

OCEAN ENGINEERING DIVISION
UNITED STATES COAST GUARD
WASHINGTON D.C.

SPECIFICATION FOR
BATTERIES FOR ICE BUOYS

SPECIFICATION G-SEC-406E
CHANGE 2

Please make the following changes to the specification:

Change paragraph 1.2, subpart a to read:

- a. Solicitation Sample Test Data and Final Report

Replace paragraph 1.4 Qualification with the following:

1.4 Solicitation Sample. Award will be made for such solicitation samples that have, prior to the time set for opening bids, been designed, constructed, tested and accepted in accordance with section 4.0 of this specification. Previous suppliers in good standing can reference previous qualification test dates.

Replace paragraph 3.2 to read:

3.2 Standardization of Design and Certification. Batteries furnished under this specification must not differ in any way from those tested and accepted as solicitation samples. In the event that the manufacturer wishes to change any of the materials or processes used to construct the battery, the Contracting Officer's Specification Preparing Activity (SPA) may require repetition of any or all tests before the proposed changes are approved.

Delete the last sentence in paragraph 3.18, Qualification Test Data and Final Report.

Prepared by:

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Mr. Harley R. Cleveland
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30 April 2003

Date:

OCEAN ENGINEERING DIVISION
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SPECIFICATION FOR
BATTERIES FOR ICE BUOYS

SPECIFICATION G-SEC-406E
CHANGE 1

Please make the following changes to the specification:

Replace paragraph 3.7 Case with the following:

3.7 Case. The cells shall be arranged in a cylindrical container 9"±1/2" outside diameter, 31"±2" tall (including handle and terminals). The base of the container shall be at least 8-7/8", but not more than 9-1/2" in diameter to properly center itself in the battery pocket. The case shall be made of a material that will not swell or deteriorate if exposed to water, which could cause the battery to fall apart or be difficult to remove from the battery pocket. The battery shall not be damaged by the insertion of number 10 self-tapping screws to a depth of 1 inch into the top of the battery (used to secure the Ice Buoy Battery Clamp).

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20 February 2001
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FEBRUARY 1999

SPECIFICATION FOR
BATTERIES FOR ICE BUOYS

SPECIFICATION G-SEC-406E

1. SCOPE.

1.1 General. This specification details the requirements for a sealed battery for use in ice buoys as lighted maritime aids to navigation. These buoys are deployed during the ice season and are designed to withstand shock, vibration and submergence associated with operation in ice conditions.

1.2 Equipment & Documentation. This specification sets forth the requirements for the following equipment and documentation:

- a. Qualification Test Data and Final Report
- b. Material Safety Data Sheet (MSDS) or chemical analysis
- c. Design Certification Certificate
- d. Ice batteries

1.3 Precedence. Any ambiguity or conflict between the specification and applicable documents shall be resolved by utilizing the following documents in the precedence shown:

- a. This specification
- b. Applicable documents

1.4 Qualification. Awards will be made only for such products that have, prior to the time set for opening bids, been tested and approved for inclusion on the applicable Qualified Products List (QPL) whether or not such products have been so listed by that date. Manufacturer's are urged to arrange to have their products tested for qualification in order to be eligible to bid on future procurements. The Specification Preparing Activity (SPA), Commandant (G-SEC-2A), U.S. Coast Guard Headquarters, Washington D.C, 20593-0001, maintains the QPL and information pertaining to qualification may be obtained from that activity.

2. APPLICABLE DOCUMENTS

2.1 Drawings

120982 Rev D

Ice Buoy Battery Clamp

2.2 Sources of Documents. Copies of these drawings are available from the SPA.

3. REQUIREMENTS.

3.1 General. The battery defined by these requirements shall be 12-volt (nominal), with a capacity of 320 ampere-hours (based on the C/320 discharge rate to 9.0 volts). The battery will be used in ice buoys and on fixed aids to navigation during the ice season in Alaska, the Great Lakes and from New England down to the Chesapeake Bay. When installed in a buoy, the battery will be housed in an airtight compartment. The battery will be expected to flash (at night) a signal load consisting of 0.25 ampere, 0.55 ampere or 0.77 ampere lamps, with a duty cycle of up to 30 percent. The battery shall not vent hydrogen gas outside its overall case during storage or discharge. Accidental shorting shall not cause violent (explosive) venting.

3.2 Standardization of Design and Certification. Batteries furnished under this specification must not differ in any way from those that have qualified and been approved for listing on the applicable QPL. The manufacturer must submit a certification to this effect covering each lot of batteries furnished under this specification. In the event the manufacturer wishes to change any of the materials or processes used to construct the battery, the SPA may require repetition of any or all of the qualification tests before the proposed changes are approved.

3.3 Material Safety Data Sheet (MSDS). A MSDS or chemical analysis certificate shall be submitted as part of the qualification test report and with each delivery order (destination) where batteries are shipped. The chemical analysis certificate shall contain a list of materials used in the battery, by weight, including the overall case, and any precautions necessary if materials come into contact with personnel.

3.4 Environmental. The batteries shall be designed and constructed to withstand storage and operation in the following environment:

Ambient Temperature	25° F to 95° F (storage –25° F to 140° F)
Air Pressure	0 psig (in air tight container)
Humidity	0-100% relative
Atmosphere	Salt air
Shock & Vibration	Incident to transportation to and operation on a buoy
Off Axis Operation	60° from normal vertical operating position

3.5 Fasteners and Terminal Connections. All fasteners and terminal connections shall be nickel-plated brass or 304/316 stainless steel.

3.6 Cells. Commercial or noncommercial cells may be wired in the case to provide the nominal 12-volts and 320 ampere-hours.

3.7 Case. The cells shall be arranged in a cylindrical container $9 \pm 1/2$ " outside diameter, 33" (max) tall (including handle and terminals). The case shall be made of a material that will not swell or deteriorate if exposed to water, which could cause the battery to fall apart or be difficult to remove from the battery pocket.

3.8 Sealed Construction. The case shall be sealed in the event the cells leak. The battery shall not vent hydrogen gas during storage or discharge. The case may contain hydrogen absorbers, if necessary, to prevent this from occurring.

3.9 Handle. The battery shall contain a handle designed to fit the Ice Buoy Battery Clamp and have a load capacity of at least three times the weight of the battery. The handle is used both to lift the battery, and to prevent rotation in the battery pocket when fitted with the Ice Buoy Battery Clamp.

3.10 Terminals. Positive battery terminals shall be permanently marked with a (+) symbol and color-coded black. Negative battery terminals shall be permanently marked with a (-) symbol and color-coded white. Battery terminals shall be shipped with two flat washers, one lock washer and a nut. All nuts and studs shall accept up to 70 inch-pounds of torque without stripping, twisting in the case or shearing off. Terminal posts shall be $1/4$ " in diameter and insulators (if used) shall be sized to accept a $3/8$ " wide spade lug.

3.11 Terminal Protection. All batteries shall be protected against short circuits. This shall be accomplished by wrapping the terminals with an easily removable, nonconductive substance that leaves no residue.

3.12 Electrical Characteristics.

3.12.1 Nominal Voltage. The nominal voltage is 12 volts DC

3.12.2 Max Open Circuit Voltage. The maximum open circuit voltage shall be 18.0 volts.

3.12.3 Cutoff Voltage. The minimum acceptable load voltage over the life of the battery shall be 9.0 volts

3.12.4 Surge Current. The battery shall be capable of providing a minimum surge current of 3.2 amperes for 20 milliseconds over the service life of the battery.

3.13 Wiring. All internal wiring shall be insulated, stranded copper wire sized to handle a maximum continuous load of 3.0 amps.

3.14 Pressure Contact Connections. Plates or trays when used to electrically connect cells by pressure contact as well as intermediate contact plates or trays shall be clean and free of dirt and corrosion at the contact surfaces. Intermediate contact plates or trays shall not distort under pressure to the point where individual cell contact is lost. All connecting plates or trays shall be formed without sharp edges at their perimeters and shall be insulated to prevent shorting through the case.

3.15 Electrical Connections. Lugs used on internal wiring shall be both crimped and soldered.

3.16 Solder. Solder used in making electrical connections and in tinning operations shall contain a minimum of 30 percent tin. Solder, if used to seal the overall case, shall be lead-free solder.

3.17 Label. Each battery shall contain a permanent identification label located on top beneath the handle (preferred), or on the side near the top of the container. The label shall contain, as a minimum, the following information:

12 VDC, 320 AH Ice Buoy Battery
Manufacture Date MM/YY
NSN 6135-01-106-5542
Contract No. DTCG##-##-#-#####
Serial No. #####
Manufacturer's Name & Address
Property of U.S. Coast Guard

To aid disposal, an additional label on the side of the case shall list the contents of the battery (example):

Primary Battery
Contents: Zinc-Manganese Dioxide "F" Cells
Closed Cell Polyurethane Foam Insulation

3.18 Qualification Test Data and Final Report. Within 30 days of the conclusion of the qualification testing, the manufacturer shall submit to the SPA a test report containing all qualification test data sheets, MSDS (or equivalent) and the results of each qualification test. Included with all complete data sheets shall be a summary of all deficiencies noted and corrective action taken. This information will be reviewed by the SPA prior to placing the manufacturer's battery on the QPL.

4.0 QUALITY ASSURANCE PROVISIONS.

4.1 Inspections. Two types of inspections are detailed in this section, Qualification and Production.

4.2 Inspection Responsibility. Qualification inspections are the responsibility of the Contractor and shall be conducted at a facility acceptable to the Government.

4.3 Qualification

4.3.1 Sample Submission. After notification to the SPA of a desire to qualify a battery, the manufacturer shall prepare for testing five 12-volt, 320 ampere-hour batteries. The batteries shall be representative of the manufacturer's proposed normal production.

4.3.2 Initial Inspection. Measure and check one battery from the sample for the following features:

- a. Terminal markings are properly placed and legible? (3.10)
- b. Labels are properly placed and legible (3.17)
- c. Conform to physical dimensions (3.7)
- d. Conform to materials (3.5 & 3.7)
- e. Handle conforms to requirements (3.9)
- f. Terminals equipped with two flat washers, one lock washer and nut (3.10)
- g. Battery terminal nuts can be torqued to 70 inch-pounds without rotating terminal (3.10)
- h. Battery terminals protected against shorting during shipment (3.11)

4.3.3 Acceptance/Rejection Criteria. Failure of the battery to conform to all of the initial inspection requirements shall constitute failure of the qualification test.

4.3.4 Vibration Testing. Three of the five sample units shall be selected for vibration testing. An acceptable alternative is to ship the batteries from the East Coast to the West Coast (New York to California) and back (or equivalent distance; 5000 miles), by commercial land carrier.

4.3.4.1 Vibration. Batteries shall be firmly attached to the vibration table so that all forces are transmitted to the base of the battery. The battery shall be subjected to a sinusoidal vibration along each of its three mutual perpendicular axes, independently in accordance with Figure 1. The frequency shall be swept logarithmically with a sweep time (ascending and descending) of 12 minutes from 5 to 200 Hertz.

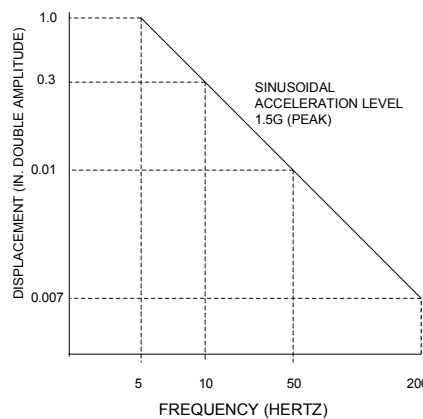


Figure 1

4.3.4.2 Acceptance/Rejection Criteria. Separation or cracking of the case components (handle, lid, base, case seam) or leakage of the battery assembly shall constitute failure of the qualification test.

4.3.5 Handling Test. The three batteries tested in 4.3.4 shall be subject to the handling test. Raise each battery to a height of $4 \pm \frac{1}{4}$ inches above a level unyielding surface. Drop each battery five times, once flat on its bottom and four times on a bottom edge. The apparatus used to release the battery shall assure an instantaneous release that does not impart rotational or sidewise forces to the battery.

4.3.5.1 Acceptance/Rejection Criteria. Separation or cracking of the case components (handle, lid, base, case seam) or leakage of the battery assembly shall constitute failure of the qualification test.

4.3.6 Battery Capacity. All batteries shall be discharged into constant 12 ohm, one percent resistors. Batteries shall be sealed in a plastic bag or other suitable airtight container and tilted to 60°+/-5° from vertical. The batteries shall be maintained at 68+/- 2°F during the entire test. Voltage and current readings shall be taken using digital volt-ammeters with an accuracy of at least 0.5%. The test discharge current, battery voltage, battery temperature and time shall be recorded at least hourly when the battery reaches 10% of rated capacity. The cutoff voltage is 9.0 volts.

4.3.6.1 Acceptance/Rejection Criteria. Any battery failing to meet the rated battery capacity, less 5%, shall constitute failure of the qualification test.

4.4 Production Inspection. The Contractor shall conform to the requirements of section H of the Solicitation/Contract.

5.0 PREPARATION FOR DELIVERY.

5.1 Packaging. Each battery shall be individually packaged in a cardboard carton. The handle of the battery shall be accessible after opening the carton to facilitate removal. The preservation and packing shall conform to the manufacturer's commercial practice. One copy of the MSDS shall be included for each destination.

5.2 Palletizing. Up to 16 batteries, one layer high may be placed on one pallet. All cartons shall be strapped together and to the pallet, then shrink wrapped to protect from moisture.

5.3 Marking. Each box and pallet shall be marked with at least the following:

12 VDC, 320 AH Ice Buoy Battery
Manufacture Date MM/YY
Box/Pallet Weight XXX lbs.
NSN 6135-01-106-5542
Contract No. DTTCG###-##-#-#####
Manufacturer's Name & Address
Primary Battery
Contents: Zinc-Manganese Dioxide Cells (example)
Closed Cell Polyurethane Foam Insulation

Specification G-SEC-406E
Batteries for Ice Buoys

February 1999

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