STATEMENT OF TECHNICAL REQUIREMENTS

FOR

BATTERY CHARGING FACILITIES

EED 50- 35

NOV 11
### RECORD OF AMENDMENTS

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<th>DATE</th>
<th>SIGNATURE</th>
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### II. REVISION NOTE

No revision incorporated.

### III. HISTORICAL RECORD

This standard supersedes the following: - NIL.

NEW DELHI 110011
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<th>Page No</th>
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<td>Governing Specification</td>
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</tr>
</tbody>
</table>
1. INTRODUCTION.

1.1 Battery charging facilities shall be provided on the ship such that discharged batteries on board could be charged to their capacity in specified time as well as the charged batteries are preserved by giving a trickle charge to compensate for their internal discharge when stored for a long time. For this the ship shall have a central battery charging room on upper deck close to the weather deck. The battery charging room shall have the facilities for the charging, stowage, maintenance and preservation of ship’s general service batteries in accordance with NES 101. The facilities shall cater to charging and preservation of all type (viz Lead Acid, Nickel Cadmium(Ni-Cd), Nickel Metal Hydride (Ni-MH), Lithium Ion (Li-Ion) and any other secondary battery) of batteries used normally for the following services/systems/equipment.

(a) Motorboat and Vehicle batteries
(b) AEL Batteries
(c) Lantern Batteries
(d) Magazine hand lamps batteries.
(e) Emergency navigation lights batteries.
(f) Portable WT sets Batteries.
(g) Miscellaneous and other low capacity batteries.

1.2 Charging of the batteries that are part of C&C supply system, Aviation related services and any other system batteries requiring more than 10A charging current shall not be supported by these centralized charging facilities.

1.3 Standard charging panels of type A,B,C, loading panel, local motorboat battery charging arrangement and other requirements detailed in the succeeding paragraphs shall be provided under these facilities.

2. Features of the Design of Ship Charging Room.

2.1 The battery charging room has to be located at weather deck level for easy reach of accommodation ladders, boat davits etc. to reduce the manhandling of heavy batteries.

2.2 The compartment has to be remote from machinery spaces, power rooms, galleys and welding workshop, laundry and radio equipment in order to maintain the ambient temperature as low as possible.
2.3 The compartment has to be not sited adjacent to any compartment containing explosives, the doors are to be water tight in accordance with NES 127 and to be lockable from the outside with a padlock. All drawers and cupboards are to be lockable.

2.4 Proper ventilation and fresh air are to be provided, ventilation interlock with battery charging system should be provided to ensure healthy environmental condition in accordance with NES 102.

2.5 Battery charging room may be sub-divided in to two parts as battery charge control room and battery stowage/charging room. The charging and loading panels are to be located in charge control room. Battery stowage racks, acid bottles, acid neutralizer/alkali neutralizer and preserved batteries are to be accommodated in the battery stowage and charging room.

2.6 The following types of standard battery charging panels and other units take care of the charging requirements as indicated against them in the existing ships.

(a) Battery charging panel type ‘A’ - For motorboats 7 vehicular batteries and other batteries that require more than 3A charging current.

(b) Battery charging panel type ‘B’ - For Magazine hand lamps and emergency navigation lights.

(c) Battery charging panel type ‘C’ - For miscellaneous batteries.

(d) Portable battery charger Unit - For general portable charging requirements.

(e) Battery loading panel - For loading the batteries on maintenance

2.7 Arrangements have to be provided for the remote charging of the motorboat batteries whilst the boats are in crutches or at davit head, a remote/local change-over switch from the charging panel connected to an approved external double pole switch socket is to be provided.

(a) Input supply failed.

(b) Output DC Under/Over Voltage.

(c) Charger Failed/Reverse Charge

3.1 **Contactor Panel.** The Contactor Panel 230V, 50Hz, 1 Ph, 30A which has interlocking facility with the starter of battery charging room ventilation exhaust fan such that the charging takes place only after the ventilation fan is switched on. By switching on the ‘ON’ push button on the contactor panel the power supply will be energized up to both the MCB panels of the system simultaneously. The Panel shall consist of the following:-

(a) Contact with aux contacts - 01 no
(b) Push button ON/OFF - 01 Set
(c) MCBs, 16 A - 02 Nos.
(d) Indication lamps - As required

3.2 **Portable Battery Charger Unit.** The numbers of Portable battery charger units of standard type and make, suitable for warship use shall be provided for charging of small maintenance free, portable equipments batteries etc. The charger shall be suitable for operation on input supply of 230V, 1PH, 50HZ and provide a smooth variable DC output of 0-15V at 0-3A charging current.

3.3 Flexible cable assembly for motorboat battery charging. The cable assembly shall be made up of cable pattern no. 521-8488 of sufficient length.

3.4 Wash basin and fresh water tap shall be provided as a safety and precautionary measure to protect the personnel from chemical hazards like acids & alkalis and to clean the chemical particles spill out on battery surface and to clean the implement and hands.

3.5 Wax impregnated wooden gratings shall be spread on the floor to avoid direct contact with the spilled out chemical particles in the compartment.

3.6 The paneling, insulation, deck covering and painting in the battery compartment shall conform to the respective NES.

4. **Governing Specifications.**

(a) NES 101 – Requirements for Workshops and Maintenance Spaces.

(b) NES – 532 – Design of electrical supply and distribution system.

(c) NES 502- Requirements for Electrical Installation on board ship.

(d) NES 501- General Requirements for design of electro technical equipment.

(e) DEF STAN 61-5, Part 4 – Low voltage electrical power supply system.

(f) STANAG 1008- Characteristics of Shipboard Electrical Power Systems.
STATEMENT OF REQUIREMENT FOR
BATTERY CHARGING PANEL

1. **SCOPE.** This statement of requirement covers the manufacturing, testing and on-board commissioning of the Battery Charging Panels Type A, B & C on board ships. The Battery Charging Panels Type shall be designed to meet the input supply characteristics and duty cycle. The design is to be catered for the most adverse of the environmental and electrical conditions. Battery Charging Panels Type A, B & C shall conform to DPIN drawing & specifications mentioned therein:-

2. **POWER SUPPLY.** 230 V, 50 HZ, 1PH.

2.1 **Input Supply Voltage & A.C Supply Characteristics.** 230V, 50Hz, 1 Phase. The main AC supply voltage characteristics shall be as per table below:-

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Characteristic</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>(a) User Voltage Tolerances:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(i) Average of three line-to-line voltages</td>
<td>(i) ±5%</td>
</tr>
<tr>
<td></td>
<td>(ii) Any one line-to-line voltage, including item (a)(i) &amp; line voltage unbalances item (b)</td>
<td>(ii) ±7%</td>
</tr>
<tr>
<td></td>
<td>(b) Line voltage unbalance</td>
<td>±2%</td>
</tr>
<tr>
<td></td>
<td>(c) Voltage modulation</td>
<td>±2%</td>
</tr>
</tbody>
</table>
(d) Voltage transient:

(i) Voltage transient tolerances ±16%

(ii) Voltage transient recovery time 2 seconds

(e) Voltage spike (peak value includes fundamental) 1 KV (120-240V) system

(f) The maximum departure voltage resulting from item (a)(i) and item (d) combined, except under transient or emergency conditions ±6%

(g) The worst-case voltage excursion from nominal user voltage resulting from item (a)(i), item (a)(ii), and item (d) (i) combined, except under emergency conditions ±20%

Waveform

Waveform voltage distortion:

(a) Maximum total harmonic distortion 5%

(b) Maximum single harmonic 3%

(c) Maximum deviation factor 5%

Frequency

(b.i.a.a) Nominal frequency 50 Hz

(b.i.a.b) Frequency tolerances ±3%

(b.i.a.c) Frequency modulation 0.5%

(b.i.a.d) Frequency transient:

(b.i.a.d.i) Tolerance ±4%

(b.i.a.d.ii) Recovery time 2 sec

(b.i.a.e) The worst-case frequency excursion from nominal frequency resulting from item (b), item (c) and item (d) (i) combined, except under emergency conditions 5.5%
2.2 The battery charger shall cater to charging of all type {Nickel Cadmium (Ni-Cd), Nickel Metal Hydride (Ni-MH), Lithium Ion (Li-Ion) and lead acid} of batteries used with various services/systems/equipment.

3. The following Battery Charging Panels are recommended for use onboard ship.

   (a) **Battery Charging Panel-Type A**
       
       Type/ Pattern No. : - 0564/204384
       
       Input Supply: - 230 V, 50 HZ, 1PH
       
       Output Supply: - 50 V DC, 15 Amps – 0.75kw.
       
       Drg No. DPIN/ 3984, 3985, 3986

   (b) **Battery Charging Panel – Type B**
       
       Pattern No. : - 0564/204382
       
       Input Supply: - 230 V, 50 HZ, 1PH
       
       Output Supply: - 90 V DC, 3 Amps – 0.27 Kw.
       
       Drg No. DDI (MS)/3780 & 3781

   (c) **Battery Charging Panel- Type C**
       
       Pattern No. : - 0564/204383
       
       Input Supply: - 230 V, 50 HZ, 1PH
       
       Output Supply: - 35 V DC 1.5 Amps –(0.0525 Kw)
       
       Drg No. DPIN/3849, 3850

4. **Design Requirements.**

   4.1 The Battery charging panels shall have thyristor control for the DC output. The panel shall consist of suitable transformer, semiconductor bridge rectifier, filter circuit and monitoring and control circuit for the charging circuit. It shall have inbuilt system for automatic control of the output voltage and current with pre-determined charging current and charging time. Manual control of battery charging should also be possible by selection.

   4.2 The battery charging panel shall have following protection:-

       (a) under/over voltage protection of incoming supply,

       (b) Overload/Over charging

       (c) Short/Circuit/Reverse Polarity
In addition to isolator, fuses, indication lamps, necessary instrumentation and Audio Visual Alarm to indicate fault conditions.

4.3 Type ‘A’ panel shall have change over facility for Local/Remote trickle charging of motorboat batteries at two positions simultaneously.

4.4 The contactor panel shall have interlock with the starter of battery charging room ventilation exhaust fan such that the charging takes place only after the ventilation fan is switched on. The power supply system shall be able to switch ‘On’ from this panel only when the potential free auxiliary contacts in the starter is closed.

4.5 The charger should be able to operate both under constant current and constant voltage charging modes by suitable (auto/manual) selection.

4.6 The chargers are to be designed with suitable circuitries which can provide trickle charge, slow charge as well as fast charge. The chargers shall have provisions for detection of “End of Charge” conditions and protect batteries from the over charge. The details of methods used for detecting the “end of Charge” conditions and protect batteries from the over charge. The details of methods used for detecting the “End of Charge” conditions shall be specified along with other design details in the technical proposal for the charging panels.

4.7 All internal wiring is to be done by using LFH cables and approved type cable markers. Soldering of wires is to be avoided wherever possible.

5. **Constructions.**

5.1 The battery charging panels are to be rugged in construction, drip proof using commercial grade aluminum panels and high quality workmanship so as to withstand adverse marine condition like shock, vibration, corrosion and saline atmosphere etc. Battery charging panel shall have overload protection, isolators, fuses, control circuits, transformers and terminal for the remote and control switch. Doors are to be provided with neoprene gasket all around and door stoppers. Neoprene gasket shall be provided all around for the required enclosure protection. All MS bolts, nuts and washers etc. shall be cadmium plated.

5.2 **Protection.** IP 55

5.3 **Shock Standard.** Naval shock standard NSS-Grade A in conjunction with BR 3021 and NSM & sketch 17/L/SK/005(copy enclosed).

5.4 5-33 Hz (Conform to specification JSS – 55555)

5.5 **Insulation.** Class – F or of higher grading.

5.6 **Mountings.** The battery charging panels are to be suitable for bulkhead mounting using resilient mounts. Resilient mounts are to be supplied along with the main equipment. Quantity and pattern no, of shock mounts are to be indicated in the drawing.

5.7 **Earthing.** A separate earthing bolt is to be provided at a suitable place for connecting the panels to the ships hull.
5.8 **Cooling.** The panels are to be naturally air cooled and continuously rated for full load operation at a maximum temperature of 55°C.

5.9 **Dimensional Details.**

The dimensions are to be to the following:

<table>
<thead>
<tr>
<th>Charging Panel</th>
<th>Overall Dimensions in mm</th>
<th>Fixing Dimensions in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W</td>
<td>D</td>
</tr>
<tr>
<td>A</td>
<td>518</td>
<td>360</td>
</tr>
<tr>
<td>B</td>
<td>400</td>
<td>360</td>
</tr>
<tr>
<td>C</td>
<td>400</td>
<td>360</td>
</tr>
</tbody>
</table>

5.10 **EMI/EMC.** The equipment shall be designed to meet the EMI/EMC effect conforming to specification MIL STD 461-E/F.

5.11 **Painting.** The painting shall be conforming to specification DGS-251/NES 1005. Powder coated painting would be acceptable provided the process is approved for marine application on warships. The enclosure finish colour shall be admiralty grey, semi-gloss.

6. **Cable Details and Cable Entry Glands.** Cable entry glands shall conform to specification DGS/EED/VI/1535/R6 or NES 512 Part II for incoming and outgoing cables. The sizes of the glands for respective cables shall be as indicated in NES-512.

6.1 **Cable Details**

<table>
<thead>
<tr>
<th>S. NO</th>
<th>EQUIPT.</th>
<th>NO. OF CABLES</th>
<th>NS NO.</th>
<th>O.D.</th>
<th>STRANDS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PANEL-A</td>
<td>2</td>
<td>521-6809</td>
<td>6.5 mm</td>
<td>7/0.5 D mm</td>
<td>Input Cable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>521-6809</td>
<td>6.5 mm</td>
<td>7/0.5 D mm</td>
<td>Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>521-6809</td>
<td>6.1 mm</td>
<td>7/0.4 D mm</td>
<td>LBCB</td>
</tr>
<tr>
<td>2</td>
<td>PANEL-B</td>
<td>2</td>
<td>521-6808</td>
<td>6.1 mm</td>
<td>7/0.4 D mm</td>
<td>Input Cable</td>
</tr>
</tbody>
</table>
7. **Terminals**

Bolted type terminals and crimped lugs/sockets of electrolytic copper are to be provided for all the incoming and outgoing cables in accordance with NES 514. All terminals shall be easily and safely accessible for connection as well as checking power supply voltage if needed. Adequate spare terminal strips are to be provided for provision of additional control and indication facilities. Adequate space is to be provided in the equipment for bending and termination of incoming and outgoing cables.

8. **Components**

8.1 All components shall be of Naval approved type for use on warships. Indication lamps used shall be of approved type. Standard specification and grade of material of each component used shall be indicated in the binding drawing. Make and type of components are to be listed in the binding drawings.

9. **Tally and Diagram Plates.** All tallies and diagram plates shall be made of anodized aluminum alloy or naval brass. The size of tally plates and their letters shall conform to NES-723. “230 VOLTS-DANGER” tally shall be provided on the equipment at a prominent place.

10. **Operating Conditions.** The Electrical equipment shall operate satisfactorily in the marine environmental (Coastal conditions) and other operating conditions enumerated in the succeeding paragraphs.

10.1 **Seaway Condition.** The seaway conditions under which the equipment is required to function is as under:-

   (i) Roll : max. +/-15 deg. With 10.3 s period - operational  
            max. +/- 40 deg. With 10.3 s period - Survival

   (ii) Pitch : max +/- 3 deg. With 7 s period - operational  
               max. +/- 5 deg. With 7 s period - Survival

   (iii) Heave : max. +/- 3.5m with 7.5 s period – Operational
max. +/- 11m. with 7.5 s period - Survival

(iv) Yaw : max. 0.8 deg per s\(^2\) -Operational
max. 2.2 deg per s\(^2\) – Survival

(v) Tilt (permanent) : max 15 deg in any direction -Operational
max. 30 deg in any direction-survival

10.2 **Environmental Conditions.** The equipment shall be designed to meet the environmental conditions as specified below in accordance with NES 1004.

**Air temperature and relative humidity.**

<table>
<thead>
<tr>
<th>Operating area</th>
<th>Operation</th>
<th>Temperature limits</th>
<th>Relative humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh air ventilated or air –conditioned compartments and hot &amp; humid compartments such as engine room and other machinery spaces</td>
<td>Continuous</td>
<td>0(^\circ) to 55 (^\circ)C</td>
<td>30% to 100%</td>
</tr>
<tr>
<td>Equipment storage</td>
<td>Unpacked</td>
<td>10(^\circ) to 70 (^\circ)C</td>
<td>75%</td>
</tr>
</tbody>
</table>

**Air Contamination.** The equipment shall be able to operate in the contaminated air through salt, oil and other contaminates with marine environment (coastal conditions).

11. **Spares, Tools and Test Equipment.** The onboard spares, Base & Depot spares, tools and test equipment as applicable to the equipment shall be recommended by the supplier. Such recommendations are to commensurate with the reliability of critical components and component used in the system. Special tools and test equipment, if required, are to be supplied for onboard maintenance.

111. The list of total recommended On Board spares and B&D spares shall be provided for **INCATing** as per format enclosed.
11.2. **On Board Spares.** An itemized list of On Board Spares (OBS), special tools and test equipment which will be supplied with main equipment is to be furnished along with the quotation for the main equipment. These spares, special tools and test equipment are catering for all the ship’ staff onboard maintenance routine and possible repair requirements.

11.3. **Base & Depot spares.** Base & Depot spares recommendation is to cover maintenance/overhaul requirements for 5 years including two refits of the ship. Recommendation for insurance holding of long lead items is also to be indicated. Itemized cost of B&D spares are to be forwarded with the main offer.

**To be Supplied when Tendering**: Following information are to be supplied when tendering the equipment:

(a) Overall Terminal connection and circuit diagram

(b) Material list – indicating part No, Qty, Material, Makers name etc.

(c) Dimension of the equipment

(d) Mounting arrangement

(e) CG of the equipment

(f) Power supply requirement.

12. **Binding Drawings and Documents.**

12.1 **Binding Drawings.**

- Overall dimension of the equipment
- Mounting arrangement
- CG of the equipment
- Terminal connection and circuit diagram
- Material list – indicating part No., Qty, Material, Makers name etc.
- Power supply requirements.
- Estimated weight of equipment.
- List of tally plates.

One set of binding drawings is also to be supplied to the shipyard for their comments while forwarding to DQA(N)/NSM at the time approval.

13. **Documents.** The format and scope of content of documentation being provided shall be as per JSS 0251-01 and EED-S-048. Documentation shall be supplied as per the
No documents should be supplied in loose. All sets of documents are to be properly filed/bounded and labeled.

13.1 Test certificate is to include the actual value of test data conducted during FAT.

14. Tests/Type Testing and Inspection. All tests required are to be carried out as per section of specification NES 537 & 511 and JSS-55555 (for environmental testing) in the presence of Naval Inspection Agencies and report submitted thereafter.

<table>
<thead>
<tr>
<th>Sl.no.</th>
<th>Test</th>
<th>Specification</th>
<th>Test condition/ severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vibration</td>
<td>JSS 55555 - Test 28</td>
<td>5 – 33 Hz</td>
</tr>
<tr>
<td>2</td>
<td>High Temperature</td>
<td>JSS 55555 - Test 17</td>
<td>55 °C for 16 Hrs., Procedure 5, Test Condition ‘G’</td>
</tr>
<tr>
<td>3</td>
<td>Damp heat</td>
<td>JSS 55555 - Test 10</td>
<td>40 °C, 95 %RH for 16 Hrs</td>
</tr>
<tr>
<td>4</td>
<td>Drip proof</td>
<td>JSS 55555 - Test 11</td>
<td>Vertical Water drip</td>
</tr>
<tr>
<td>5</td>
<td>Mould growth</td>
<td>JSS 55555 - Test 21</td>
<td>29°C, 90 % RH mould growth chamber for 28 days</td>
</tr>
</tbody>
</table>
### Inspections

**DQA(N)**

#### 15. Warranty

The equipment is to be guaranteed for stipulated performance for 24 months after commissioning. The equipment supplied shall be warranted from defects, manufacturer and performance, for the said period and cover all the defects arising from malfunction through design faults, inappropriate material, bad production and non-conformance to specifications. Any expense on account of repair/supply of spares against guarantee defects is to be borne by the supplier.

#### Governing Specifications

NES-501 - General requirements for the design of Electro Technical equipment.

DGS-251/ NES1005 – Code of Practice for Protective Finishes.

DGS/EED/VI/1535/R6 – Cable Glands

NES 512 Part 11 – Guide to selection of Cable Glands.

NES-514 – Guide to cable entry, termination and junction components for equipment.

<table>
<thead>
<tr>
<th></th>
<th>Test Description</th>
<th>Test Code</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Bump</td>
<td>JSS 55555 - Test 5</td>
<td>1000 bumps – 40 g, 6 m/sec</td>
</tr>
<tr>
<td>7</td>
<td>Shock / Impact</td>
<td>JSS 55555 - Test 24</td>
<td>As per laid down Specifications</td>
</tr>
<tr>
<td>8</td>
<td>Inclination/ Tilt</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Ship Motion</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>EMI/EMC</td>
<td>As applicable for equipment for installation on surface ships</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MIL-STD 461 E/F</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Airborne noise and vibration</td>
<td>Cl. 730 of NES 537</td>
<td>As per laid down specifications</td>
</tr>
<tr>
<td>12</td>
<td>Magnetic field effects</td>
<td>NWS1000</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>Performance/Electrical test</td>
<td>NES 537/ 536 &amp; 511</td>
<td>As per laid down specifications</td>
</tr>
</tbody>
</table>
NES-723 - Tally plates and diagram plates.

JSS-55555- Environmental tests methods for Electrical and Electronic equipment.

MIL STD -461E - Electromagnetic Compatibility.


DEF STAN 61-5, Part 4 – Low voltage electrical power supply system.

(STANAG 1008- Characteristics of Shipboard Electrical Power Systems.

-xxxxx-