

PUBLIC POWER CORPORATION
ATHENS - GREECE

June 1983

SPECIFICATION SS-84/1

**220V, 200 Ah ALCALINE STORAGE BATTERY
AND CHARGER**

I. SCOPE

The present Specification covers the manufacturing, testing and shipment to the Public Power Corporation the requested units of 220V, 200Ah alkaline batteries with pocket plates in addition with a constant voltage automatic charger as specified herebelow.

The complete "Battery - charger" unit is to equip 400/150kV outdoor substations of the 400kV Greek System and shall be suitable for indoor installation.

II. SERVICE CONDITIONS

- a. System Characteristics
The battery will be charged by a constant voltage automatic charging equipment. The supply to the above will be provided from a 3-phase, 50-cycles, 380V main supply from a station service transformer.
- b. Altitude
Below 1000m from sea level.
- c. Ambient Temperature
The ambient temperature will range from +5°C to +40°C. Maximum mean temperature +30°C.
- d. Installation : Indoor.

III. NICKEL CADMIUM BATTERY

1. GENERAL DESCRIPTION
The specified alkaline battery shall be of low internal resistance "POCKET-TYPE" capable of alternate quick and low-rate charging. It shall be offered complete with all the necessary mounting insulators, stands, end-cell connectors, lead plated copper lugs, trays, wooden blocks e.t.c., as well as the

necessary electrolyte, and they shall require only assembly of parts as shipped and connection to purchaser's D.C. board. The battery shall be placed on wooden blocks, and the cells shall be arranged on the wooden blocks in strips. The whole rack shall be seated on insulators.

Each set will consist of identical (Ni-Cd) nickel-cadmium cells, and in case of failure of the network power supply, the battery system should be capable of switching automatically and provide the necessary power to all control and emergency circuits - indicating annunciation, protection, emergency lighting e.t.c.

2. BASIC TECHNICAL CHARACTERISTICS OF THE BATTERY

- a. The specified alkaline battery shall be of a suitable type in order to require the minimum possible maintenance, and shall be capable to deliver at least 200Ah at max., discharge rate C/5 and ambient temperature variation between +5°C to +40°C, relative humidity 40% with the voltage remaining within the limits of 198 and 242 (220±10%) to the battery terminals.
- b. At normal operation the battery shall be charged with a floating connection by means of the constant voltage charger.
- c. With a max. discharge rate C/5 the terminal voltage shall never fall below 200V when the battery becomes 90% discharged in an ambient temperature of 20°C. In addition, it should be capable to ensure the following current peaks that may occur with the 200Ah battery at 90% discharged:

Peak Currents	Permissible Minimum Voltage
1 peak of 700A during 1 sec.	180 Volts
1 peak of 50A during 5 sec.	200 Volts

3. TESTS

The following tests shall be performed on a battery unit chosen at random. The cost of performing all the tests shall be included in the bid price.

- 3.1. Test for determining the internal average resistance of one cell at 20°C, at different states of charge.
 - a. Fully charged.

- b. Fifty percent (50%) discharged.
 - c. Ninety percent (90%) discharged.
- 3.2. Tests (visual) for mechanical rigidness of cell parts according to international acceptable commercial practice.
 - 3.3. Test for peak currents and time of duration when the battery is 90% discharged.
 - 3.4. Performance test under normal operation.
4. DATA TO BE SUPPLIED BY BIDDER

Bidders are requested to submit, attached with their offer the following information, drawings, sketches, figures e.t.c. giving a complete description of the proposed battery unit.

- a. Assembled cell outline drawing.
- b. All mounting details and dimension drawings for the complete installation of the battery.
- c. Charge and discharge curves of the battery's cells (typical).
- d. The voltage variation of the battery during the operating conditions stated in III-2.
- e. The number of strips and the number of cells per strip.
- f. Maintenance instructions outlining periodical operations necessary for the correct performance and good maintenance of the offered material.
- g. Completion of SCHEDULE "A" "Information by seller" for the battery unit.
- h. Spare parts list of the offered material⁽¹⁾ and the per-unit price.

IV. CONSTANT VOLTAGE AUTOMATIC CHARGING EQUIPMENT FOR 220V, 200Ah, ALKALINE STORAGE BATTERY.

1. GENERAL DESCRIPTION

- a. The specified charging equipment shall be of the indoor steel cubicle type suitable for floor mounting, and shall require the minimum possible maintenance. It will incorporate all necessary controls, indications, interlocks

⁽¹⁾ In the offered spare parts the supplier shall include two (2) cell units.

and Timing features to prevent any false operation and to insure proper operations.

- b. Each charger shall be protected against any damage from overload current and it will be designed so that when it delivers continuously at least rated current output it will not activate the protective overload devices, for abnormal conditions of low battery voltage down to 80 percent of rated battery voltage. Also, it shall be of the completely automatic, voltage-regulated type with low ripple output voltage.
- c. The charging unit will provide the necessary power to feed station's D.C. loads under normal operating conditions as well as power for charging the complete battery when connected in parallel with them in floating operation.

The charger shall be furnished with full-wave germanium, selenium or silicon type rectifiers without electronic tube devices for control or regulation.

- d. All isolating transformers and reactor transformers shall be of the dry type. The direct current ammeter, voltmeter, voltage adjusting controls and snap switches or circuit breakers for the input and output circuits will be mounted on the front panel of the charger.
- e. The sheet-iron thickness of the board shall not be less than 2.3mm. It shall be painted white or light grey inside and grey outside. All iron parts shall be painted with one prime coating and two coats of excellent quality finishing paint. The prime coating shall be of excellent quality and the two coats of finishing painting shall consist of enameled hot paint (Duco). Before painting the base material it shall be pretreated with zinc phosphate.
- f. The exterior sides, front and back of the board shall be supported on steel frame of suitable strength. The designing of the board shall take into consideration the proper ventilation of the charger.
- g. All metallic parts of the board shall be electrically connected by a copper tinned grounding bar of at least 25 x 3mm and to the earthing terminals provided for connecting to the earthing system.
- h. Wiring shall consist of insulated single core, copper stranded wire.
- i. The exterior side steel panels of the board shall be easily removable.

2. BASIC TECHNICAL CHARACTERISTICS OF THE CHARGER

- a. The battery charger shall be suitable for use in an ambient temperature range between +5°C and +40°C and relative humidity 95%.
The power supply shall be 3-phase, 380Volts \pm 10%, 4 wire, 50Hz.
- b. The rectifier charging the battery in a floating connection under normal operating conditions shall ensure permanently:
 - The maintenance current necessary to maintain the storage battery charged at 100% of its normal capacity.
 - The constant voltage charger shall be capable to deliver, in addition to float charging the battery, about 20A for auxiliary loads (signals and control).
 - This permanent operation must be ensured automatically and without any supervision at an adjustable voltage between 200 and 240V.
- c. In abnormal conditions and immediately after the restoration of the A.C. main supply, the rectifier shall insure the "quick charging" of the complete battery at a high rate charge.
- d. The output voltage during the charge should not exceed 270V.
The charger will be composed by a basic charge unit for feeding the load and at the same time, float charging the battery cells and maintain them in a fully charged state.
- e. Wave rippling of output D.C. power.
The maximum allowable wave rippling charger's output should be less or equal to the one which is specified by the manufacturer of the storage battery set (Schedule "A", 23).
- f. The charger must be capable to insure a level N radio interference, according to VDE 0875 specification, from both sides.
 - The equipment shall be provided with the following monitoring devices:
 - a. Fuse monitoring.

- b. D.C. over-voltage and under-voltage monitoring.
- The charger shall be so designed that the following requirements be ensured:
 - a. The charge of the battery at a high rate after restoration of the main supply.
 - b. The passage from the high rate charge state to the floating state.
 - c. The passage from the discharge state to the high rate charge.
 - d. Non-automatic periodical overcharge.

3. TESTS

The following tests will be performed on each rectifier. The cost of performing all tests shall be borne by supplier and they shall be included in the Bid price.

- 3.1. Dielectric tests in accordance with the applicable standards, subject to Approval by the Purchaser.
- 3.2. Performance tests (results to be shown in curve form).
 - a. Regulation test proving that the voltage regulation is within the specified limits of accuracy from light load to full load.
 - b. Load test to show that the chargers have the ability to deliver at least rated current, without operation of the protective overload devices, for abnormal conditions of low battery voltage down to 80 per cent of rated battery voltage.

DATA TO BE SUPPLIED BY BIDDER

Bidders are requested to submit, attached to their offer the following information drawings, sketches, figures etc. giving a complete description of the proposed charger.

- a. Charger assembled outline drawing (FRONT & SIDE VIEW).
- b. Connection diagram of the board.
- c. Detailed schematic diagram of automatic charger.
- d. General description of operation.
- e. Standard accessories supplied.

- f. Graphical representation of charger per cent output with respect to voltage for rapid charge as well as for floating charge.
- g. Completion of SCHEDULE "A" "Information by Seller" for the charger.
- h. Two copies of photographs (21x28) with binding edge on the 28mm side for the following views:
 - 1. Side view.
 - 2. Front view.

In addition, bidders shall supply all the technical data requested in SCHEDULE "A", "Information by Seller" attached hereto, as well as any deviation from the present specification and the reason thereof. Submission of SCHEDULE "A" incomplete shall constitute sufficient ground at the option of Purchaser, for rejection of the offer.

SPARE PARTS

Spare parts recommended by the manufacturer for the offered equipment will be provided for two years operation. Bidders are requested to describe those recommended spare parts and give quotation for the required quantities corresponding to the number of batteries and charger sets.

The Purchaser reserves the right to determine, when signing the Contract, the spare parts which seller shall furnish on the basis of the prices set forth in this proposal.

AA/DL/CV/4.7.80
DL/al/13.6.83

SPECIFICATION SS-84/1**SCHEDULE "A"****INFORMATION BY SELLER****220V, 200Ah ALKALINE STORAGE BATTERY AND CHARGER****A. ALKALINE STORAGE BATTERY**

1. Type of battery (short description)
2. Type of electrolyte (short description)
3. Element support (short description)
4. Type of separators (short description)
5. Rated capacity at C/5, 20°C : Ah
6. One (1) second peak current of the 90% discharged battery : A
7. Five (5) second peak current of the 90% discharged battery : A
8. Number of cells :
9. Plate thickness : mm
10. Plate Area : cm²
11. Plate weight : gr.
12. Internal resistance of cell (average): Ω
13. Per cent deviation of internal resistance : ± %
14. Per cent watt hour efficiency at discharge rate C/5, 20°C : %
15. Type of containers (short description)
16. Weight of the whole battery unit complete with electrolyte : kg

17. Weight of the whole battery unit without electrolyte : kg
18. Thickness of containers : mm
19. Material of covers (describe)
.....
20. Thickness of covers : mm
21. Specific gravity of electrolyte : max.
..... min.
22. Normal voltages at 20°C per cell
 - a. rapid charge voltage : V per cell
 - b. floating voltage : V per cell
23. Maximum allowable wave rippling during charging : A (ms)
24. Deviations from the present specification and the reasons thereof
25. List of spare parts

B. BATTERY CHARGER (at 20°C)

1. Voltage supply, No. of phases and frequency : V, ph, Hz
2. Maximum power supply : Watts
3. Rated power supply : Watts
4. Rated current to the load : A
5. Rated voltage to the load : V
6. Maximum current to the load : A
7. Max. and min. voltage to the load : Vmax., Vmin.
8. Constant voltage regulation : ± %
9. Output current rippling, % of rated D.C. current : %

- 10. Output voltage rippling,
% of rated D.C. current : %
- 11. Power rectification from A.C. (short description)
.....
- 12. Instruments and indicators on front of the cubicle
(short description)
.....
- 13. Protection of battery charger (short description)
.....
- 14. Dimensions of the steel cabinet
(length - width - height) : cm, cm, cm
- 15. Net weight of the steel cabinet : kg
- 16. Sheet-iron thickness of the board :
cm
- 17. Prime coating (type) :
- 18. Finishing paint (type and color) :
- 19. Spare parts list
.....
- 20. Deviation from the present specification
and the reasons thereof

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