DIVISION 26 ELECTRICAL
SECTION 263353 – STATIC UNINTERRUPTIBLE POWER SUPPLY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 26 Section "Electrical General Requirements."
2. Division 26 Section "Electrical Materials and Methods."

1.2 SUMMARY

A. This Section includes continuous duty, solid state Uninterruptible Power Supplies (UPS). The UPS shall contain a full rated input rectifier/boost converter, output converter, and 10 percent battery charging circuit. The system shall also contain a continuous duty bypass static switch, internal mechanical bypass, external bypass, removable hot swap battery plant, and LCD interface display. All programming and miscellaneous components for a fully operational system shall be available as part of the UPS.

1.3 DEFINITIONS

A. LCD: Liquid-crystal display.

B. LED: Light-emitting diode.

C. UPS: Uninterruptible power supply.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Electrical ratings, including the following:
   a. Capacity to provide power during failure of normal ac.
   b. Inverter voltage regulation and total harmonic distortion of output current.
   c. Rectifier data.
   d. Data for specified optional features.
2. Transfer switch.
3. Inverter.
4. Battery charger.
5. Batteries.
6. Battery monitoring.
7. Manufacturer's anchorage and base recommendations.
8. Physical Size

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, components, and location and identification of each field connection. Show access, workspace, and clearance requirements; details of control panels; and battery arrangement.

1. Wiring Diagrams: Detail internal and interconnecting wiring; and power, signal, and control wiring.
2. Elevation and details of control and indication displays.
3. Output distribution section.

C. Qualification Data: For testing agency.

D. Source quality-control test reports.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For UPS equipment to include in emergency, operation, and maintenance manuals specified in Division 1.

G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of UPS system. Refer to Division 1 Section "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Compliance with ANSI C62.41 (IEEE 587)

E. The UPS, and associated equipment, shall be UL listed and labeled, per UL Standard 1778, and shall be CSA certified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in fully enclosed vehicles.

B. Store equipment in spaces having environments controlled within manufacturers' written instructions for ambient temperature and humidity conditions for nonoperating equipment.

1.7 SPACE RESTRICTIONS

A. The UPS should be no larger than **xx**"D x **yy**"W x **zz**"H and weigh no more than **xx** lbs.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace batteries that fail in materials or workmanship within specified warranty period. Special warranty, applying to batteries only, applies to materials only, on a prorated basis, for period specified.

B. Warranty Period: Include the following warranty periods, from date of Substantial Completion.

1. Standard, Valve-Regulated, Recombinant, Lead-Calcium Batteries:
   a. Full Warranty: One year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. APC.
2. Best.
3. Controlled Power.
4. Liebert.
5. MGE.
6. Mitsubishi.
7. Toshiba.
8. Eaton.

2.2 UPS PERFORMANCE REQUIREMENTS

A. Ratings: Provide rated KVA output, input voltage and output voltage as indicated (**XX** KVA, **XXX**V-**X**PH input, **XXX**V-**X**PH output). Automatically sense loss of normal ac supply and use a solid-state switch to transfer loads in an uninterruptible manner.

1. Operation: Unit supplies power to output circuits from a single, external, normal supply source. Unit automatically transfers load from normal source to internal battery/inverter source. Retransfer to normal is automatic when normal power is restored.

B. Maximum Acoustical Noise: 50 dB, "A" weighting, emanating from any component under any condition of normal operation, measured 39 inches from nearest surface of component enclosure.

2.3 SERVICE CONDITIONS

A. Environmental Conditions: UPS system shall be capable of operating continuously in the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Ambient Temperature for Electronic Components: 32 to 104 deg F.
2. Relative Humidity: 0 to 95 percent, noncondensing.
3. Altitude: Sea level to 4000 feet.

2.4 UPS

A. Description: Solid-state type, with the following operational features:

1. Automatically regulate output voltage to within plus or minus 5 percent.

2. Automatically regulate output frequency to within plus or minus 1 Hz, from no load to full load at unit power factor over the operating range of battery voltage.
3. Output Voltage Waveform of Unit: Sine wave with maximum 10 percent THD throughout battery operating-voltage range, from no load to full load.
4. Output power rating: Rated in kVA at unity power factor, and shall be able to supply the rated kW from .5 lagging to .5 leading.
5. Output Protection: Current-limiting and short-circuit protection.
6. Brownout Protection: Produces rated power without draining batteries when input voltage is down to 75 percent of normal.
7. The input power converters of the system shall constantly control the power imported from the mains input of the system, to provide the necessary UPS power for precise regulation of the DC bus voltage, battery charging, and main inverter regulated output power.
8. The input current THD shall be held to 5 percent or less at full system load, while providing conditioned power to the critical load bus, and charging the batteries under steady state operating conditions. This shall be true while supporting loads of both a linear and non-linear type.

2.5 BATTERY CHARGER

A. Description: Solid-state, automatically maintaining batteries in fully charged condition when normal power is available, with LED indicators for "float" and "high-charge" modes. The battery charging shall keep the DC bus float voltage of +/- 1 percent.

2.6 BATTERIES

A. Description: Standard, valve-regulated, recombinant, lead-calcium hot swappable maintenance free batteries. Supply and maintain total load for a minimum period of XX minutes, without the voltage applied to the load falling below 87% of normal. Provide mid-string disconnects to minimize DC arc flash potential.

2.7 ENCLOSURES

A. NEMA 250, Type 1 steel cabinets with access to components through hinged doors with flush tumbler lock and latch.

B. Finish: Manufacturer's standard baked-enamel finish over corrosion-resistant prime treatment.

2.8 CONTROL AND INDICATION

A. Description: Group displays, indications, and basic system controls on common control panel on front of UPS enclosure.

B. Minimum displays, indicating devices, and controls shall include those in lists below. Provide sensors, transducers, terminals, relays, and wiring required to support listed items. Alarms shall include an audible signal and a visual display. Form C dry contacts shall be provided for "general trouble" and "on battery" remote monitoring.

C. Indications: Labeled LED.

1. Quantitative Indications:
   a. Input voltage, each phase, line to line.
   b. Input current, each phase, line to line.
   c. System output voltage, each phase, line to line.
   d. System output current, each phase.
   e. System output frequency.
   f. DC bus voltage.
   g. Battery current and direction (charge/discharge).
   h. Elapsed time-discharging battery.
2. Basic Status Condition Indications:
   a. Normal operation.
   b. Load-on bypass.
   c. Load-on battery.
   d. UPS off.
   e. Alarm condition exists.
3. Alarm Indications:
   a. Battery system alarm.
   b. Control power failure.
   c. Fan failure.
   d. Overload.
   e. Battery-charging control faulty.
   f. Input overvoltage or undervoltage.
   g. Approaching end of battery operation.
   h. Battery undervoltage shutdown.
   i. UPS fuse blown.
   j. UPS transformer overtemperature.
   k. UPS overtemperature.
   l. Transfer switch overtemperature.
   m. UPS power supply fault.
   n. UPS output overvoltage or undervoltage.
   o. System overload shutdown.
   p. UPS output contactor open.
   q. UPS current limit.
4. Controls:
   a. UPS on-off.
   b. Start.
   c. Battery test.
   d. Alarm silence/reset.
   e. Output-voltage adjustment.
   f. Maintenance bypass.

D. Include the following minimum array:

1. Ready, normal-power on light.
2. Charge light.
3. UPS supply load light.
4. Battery voltmeter.
5. AC output voltmeter with an accuracy within 2 percent of full scale.
6. Load ammeter.

7. Test switch to simulate ac failure.

E. Enclosure: Steel, with hinged lockable doors, suitable for **wall/floor** mounting. Manufacturer's standard corrosion-resistant finish.

2.9 SOURCE QUALITY CONTROL

A. Factory test complete UPS system, including battery, before shipment. Include the following:

1. Functional test and demonstration of all functions, controls, indicators, sensors, and protective devices.
2. Full-load test.
3. Transient-load response test.
4. Overload test.
5. Power failure test.
6. Alarm points test.

B. Observation of Test: Give 14 days' advance notice of tests and provide access for Owner's representative to observe tests at Owner's option.

C. Report test results. Include the following data:

1. Description of input source and output loads used. Describe actions required to simulate source load variation and various operating conditions and malfunctions.
2. List of indications, parameter values, and system responses considered satisfactory for each test action. Include tabulation of actual observations during test.
3. List of instruments and equipment used in factory tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment will be installed before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install system components and anchor to concrete base according to manufacturer's recommendations and seismic codes as applicable.

B. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

3.3 CONNECTION

A. Connections: Interconnect system components. Make connections to supply and load circuits according to manufacturer's wiring diagrams, unless otherwise indicated.

B. Ground equipment according to Division 26 Section "Grounding and Bonding."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 IDENTIFICATION

A. Identify equipment and components according to Division 26 Section “Electrical Materials and Methods.”

3.5 FIELD QUALITY CONTROL

A. After UPS is installed and electrical circuitry has been energized, test for compliance with requirements.

B. Testing: Perform the following field quality-control testing according to manufacturer's written instructions and as listed below, to demonstrate condition and performance of each component of the UPS system:

1. Inspect interiors of enclosures for integrity of mechanical and electrical connections, component type and labeling verification, and ratings of installed components.
2. Test manual and automatic operational features and system protective and alarm functions.
3. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections 7.18 and 7.22.2. Certify compliance with test parameters.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field- assembled components and equipment installation, including electrical connections. Report results in writing. Coordinate with Owner’s commissioning agent.

D. Remove malfunctioning units, replace with new units, and retest as specified above.

E. Report results in writing.

3.6 STARTUP SERVICE AND TRAINING

A. Engage a factory-authorized service representative to perform startup service.

B. Verify that UPS is installed and connected according to the Contract Documents.

C. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 26 Sections.

D. Complete installation and startup checks according to manufacturer's written instructions.

E. Provide Owner training on UPS equipment.

3.7 ADJUSTING AND CLEANING

A. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

B. Install new filters in each equipment cabinet within 14 days from date of Substantial Completion.

END OF SECTION 263323