

PART 1 THE SCHEDULE

SECTION C DESCRIPTION/SPECIFICATION

LEAD CALCIUM & ANTIMONY HYBRID BATTERIES
FOR
UPS APPLICATIONS

I. APPLICABLE PUBLICATIONS

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 FEDERAL SPECIFICATIONS

O-S-801 (E) Sulfuric Acid, Electrolyte; For Storage Batteries

PPP-B-140B Batteries, Storage, Industrial, Packaging

1.2 NATIONAL FIRE PROTECTION ASSOCIATION STANDARD

70-1996 National Electric Code

1.3 IEEE STANDARDS

450-1995 Recommended Practice for Maintenance, Testing, and replacement of Large Lead Storage Batteries for Generating Stations and Substations.

484-1996 Large Lead Storage Batteries for Generating Stations and Substations.

1.4 INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS

1997 Uniform Building Code.

1.5 AMERICAN SOCIETY FOR TESTING AND MATERIALS

D 2863-95 Measuring the Minimum Oxygen
Concentration to Support Candle-like
Combustion of Plastics (Oxygen Index)

1.6 CODE OF FEDERAL REGULATIONS 49 CFR Transportation of Hazardous Materials

II. GENERAL REQUIREMENTS

2.1 GENERAL DESCRIPTION: Each battery shall be of the lead acid calcium or lead antimony (positive)/calcium (negative) flat plate type as specified at time of order. Each battery shall consist of the number of cells specified, and designed for high-rate/short duration performance to support Government furnished Uninterruptible Power Supply (UPS) equipment. Each battery shall include electrolyte (if required), technical documentation, and accessories as specified herein. Battery racks or cabinets shall be provided to install the battery cells. Contractor shall furnish batteries either wet charged, dry charged or maintenance free as specified at time of order.

2.2 STANDARD PRODUCTS: Materials and equipment shall be the standard products of a manufacturer. The battery manufacturer shall have been regularly producing large storage batteries of the sizes and rating specified for five years. Items of equipment shall essentially duplicate equipment that has been in production for at least one year prior to bid opening.

III. SUBMITTAL

3.1 CERTIFICATION: Within 30 days after contract award, the Contractor shall furnish certification from an independent engineering source or laboratory that all shock-protected racks, seismic racks and seismic battery cabinets have been tested or computer analyzed, and shall withstand seismic loads specified herein.

3.2 LIST OF MATERIALS: A list of materials and equipment for each type of battery shall be submitted, within 30 days after award of contract, to the Contracting Officer. The list of materials shall include cell specifications, interconnecting hardware, flame arrestor, terminal connectors, shop drawings for the stress relief brackets and all accessories to be included within each battery shipment. The submittal shall also include battery monitoring system, battery rack information and specifications for each size and type of battery. Information shall include maximum number of cells for each rack length. Rack information shall be supplied for standard, shock-protected and seismic racks. Information shall be provided for both 2 tier and 3 tier rack types.

3.3 INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS: Four sets of printed installation, operation, maintenance and safety instruction for each type of battery shall be furnished within 30 days after contract award to the Contracting Officer's Technical Representative (COTR), at the address listed in paragraph 3.5.

Three sets shall be furnished with each battery shipment. The instruction shall include standard rack installation instructions, shock-protected installation instruction, seismic rack or cabinet installation instruction, battery installation instruction, maintenance-free battery installation instruction, float and equalize charging instruction and battery and rack maintenance instructions. Charging instructions for batteries shall include voltage, current, temperature and minimum ampere-hour specifications to activate the battery.

3.4 SPARE PARTS DATA: Contractor shall furnish spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply. A list and itemized price breakdown of spare parts recommended for stocking shall be furnished. The parts selected shall be those which, in the manufacturer's judgement, will be involved in the majority of maintenance difficulties encountered. Four sets shall be submitted to the COTR at the address listed in paragraph 3.5 within 30 days after contract award and three sets with each battery shipment.

3.5 SUBMITTAL: All submittals shall be sent to the address listed below:

**NAVAL FACILITIES ENGINEERING SERVICE
CENTER EAST COAST DETACHMENT
WASHINGTON NAVY YARD, ESC, Code 24 & Code 81
1435 PENDELLTON AVENUE SE SUITE 3000
WASHINGTON, D.C. 20374-5063**

IV. PRODUCTS

4.1 PRODUCTS: Materials and equipment shall meet the requirements as specified herein. Battery containers and covers shall consist of high impact, flame retardant thermoplastic resin, or materials suitable for the specified application; however, all materials, after molding, shall have a limiting oxygen index (L.O.I.) no less than 26 when tested in accordance with ASMT D2863-95.

V. TECHNICAL SPECIFICATIONS

5.1 SIZES: Each type of battery specified shall be sized to support the UPS equipment listed for a minimum period of 15 minutes at time of installation, and each individual cell shall provide the minimum KW listed over

the 15 minutes period with an end voltage not lower than 1.67 volts/cell. Batteries will under go Acceptance Testing upon initial activation. "Acceptance Testing" shall be as defined in IEEE STD 450-1995.

TYPE	UPS RATING	BATTERY RATING	MINIMUM PER CELL	NUMBER OF CELLS REQUIRED
A	50 KVA	50.0 KW	0.238 KW	210 CELLS
B	100 KVA	96.0 KW	0.540 KW	180 CELLS
C	200 KVA	187.0 KW	1.039 KW	180 CELLS
D	300 KVA	276.0 KW	1.468 KW	188 CELLS
E	400 KVA	366.0 KW	1.906 KW	192 CELLS
F	500 KVA	455.0 KW	2.350 KW	180 CELLS
G	600 KVA	540.0 KW	2.970 KW	180 CELLS
H	750 KVA	667.0 KW	3.474 KW	192 CELLS
J*	50 KVA	50.0 KW	0.238 KW	210 CELLS
K*	100 KVA	96.0 KW	0.457 KW	210 CELLS
L*	200 KVA	187.0 KW	1.039 KW	180 CELLS
Modular			1.039 KW	180 CELLS
M*	300 KVA	276.0 KW	1.468 KW	188 CELLS
Modular			1.468 KW	188 CELLS
			1.314 KW	210 CELLS
N*	400 KVA	366.0 KW	1.906 KW	192 CELLS
Modular			1.906 KW	192 CELLS
O*	500 KVA	455.0 KW	2.370 KW	192 CELLS
Modular			2.370 KW	192 CELLS
P*	600 KVA	540.0 KW	2.813 KW	192 CELLS
Modular			2.813 KW	192 CELLS
Q*	750 KVA	667.0 KW	3.474 KW	192 CELLS
R**	62.5 KVA	60.0 KW	0.286 KW	210 CELLS
			0.125 KW	240 CELLS

(* MAINTENANCE-FREE BATTERY. See paragraph 5.3)

(** MAINTENANCE-FREE BATTERY TO SUPPORT EXIDE ELECTRONICS UPS
POWERWARE MODEL XX ES (Modified). See paragraph 5.4)

5.2 BATTERY TYPES A THROUGH H

5.2.1 BATTERY CELLS: Battery cells shall be of the flat plate lead calcium or lead antimony hybrid (positive) type construction, as deemed most suitable for the system, and as specified on the delivery order. Plate thickness, sediment space, and construction shall be designed to provide a minimum service life of 20 years (@ 77° F) for UPS applications. Cells shall operate with an average specific gravity of 1.215 (@ 77° F) and float voltage of 2.17 - 2.25 volts/cell. The battery shall consist of the number of cells specified. The cell jars shall be made from a material with a minimum of 28 LOI. Cells shall have one withdrawal tube to enable measuring specific gravity without removing the flame arrestor vent cap.

5.2.1.1 MULTIPLE CELL UNITS: Multiple cell units shall be permitted for types A and B batteries. Multiple cell units shall be limited to no more than 3 cells per unit or casing. All other batteries shall consist of single cell units.

5.2.1.2 WORKMANSHIP: The workmanship in fabricating the parts, the assembly of the battery, and the lead burning shall be first class in every particular. Active plate material shall be free from breaks and loose parts. Lead calcium grids shall be clean and sharp, and free of blowholes, dross inclusions, and cracks. All sections of plates involving lead burning shall be homogeneous and free from blowholes or imperfect bonds between the portion jointed.

5.2.1.3 CYCLE LIFE: The lead calcium battery shall be capable of 2 full 8-hour discharges, and the lead antimony hybrid battery, when ordered, shall be capable of 8 full 8-hours discharges (or the equivalent thereof when discharges are less than 8 hours) per year over the 20 year life of the battery.

5.2.2 BATTERY RACKS: When ordered battery racks shall be furnished with each battery. The type of racks, standard, shock-protected or seismic will be specified at time of order. The government will at the time of order specify number and length of racks required. Rack length shall be ordered in foot increment only. Racks may be ordered in 2-tier or 3-tier configurations. (Seismic racks will not be ordered in a 3-tier configuration). Total battery capacity of racks shall not exceed the number of cells ordered, plus 5%. Each battery rack shall be painted with two coats of acid resisting gray paint. Rack construction shall be designed to meet the necessary battery support and restraint requirements. Battery racks shall be shipped dismantled. All necessary assembly hardware and assembly instructions shall be provided by the contractor.

5.2.2.1 STANDARD RACKS: When specified at the time of order the Contractor shall furnish standard racks as specified above. These racks shall provide structural support to meet the Uniform Building Code requirements for Seismic Zone 0 areas. Assembly hardware shall include butt plate packages and wall brackets.

5.2.2.2 SHOCK-PROTECTED RACKS: When specified at the time of order the Contractor shall provide shock-protected racks. These racks shall include the additional bracing required to meet the Uniform Building Code requirements for Seismic Zone 1 areas. Assembly hardware shall include butt plate packages and wall brackets.

5.2.2.3 SEISMIC RACKS: When specified at time of order the Contractor shall provide seismic racks. These racks shall include the additional strength, support and bracing required to meet the Uniform Building Code requirements for Seismic Zones 2, 3 and 4 areas. Racks shall be provided in 2-tier configuration only.

5.2.3 ACCESSORIES: The contractor shall furnish the following accessories with each battery order:

5.2.3.1 FLAME ARRESTOR: Flame arrestors with dust caps shall be furnished with each battery. Quantity shall be the same as the number of cells ordered, plus 10 additional flame arrestors. Flame arrestor shall be

designed to guard against accidental cell explosions. They shall prevent an accidental spark or flame from entering the cell and yet allow hydrogen gas to escape the cell. They shall be designed to allow easy water addition to the battery.

5.2.3.2 CONNECTORS: With the exception of inter-rack cables, the contractor shall furnish all necessary hardware for a complete battery system. All inter-cell, inter-tier, end-to-end inter-rack, back-to-back inter-rack connectors, terminal lugs and terminal plates shall be furnished with every battery. This shall include a minimum of 4 terminal plates per rack to allow connections rack-to-rack and terminal connections to 3-pole battery breaker (Government furnished). The contractor shall also provide suitable stress relief brackets to relieve undue stress and pressure to the cables, and to simplify inter-tier and inter-rack connections. Within 30 days after award of the contract, the contractor shall provide to COTR, for approval by the Government, proposed shop drawings for the stress relief brackets and a list of recommended cable types, size and number of cables for all battery connections. All connector hardware shall meet all applicable requirements of NFPA 70, 1996. Intercell connectors and connector bolts shall be designed for 1/2" spacing between jars. Connector bolts, nuts and washers shall be grade 300 series stainless steel. Sufficient quantity of anti-corrosive compound shall be furnished to cover all connecting surfaces.

5.2.3.3 INSTALLATION ACCESSORIES: The contractor shall furnish with each battery, two cell lifting straps and spreaders, and one cell number set.

5.2.3.4 MAINTENANCE ACCESSORIES: Contractor shall furnish 10 thermometers, 2 hydrometers, and 2 hydrometer holders with each battery. Two safety kits consisting of apron, eye protection and gloves shall be furnished with each battery.

5.2.3.5 ELECTROLYTE: Electrolyte shall conform to Fed. Spec O-S-801C. When specified as wet charged, the contractor shall ship batteries filled with electrolyte of proper specific gravity, fully charged and ready for use. Batteries shall have a minimum shelf life of 6 months without recharging. When specified as dry charged, the contractor shall ship batteries in the charged and dry condition and the electrolyte in separate containers. The quantity of electrolyte furnished shall be enough to fill the battery plus 5% to allow for spillage. Electrolyte specific gravity shall be nominally 1.215 and be shipped in 15 gallons D.O.T. #37P-2U poly-lined steel drum containers as defined in the Code of Federal Regulations #49. The containers shall be suitable for highway, rail, shipboard, domestic or export transport. Batteries, either wet or dry charged, shall be furnished at the same cost to the government.

5.2.3.6 SPILL CONTAINMENT SYSTEM: A spill containment system shall be provided that meets the requirements of Article 64 of the uniform fire code. The spill containment system shall consist of a liquid-tight four-inch deep spill control barrier that surrounds the battery rack to prevent the free flow of spilled electrolyte. The barrier shall extend at least two inches beyond the battery rack in all directions and be constructed of a non-corrosive material that have a minimum of 28 LOI. Within the barrier shall be a layer of neutralizing and absorbing pillows. The neutralizing pillows shall be capable of neutralizing a spill from the largest battery to a PH of between 7.0 and 9.0. The system shall be easy to install, no welding shall be required.

5.3 BATTERY TYPES J THROUGH Q

5.3.1 BATTERY CELLS: Battery cells shall be the sealed, maintenance-free design using absorbed or gelled electrolyte technology for a totally closed cycle recombinant operation. Batteries shall be designed so as to require no watering. Cell construction shall be designed to provide a minimum service life of 10 years for UPS applications. Multiple cell units not exceeding 6 cells per unit are acceptable. Cells shall operate with a specific gravity not exceeding 1.300. Cells shall be designed to float at 2.25 - 2.30 volts per cell @ 77° F. The battery shall consist of the number of cells specified. Cells shall not be paralleled to meet capacity requirements. Intercell connectors on units having more than 3 cells shall be lead plated copper and bolted to cell post.

5.3.1.1 BATTERY CELL CONTAINERS: Battery cell containers shall be a plastic material and shall be of the type having hermetically sealed covers fixed to the jar with a permanent leak-proof joint. The cell containers, and the cover-to-jar joints shall be capable of withstanding an internal pressure of at least three times normal operating pressure. Operating pressure shall not exceed 4.0 psi. Cells shall be equipped with a

low-pressure self-resealing safety pressure relief vent which prevents ambient air from entering the cell. The relief vent shall be designed to prevent excessive release of gas and yet protect cell casings from warping or deforming. The cell post-to-cell cover joint shall be capable of withstanding an internal cell pressure of three times normal operating pressure without leaking.

5.3.1.2 BATTERY CELL PLATES: The cells shall require no water or electrolyte replenishing over their design life. Plate grids and other structures shall be of sufficient proportions and strengths to ensure minimal warping, buckling, and loss of active material. Cell elements shall be assembled with an inert micro-porous absorbent separator of sufficient design to prevent internal shorting.

5.3.1.3 CYCLE LIFE: The battery shall be capable of 6 full 8-hour discharges (or the equivalent thereof when discharges are less than 8 hours) per year over the 10 year life of the battery.

5.3.1.4 Modular Battery System: The type "L", "M", "N", "O", and "P" batteries shall also be provided in the modular stackable design. The cells used in the modular battery system shall be of the absorbed electrolyte type as specified above. The modular system shall meet the Uniform Building Code requirements for Zones 2, 3, and 4 areas. The design shall provide for proper ventilation of the cells. Safety shields shall be provided to cover the front of each module to protect anyone from coming in contact current carrying parts of the batteries.

5.3.2 BATTERY CABINET: When ordered a battery cabinet shall be furnished with each 25 kva, 50 kva and 100 kva maintenance free battery.

5.3.2.1 BATTERY CABINETS: Battery cabinets shall be furnished with types "J" & "K" maintenance free batteries, when ordered. The cabinet shall be of standard manufacture, and capable of supporting the entire battery system. With the battery installed, the cabinet shall be constructed to meet the Uniform Building Code requirements for Seismic Zone 4, essential facilities areas. The cabinet shall have cable terminations for easy hook up, easy access to service the battery and replacement of cells. The cabinet shall be constructed as to prevent any accumulation of gases in its interior spaces.

5.3.2.2 BATTERY RACKS: A seismic battery rack shall be furnished with type "M" through "S" maintenance free battery when ordered. The government will at time of order, specify number and length of racks required, or a cabinet for type "M" battery. Rack length shall be ordered in foot increments only. Total battery capacity of racks shall not exceed the number of cells specified, plus 5%. Each battery rack shall be painted with two coats of acid-resisting gray paint. Rack construction shall be designed to meet the necessary battery support and restraints requirements. Battery racks shall be shipped dismantled. All necessary assembly hardware and assembly instructions shall be provided by the contractor. These racks shall include the additional strength, support and bracing required to meet the Uniform Building Code requirements for Seismic Zones 2, 3 and 4 areas.

5.3.3 ACCESSORIES: The Contractor shall furnish the following accessories with each maintenance free battery order:

5.3.3.1 CONNECTORS: The Contractor shall furnish all necessary hardware for a complete battery system. All necessary inter-cell, inter-tier, or shelf-to-shelf connectors, terminal lugs, and terminal plates shall be furnished with every battery. All connector hardware shall meet all applicable requirements of NFPA 70, 1993. Intercell connectors and connector bolts shall be designed for 1/2" spacing between jars. Connector bolts, nuts and washers shall be grade 300 series stainless steel. Terminal blocks or lugs shall be provided for terminal connection to government furnished 3-pole battery breaker. Battery shall be divided electrically at the midpoint cell for connection to center pole of battery breaker. Sufficient quantity of anti-corrosive compound shall be furnished to cover all connecting surfaces.

5.3.3.2 INSTALLATION ACCESSORIES: the contractor shall furnish with each battery two cell lifting straps and spreaders, and one cell number set.

5.4 BATTERY TYPE "R"

5.4.1 SIZE: The battery specified herein shall be sized to support EXIDE ELECTRONICS UPS POWERWARE MODEL XX ES (modified) rated at 62.5 KVA, for a minimum period of 15 minutes to a cut off voltage of 1.67 volts. Battery units shall have a nominal voltage of 12 volts (6 cells), and shall be sized to provide 100% capacity upon initial activation.

5.4.2 BATTERY CELLS: Battery cells shall be the sealed, valve regulated (maintenance-free) design using absorbed electrolyte technology for a totally closed cycle recombinant operation. Batteries shall be designed so as to require no watering. Cell construction shall be designed to provide a minimum service life of 5 years for UPS applications. Each unit shall consist of 6 cells, and shall be rated 12 volts (2 volts/cell). Cells shall operate with a specific gravity not exceeding 1.300. Cells shall be designed to float at 2.25 - 2.30 volts per cell @ 77° F. Internal resistance of the charged battery shall not exceed 6 mΩ, maximum discharge current shall be 800 A. Posts terminals shall be "L" type with clearance hole suitable for ¼ in. bolt. Weight shall not exceed 55 lbs per battery unit.

5.4.3 BATTERY CELL CONTAINERS: Battery cell containers shall be of high impact plastic material, non conductive, chemically neutral case that will prevent corrosion, will not cause short circuit or support organic growth. The container shall be of the type having hermetically sealed covers fixed to the jar with a permanent leakproof joint. The cell containers, and the cover-to-jar joints shall be capable of withstanding an internal pressure of at least three times normal operating pressure. Operating pressure shall not exceed 3.0 psig. Cells shall be equipped with a low-pressure self-resealing safety pressure relief vent which prevents ambient air from entering the cell. The vent shall be constructed so it is not removable from the cell once set in place. The cell post-to-cell cover joint shall be capable of withstanding an internal cell pressure of three times normal operating pressure without leaking.

5.4.4 BATTERY CELL PLATES: The cells shall require no water or electrolyte replenishing over their design life. Plate grids and other structures shall be of sufficient proportions and strengths to ensure minimal warping, buckling, and loss of active material. Cell elements shall be assembled with an inert microporous absorbent separator which immobilizes the electrolyte and is of sufficient design to prevent internal shorting.

5.4.5 INSTALLATION: The battery pack shall consist of individual batteries which must fit in existing battery drawers enclosed in metal cabinets as manufactured by Exide Electronics. The battery cabinets are 73.5" high, 36" wide and 31.5" deep. Each cabinet holds 10 battery drawers. The battery units will be secured in place by the hold down bracket. Attachments 1 shows the battery drawer (1 sheet), attachment 2 (4 sheets) consists of the two possible battery configurations and hold down brackets available for installation in the battery cabinets.

5.5 REPLACEMENT CELLS OR UNITS: Should a battery cell or multiple cell unit be defective or damaged (and not covered under the manufacturer's warranty), or if additional cells are requested by the Government representative, the contractor shall provide replacements or additional cells at a cost equal to the following formula:

BATTERY TYPES A THROUGH R

$$\text{COST} = \frac{(\text{TOTAL BATTERY COST}) \times (\# \text{ OF ADD'L CELLS REQD OR DAMAGED})}{\text{TOTAL NUMBER OF CELLS IN THE BATTERY}}$$

The cells shall be ordered under the same CLIN as the respective battery but shall be clearly be marked cells. Cells shall be packaged, packed and shipped as specified in the original battery order.

VI. BATTERY MONITORING SYSTEM

6.1. BATTERY MONITORING SYSTEM: A battery monitoring module shall be provided when ordered, for each battery system supporting the UPS system.

6.2. METHOD OF OPERATION: The battery monitoring module shall be a system that measures the impedance of cells and interconnects, and voltage of cells and total battery while the system is at float charge. The system shall sense power outages, record and store each event, cell voltage decay, length of discharge, number of discharge, ambient temperature and temperature of the pilot cells, and total battery system decay for future analysis. The monitoring system shall not require that the battery be taken off line for testing and shall

not interfere in any way with the capability of the battery to supply its full load at any time, including during measurements. Whenever an alarm is indicated a printer shall provide up to the minute data on the condition of the battery.

6.2.1. The battery monitoring system shall be suitable for battery system of up to 250 cells having a maximum battery voltage not exceeding 850 VDC, and 7000a. The monitoring system shall operate on 120 VAC 50/60 Hz and be equipped with a 3 hrs (min.) battery backup in the event of a power failure. The system shall be suitable for series/parallel combination of cells.

6.2.1.1 The battery monitoring system shall be capable of sensing and detecting all battery current discharges and be equipped with RS 232 port for remote communication capabilities (a modem for telephone communication is not required under this contract), and a serial cable pinout for short range communication. Software programs to archive, sort, analyze, display data, and predict battery performance shall be included with each system.

6.2.2. Connections to the battery shall be protected from faults or anomalies by fusing and/or other appropriate means, and shall be correctly sized for the battery specified.

VII. SERVICE CAPABILITY

7.1 GENERAL: The Contractor shall have demonstrated the capability of providing service worldwide.

VIII. TECHNICAL REPRESENTATIVE SUPPORT REQUIREMENTS

8.1 GENERAL: The Contractor shall furnish the service of a technical representative to inspect existing battery systems, charge battery systems, and other work related to inspection and maintenance of battery systems. Within ten days of the completion of services, the contractor shall provide the Contracting Officer a written report on the services performed, including the time of reporting to and leaving the site. The Government Representative at the site must sign each page of the report before payment for the services can be made.

8.1.1 The Contractor shall be responsible for providing all equipment and materials required to perform the services.

8.2 QUALIFICATIONS: The technical representative shall be well qualified through training and experience in the installation and maintenance of the batteries covered by the specifications and capable of conducting training of site personnel on maintenance and record keeping of the battery.

8.3 NOTIFICATIONS: The government will provide the contractor a minimum of fourteen days advance notice prior to the date the technical representative is required on site. The contractor shall provide the representative on the date requested or notify the government of an alternate date not later than seven days from the date requested. The alternate date shall be no later than seven days from the requested date.

IX. INSTALLATION OF BATTERY SYSTEM

9.1 GENERAL: The Contractor shall provide all labor and materials to install, charge and put into service the battery system complete with Government furnished UPS system, when battery installation services is ordered. Installation of the battery shall include installation of the Spill Containment System. In determining the bid price, the Contractor should consider that the battery will be stored locally and the maximum distance that will be required to transport it to the installation site is ten miles. There may be other construction undergoing at the site that will require coordination, however, the Contractor will be provided reasonable access to the area in which the installation is to take place. The battery to be installed may be wet charged, dry charged or maintenance free, as specified at time of order. The Government will furnish the battery with separate electrolyte, if required; battery racks with associated hardware unassembled, and all intercell connectors with hardware. The Contractor shall provide all additional materials and labor to assemble, install, filled with electrolyte if required, and charge the battery. Upon completion, the battery system shall be complete, usable and ready to provide back up electrical power to the Government furnished UPS system.

9.1.1 The Contractor may use a commercially available battery charger or the UPS to charge the battery. The extent to which the battery charger/UPS DC voltage may be adjusted will limit the number of cells that can be charged at one time. Under no circumstances shall the Contractor parallel more than two strings of cells for charging at the same time. Battery charging or refreshing charge, if maintenance free battery, shall be performed in accordance with the battery manufacturer's instructions.

9.1.2 All work is to be in accordance with all applicable codes and in keeping with standard acceptable construction practices. Before installation of the battery system, the Contractor shall submit to the Contracting Officer Technical Representative (COTR) a basic description of how the equipment will be installed, charging procedures, and activation charge requirements including maximum charging current and minimum ampere hours required, for approval. This description can be in any reasonable format but must clearly describe all work including a list of materials to be used.

9.2 NOTIFICATIONS: The Government will provide the Contractor a minimum of 30 days advance notice prior to the date the site will be available to installation. The Contractor shall commence installation on the date requested or notify the Government of an alternate date within 14 days of the request. The alternate date may not exceed 15 days from the date originally requested.

9.3 QUALIFICATIONS: If the Contractor elects to use a subcontractor to perform the installation, the subcontractor shall be experienced in installing battery systems.

9.4 REMOVAL AND DISPOSAL: When ordered the contractor shall remove from service and dispose of obsolete batteries and racks and if required, empty acid drums, partially full excess acid drums and shipping containers. Disposal shall be accomplished off base and in conformance with local laws and regulations regarding disposal of hazardous material.