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NRL Report No. B-1715

NAVY DEPARTMENT

FR-1715

Report of Test

on

Bell, Watertight, 115 Volts, Direct Current

Submitted by

Edwards and Company, Incorporated,

Norwalk, Connecticut

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

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Date of Test: March, 1941.

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APPENDICES

Photograph of sample bell	Plate 1
Photograph of sample bell, removed from case.	Plate 2

AUTHORIZATION FOR TEST

1. This problem was authorized by reference (a), and other references pertinent to this problem are listed as references (b) and (c).

Reference: (a) BuShips ltr. S65-4(DYs-3) of 10 February 1941.
(b) Specification 17S11c of 1 May 1940.
(c) Edwards and Co., Inc., Plan No. 5367-A.

OBJECT OF TEST

2. The object of this test was to determine how closely the sample Edwards and Company, Incorporated, type 1740 bell complied with specification, reference (b), as a Navy type B-3 bell and its suitability for Naval use.

ABSTRACT OF TEST

3. The sample bell was set up at this Laboratory in suitable test circuits where its performance was carefully observed for compliance with the specifications. An inspection of the sample to determine compliance in the matter of materials, design, and workmanship, concluded the test.

Conclusions

(a) The Edwards and Company, Incorporated, type B-3 bell fails to meet the specification requirements in many fabrication particulars. It conforms to all test requirements of operation except for low stroke frequency.

Recommendations

(a) It is recommended that the subject bell be considered NOT satisfactory for Naval use because of non-conformance with specifications as listed in paragraph 11.

(b) It is recommended that, provided the manufacturer is willing to correct deficiencies to meet specifications, the bell be resubmitted for type approval tests and inspections.

(c) It is recommended, because of its good performance under test, that this bell be considered acceptable for use in circumstances that permit a waiver of the structural non-conformities listed.

DESCRIPTION OF MATERIAL

4. The sample bell is manufactured by Edwards and Company, Incorporated, as type 1740 and designed for 115-volt, direct current operation.

5. The mechanism is housed in a cast brass case provided with a boss, tapped for a 1/2-inch (IPS) terminal tube, and four mounting lugs, having clearance holes for No. 10 machine screws.

6. It employs a 6-inch brass gong which is mounted on a gong lift, riveted and soldered to the brass cover.

7. Further details are shown by photographs, Plates 1 and 2, and drawing, reference (c).

METHOD OF TEST

8. The sample bell, following tests to determine its electrical and acoustical characteristics at rated voltage was subjected to further tests in the following order:

- (a) Inclination
- (b) Endurance and temperature rise
- (c) Retest of sound pressure output
- (d) Shock
- (e) Vibration
- (f) Dielectric
- (g) Insulation resistance
- (h) Splashproof
- (i) Salt spray

9. The tests were concluded with a careful examination of the sample to determine compliance with the specification, pertaining to design, quality of workmanship and materials, and any defects resulting from the tests.

RESULTS OF TEST

10. The test results obtained were as follows:

<u>Requirements</u>	<u>Test Values</u>
Voltage: 115 volts, direct potential	115 volts, direct potential
Amperes: Not specified.	0.063 ampere
Watts: Shall not exceed 25 watts	Complied. 7.24 watts

Requirements

Test Values

Sound pressure output: Shall be not less than 65 decibels at 18 feet in a soundproof room under the following conditions:

Complied

- (a) Before the endurance test
- (b) Following the endurance test

88 db

83 db

Bell tones: Tone A shall be obtained by utilizing gong shapes specified in Bureau drawing 9-S-5105-L and by maintaining a stroke frequency within 40 to 60 strokes per second.

*Gong 6 inches in diameter furnished while that required is 8 inches.

*Stroke frequency 31 strokes per second.

Inclination: Shall operate in any position when supplied with rated voltage \pm 10 per cent.

Complied

Endurance test: Shall operate satisfactorily 1500 cycles of "one minute on" and "one minute off," the first 750 cycles at 60° C. and the second at 0° C. ambient temperatures.

Complied

Temperature rise: Maximum temperature shall not exceed 115° C. during the endurance test. (55° C. rise at 60° C. ambient temperature.)

Complied.
22.8° C. above 60° C. ambient temperature.

Shock test: Shall withstand 20 shocks of 250 foot-pounds each as specified in paragraph F-2g.

Complied.

Vibration test: Shall be mounted on a standard Navy 3 foot-pound vibration machine and subjected to six tests of 30 minutes each at frequencies of 100, 150, 200, 250, 300, and 350 shocks per minute.

Complied.

Dielectric test: Shall withstand twice the rated voltage plus 1250 volts, 60 cycles, for one minute between electrical circuits and between electrical circuits and ground.

Complied.

Requirements

Insulation resistance: Shall be not less than 5 megohms at not less than 500 volts, d.c.

Splashproof integrity: Shall be subjected to a 1-inch stream of water, under a pressure head of 35 feet, played from a hose at a distance of 5 feet, for 5 minutes, without the entry of water into the case.

Salt spray test: Shall be subjected, under ultra-violet light, to a 20 per cent salt spray at 55° C. for a period of 3 minutes, followed by an air blast at 55° C. for 3 minutes, the cycle being repeated continuously for 100 hours.

Weight: Shall not exceed 8 pounds.

Nameplate: Shall be in accordance with N. D. Specification 42N2.

Dissimilar metals: Contact of dissimilar metals, except steel, with aluminum alloys shall be avoided as much as practicable in the assembly of parts. Where contact cannot be avoided, an approved spar varnish or other approved material shall be used between the faying surfaces.

Protection of exterior surfaces: Exterior surfaces of all equipment, except nameplates, gongs, and strikers, shall be finished with two coats of gray paint specifically approved by the bureau concerned.

Clearances: Clearances between any two electrical circuits or between any electrical circuit and ground, where not separated by at least 1/16-inch of approved insulating material, shall be not less than 1/8-inch, unless otherwise approved.

Test Values

Complied.
200+ megohms by 1000 volt megger.

Complied.

*Finish came off both the gong and case. Lockwasher (pc. 6667) badly rusted.

Complied. 5 pounds,
8 ounces.

*Material satisfactory but relief etching is used instead of etched lettering.

No aluminum used.

*Case and gong finished with black enamel.

*Less than 1/8-inch between armature (pc. 3711) and special headed screw (pc. 7358).

Requirements

Test Values

Wiring: All wiring shall be in accordance with the requirements of N. D. Specification 15C1, unless otherwise approved.

Complied

Coil windings: May be either single or double silk or cotton covered enamel copper wire.

*Single silk covered wire without enamel.

Protective covering for coils: Shall be nonhygroscopic, not glued or cemented to the coils, but shall be overlapped and cemented in the lap.

*Friction tape used.

Waterproofing of coils: All coils shall be impregnated with an approved synthetic resinous material or other suitable and approved waterproofing and insulating compound.

Complied.

Magnetic circuits: Shall be of laminated punchings of the best available grade for the purpose and shall be protected against corrosion.

*Not of laminated punchings.

Terminal block: Shall be of approved material and type, and readily accessible.

*None furnished.

Terminal lugs: Shall be in accordance with Bureau of Engineering drawing 9-S-1841-L, unless otherwise specified by the bureau concerned.

*None furnished.

Supply leads: Shall enter through the casing attached to the mounting bulk-head and not through any removable part.

Complied.

Terminal wiring: Shall be lead in through a boss drilled and tapped for a Navy standard terminal tube. The case shall be provided with two bosses, one located at the top and the other at the bottom of the case, unless otherwise approved by the bureau concerned.

*Only one boss provided.

Requirements

Test Value

Springs: All springs which form a part of the electrical circuit shall be of beryllium copper, phosphor bronze, or their approved equivalent.

Complied. Interrupter spring (pc. 3713) is of bronze.

Contacts: All contacts for making and breaking an electrical circuit shall be of tungsten.

*Contacts are of silver.

Agreement with test plans: Blueprint plans of sufficient detail to show all essential components of the equipment to be tested shall be furnished and shall check with the equipment.

*Plan furnished is not clear in many details.

*Denotes failure to comply with the specifications.

COMMENTS ON RESULTS OF TEST

11. The subject bell failed to meet the specification in the following respects:

- (a) Paragraph E-2c(2), Bell tone: Gong 6 inches in diameter furnished instead of 8 inches. Stroke frequency is 31 strokes per second instead of 40 to 60 strokes per second as specified.
- (b) Paragraph F-2p, Salt spray test: Enamel came off both the gong and case. Unplated lockwasher (pc. 6667) badly rusted.
- (c) Paragraph D-13a, Nameplate: Relief etching is used instead of etching as specified in N. D. Spec. 42N2. Space for contract number and inspector's stamp not provided.
- (d) Paragraph C-5d, Painting: Finished with black enamel instead of two coats of gray paint as specified.
- (e) Paragraph D-5, Clearances: Less than 1/8-inch between armature (pc. 3711) and special headed screw (pc. 7358).
- (f) Paragraph D-9, Coils: Magnet wire not enameled as specified.
- (g) Paragraph D-9c, Magnet core: Not of laminated punchings as specified.
- (h) Paragraph D-10a, Terminal block: None furnished.
- (i) Paragraph D-10b, Terminal lugs: None furnished.

- (j) Paragraph D-10d, Terminal wiring: Only one boss provided instead of two as specified.
- (k) Paragraph D-11e, Contacts: Silver contacts are used instead of tungsten, as specified.
- (l) Paragraph C-4e, Bolting: Cover is secured to the case by machine screws, tapped into the case, instead of through bolts as specified.
- (m) Paragraph C-5c, Plating: Steel parts are cadmium plated instead of zinc plated as specified.
- (n) Paragraph C-7i, Locking devices: Lockwashers are not provided on studs supporting the contact assembly.

COMMENTS ON DESIGN

- 12. The following features of design are considered objectionable:
 - (a) The armature and striker arm are assembled by the peening method, thereby preventing separate replacements.
 - (b) The case mounting lugs are not of sufficient size to accommodate 3/8-inch mounting screws.

CONCLUSIONS

13. The Edwards and Company, Incorporated, type B-3 bell fails to meet the specification requirements in many fabrication particulars. It conforms to all test requirements of operation except for low stroke frequency.



