the front without removing sub-assemblies for service access.

B. Wiring
1. All electrical power connections shall be torqued to the required value and marked with a visual indicator.
2. Provide tin-plated copper busbars.

C. Cooling
1. Provide cooling capacity as needed to maintain manufacturer's recommended operating temperature for the UPS and batteries.

2.2 COMPONENTS

A. General
1. Provide on line, double conversion UPS.

B. DC Filter
1. Provide DC filter with adequate capacity to ensure that the DC output of the rectifier/charger will meet the input requirements of the inverter without the battery connected.

2.3 INVERTER

A. Overload Capability
1. Provide inverter be capable of supplying current and voltage for overloads exceeding 100% up to 150%. The UPS shall transfer the load to bypass when overload capacity is exceeded.

B. Voltage Distortion
1. Total harmonic distortion in the output voltage will not exceed 1% for 0% to 100% linear loads.
2. Total harmonic distortion in the output voltage will not exceed 4% for 0% to 100% non-linear loads.
3. Total harmonic distortion in the output voltage will not exceed 5% for 0% to 100% non-linear, unbalanced loads.

2.4 DISPLAY AND CONTROLS

A. Monitoring and Control
1. Provide microprocessor/graphical status display and controls. A graphical shall be used to show a single-line diagram of the UPS and shall be provided as part of the monitoring and controls sections of the UPS. Locate operator controls and monitors on the front of the UPS cabinet display. Monitoring functions such as metering, status and alarms on the graphical display. Additional features of the monitoring system shall include:
a. Menu-driven display with pushbutton navigation
b. Real-time clock (time and date)
c. Alarm history with time and date stamp
d. Memory with battery backup

B. Metering
1. Display the following parameters:
a. Input AC voltage line-to-line
b. Input AC current for each phase
c. Input frequency
d. Battery voltage
e. Battery charge/discharge current
f. Output AC voltage line-to-line
g. Output AC current for each phase
h. Output frequency
i. Apparent power
j. Active power
k. Battery time left during battery operation

C. Alarm Messages
1. Display the following alarm messages:
a. Mains Voltage Abnormal
b. Mains Undervoltage
c. Mains Freq. Abnormal
d. Charger Fault
e. Battery Reversed
f. No Battery
g. Control Power 1 Fail
h. Parallel Comm. Fail
i. Bypass Unable To Track
j. Bypass Abnormal
k. Inverter Asynchronous
l. Fan Fault
m. Control Power 2 Fail
n. Unit Over Load

o. System Over Load
p. Bypass Phase Reversed
q. Transfer Time-Out
r. Load Sharing Fault
s. Bypass Over Current
t. Output Ground Fault

D. Status Messages
1. Display the following UPS status messages:
a. Rectifier (Off / Soft Start / Main Input On / Battery Input On)
b. Input Supply (Normal Mode / Battery Mode / All Off)
c. Battery Self Test (True / False)
d. Input Disconnect (Open / Closed)
e. EPO (True / False)
f. Charger (On / Off)
g. Output Disconnect (Open / Closed)
h. Maint. Disconnect (Open / Closed)
i. Bypass Disconnect (Open / Closed)
j. Inverter (Off / Soft Start / On)
k. Bypass (Normal / Unable To Trace / Abnormal)
l. Output Supply (All Off / Bypass Mode / Inverter Mode / Output Disable)
m. Inverter On (Enable / Disable)

E. On-Line Battery Test
1. Provide the UPS with a menu-driven On-Line Battery Test feature. The test shall ensure the capability of the battery to supply power to the inverter while the load is supplied power in the normal mode.

2.5 STATIC TRANSFER SWITCH

A. General
1. Provide a static transfer switch and bypass circuit as an integral part of the UPS.

2.6 BATTERY POWER PACK

A. Provide the battery power pack valve-regulated, lead-acid battery cells housed in a separate cabinet that matches the UPS cabinet styling to form an integral system lineup. Provide battery cells on slide-out trays for ease of maintenance. Provide a battery disconnect circuit breaker for isolation of the battery pack from the UPS module.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide central UPS circuits for power feeding facilities Building Automation System (BAS) control panels. Circuiting building user loads to this UPS is not acceptable.

B. Provide central UPS circuits for power feeding animal facility lighting control computer and control panels associated with watering systems, robotics, cage wash, mechanical systems, etc.

C. During the design process, coordinate with the facilities department any additional building systems required to be connected on the UPS.

END OF SECTION 26 33 53