

SECTION 16535

EMERGENCY LIGHTING EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Emergency lighting units (Fixture Type E1 and E2).
- B. Exit signs (Fixture Type X1 and Type X2).
- C. Emergency Lighting Inverter (EM-1)

1.2 REFERENCES

- A. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
- B. NEMA WD1 - General Purpose Wiring Devices.

1.3 REGULATORY REQUIREMENTS

- A. Conform to NFPA 101 for installation requirements.

1.4 RELATED SECTIONS

- A. Section 16510 - Lighting Fixture Schedule

1.5 SUBMITTALS

- A. Submit product data under provisions of Division 1 and Section 16010.
- B. Provide product data on emergency lighting units and exit signs.

1.6 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of each luminaire.

PART 2 - PRODUCTS

2.1 LED EMERGENCY LIGHTING UNITS

- A. Manufacturers: As specified in the Lighting Fixture Schedule in Section 16510.
- B. Emergency Lighting Unit: Self-contained unit with rechargeable storage batteries, charger, and lamps.

## 118 ON MUNJOY HILL – PORTLAND, MAINE

- C. Battery: 6-volt, nickel-cadmium type, with 1.5-hour capacity to supply the connected lamp load (Type E1).
- D. Charger: Dual-rate charger, capable of maintaining the battery in a full-charge state during normal conditions, and capable of recharging discharged battery to fully charged within 12 hours.
- E. Lamps:
  - 1. LED supplied by fixture manufacturer (Type E1).
  - 2. Xenon supplied by fixture manufacturer (Type E2)
- F. Indicators: Provide lamps to indicate AC ON and RECHARGING.
- G. Provide switch to transfer unit from normal supply to battery supply.
- H. Unit Voltage: 120 volts, AC.

### 2.2 EXIT SIGNS

- A. Manufacturers: As specified in the Lighting Fixture Schedule in Section 16510.
- B. Exit Signs: AC-only exit sign with stencil face, white housing and red letters. Exit signs shall be equipped with LED lamps.
- C. Directional Arrows: Exit signs shall include universal, removable directional chevron inserts.
- D. Mounting: Exit Signs shall include universal top, end or back mounting provisions.

### 2.3 EMERGENCY LIGHTING INVERTERS

- A. Manufacturers:
  - 1. Myers Power Products Model # C-M-500VA
  - 2. Substitutions: Or approved equal.
- B. All materials of the CIS shall be new, of current manufacture, high grade, free from all defects and shall not have been in prior service except as required during factory testing.
- C. The CIS module shall be housed in a single wall mountable NEMA type 1 enclosure. Front access only shall be required for installation, adjustments and expedient servicing (MTTR: < 15 minutes). All components shall have a modular design and quick disconnect means to facilitate field service.
- D. Battery module(s) may be separated from electronics module. All modules shall be capable of wall mounted stacked vertically or horizontally.
- E. Description:
  - 1. The CIS shall be powder painted with the manufacturer's standard color.

2. The CIS shall be constructed of replaceable subassemblies.
3. Like assemblies and like components shall be interchangeable.
4. Cooling of the CIS shall be forced-air in emergency mode with internally mounted fans to minimize audible noise.
  - a. Fans shall not operate in the standby mode.
  - b. Fan power shall be provided by the CIS.
  - c. Air filters shall not be required.
5. Components
  - a. The CIS shall be comprised of the following components:
    - (1) CIS Module - The CIS module shall contain an inverter, an AC distribution with an input circuit breaker, battery circuit breaker, normally on output circuit breaker, control, and monitoring subsystems.
    - (2) A circuit breaker and fuse access panel shall be provided.
    - (3) Battery Module - The battery module(s) shall contain the battery plant required to produce the reserve energy to supply the inverter during abnormal AC mains conditions.
  - b. Battery Charger
    - (1) General: In the standard configuration the charger shall convert ac voltage to dc voltage. With commercial power present, the inverter power transformer shall be powered and the MOSFET modules shall be microprocessor controlled to recharge the batteries. The temperature compensated battery charger circuit shall supply constant voltage and constant current to the batteries. Once the batteries have received a full recharge, a constant trickle charge shall maintain batteries at maximum level.
    - (2) Recharge time shall be 24 hours maximum at nominal ac input voltage. The ac ripple current of the dc output shall meet the battery manufacturer specification, thus ensuring the maximum battery lifetime.
    - (3) AC Input Current: The charger unit shall be provided with an ac input current limiting circuit whereby the maximum input current shall not exceed 125% of the output full current rating.
    - (4) Automatic Restart: Upon restoration of utility AC power, after a utility AC power outage and after a full CIS automatic end-of-discharge shutdown, the CIS shall automatically restart, performing the normal CIS start up.
    - (5) DC Filter: The charger shall have an output filter to minimize AC ripple voltage into the battery.
      - (a) Under no conditions shall ripple voltage into the battery exceed 2% RMS.
    - (6) Battery Recharge: The charger shall be capable of producing battery-charging current sufficient enough to recharge the fully discharge battery bank within a 24-hour period. After the battery is recharged, the charger shall maintain full battery charge until the next emergency operation.

- c. Over-voltage Protection: The charger shall be equipped with a DC over-voltage protection circuit so that if the DC voltage rises above the pre-set limit, the charger is to shut down automatically and initiate an alarm condition.
  - d. Inverter: The inverter shall convert dc voltage supplied by the battery to ac voltage of a precisely stabilized amplitude and frequency that is suitable for powering most sophisticated electrical equipment.
  - e. The inverter output voltage shall be generated by sinusoidal pulse width modulation (PWM).
  - f. The use of a high carrier frequency for PWM and a dedicated ac filter circuit consisting of a transformer and capacitors, shall ensure a very low distortion of the output voltage (THD<3% on linear loads).
  - g. Overload Capability: The inverter during emergency modes shall be capable of supplying current and voltage for overloads exceeding 100% and up to 150% of full load current for 12 line cycles, 115% for 5 minutes and 110% for 10 minutes.
6. Output Power Transformer: A dry type power transformer shall provide the inverter AC output. The transformer shall be built with copper wiring exclusively. The hottest winding temperature of the transformer shall not exceed the temperature limit of the transformer insulation class of material at ambient temperature.
7. Display and Controls
- a. Monitoring and Control: The CIS system shall provide operation monitoring and control, audible alarms, LED indicators, and diagnostics. The front-mounted control panel shall include a 2-line 20-character LED display, and a keypad to control and monitor the internal operation of the system. This shall allow the operator to easily “watch” system functions as they occur and check on virtually any aspect of the system’s operation. Monitoring and control shall be microprocessor-based for accuracy and reliability. To ensure only authorized personnel can operate the unit, the system shall be multi-level password protected for all control functions and parameter changes.
8. Metering: Scrolling through the meter functions shall allow for monitoring of the following measurements:
- a. Utility input voltage
  - b. System output voltage
  - c. Battery voltage
  - d. Battery current
  - e. System output current
  - f. System output VA
  - g. Inverter wattage
  - h. System temperature
  - i. Date & time
9. LED Indication: The front panel with integrated LEDs shall allow a quick check of the CIS operating status.
- a. AC Present (Green)
  - b. System Ready (Green)

- c. Battery Charging (Yellow)
  - d. Battery Power (Yellow)
  - e. Fault (Red)
10. Audible Alarm: Audible alarm shall activate with any of the following conditions and automatically store the 50 most recent events and alarms.
- a. High battery charger voltage
  - b. Low battery charger voltage
  - c. High AC input voltage
  - d. Low AC input voltage
  - e. Near low battery voltage
  - f. Low battery voltage
  - g. Load reduction fault
  - h. High Ambient temperature
  - i. Inverter fault
  - j. Output fault
  - k. Output overload
11. Manual and Programmable Testing: The system shall incorporate a manual test function and two automatic test modes.
- a. The system shall perform a programmable, self-diagnostic monthly test for 5 minutes, which is preset, for the 15th of every month and the user can program the event time of day.
  - b. The yearly self-diagnostic test shall be for 90 minutes and the user shall be able to program the day and the time of the day the event is to take place.
  - c. The microprocessor shall automatically record the last 75 test events in its own separate test result log.
12. Battery Assembly: The batteries shall be sealed, lead-acid valve regulated battery cells with a ten year prorated warranty.
- a. Precut cable wires between the inverter and the batteries shall be included to provide easy installation.
  - b. A disconnect means shall be included for isolation of battery assembly from the CIS module, consisting of a fuse in each battery enclosure and a DC breaker in the CIS module
- F. System Options
- 1. RS232 Diagnostic Interface: A microprocessor-based data acquisition system designed to monitor all the system parameters remotely. Monitors alarm log, event log and automatic test log. User shall be able to command the system to perform a battery test and review all system parameters. Access shall be through a DB9 connector and transmits at 9600 baud.
  - 2. Output Circuit Breaker Trip Alarm: An audible and visual alarm shall activate when an output distribution circuit breaker is open or has tripped.
  - 3. Summary Form "C" Contacts: Form "C" contacts shall be rated at 5 amps maximum at 250VAC/30VDC. Dry contacts shall change state when any system alarm activates. Contacts shall change states with the following alarms: High/low battery charger fault, near low battery, low battery, load reduction fault, output overload, high/low AC input volts, high ambient temperature, inverter fault, and with optional circuit breaker trip alarm.

## 118 ON MUNJOY HILL – PORTLAND, MAINE

4. Remote Meter Panel: The system shall allow for monitoring all the system parameters from a remote location, up to 300 feet away from the system. This shall allow the user to remotely monitor the status of the inverter, and to control and program the inverter from a remote location.
5. Normally Off Output: This output circuit shall be dedicated for the emergency only equipment. Emergency only equipment shall operate during power outages and when the system is on battery back-up. This option shall leave the normally off load circuits off during normal utility power conditions. A 1-pole circuit breaker shall be provided.
6. Normally On Output: This output circuit shall be dedicated for normally on lighting circuits. Lighting connected to this circuit shall operate during normal power conditions and shall be operated by this system during outages of normal power when the system is on battery back-up. A 1-pole circuit breaker shall be provided.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install emergency units and exit signs plumb and level.
- B. Aim emergency unit directional lamp-heads as directed.
- C. Connect power to emergency lighting units to nearest lighting circuit ahead of all switches.
- D. Install the emergency lighting inverter in full conformance with the manufacturer's instructions. Connect the hall lighting circuit for Type K1 lights to the normally on output circuit breaker.

END OF SECTION