22 September 1939 NRL Report No. B-1558

NAVY DEPARTMENT

BUREAU OF ENGINEERING

Report of Test

on

Navy Types B-2 Bell and Z-2 Buzzer
Manufactured and Submitted by
Henschel Corporation
Amesbury, Massachusetts

FR-1550

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

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Date of Test: August and September 1939

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Distribution:
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TABLE OF CONTENTS

APPENDICES

Conclusions

(a) The B-2 bell (115 V. a.c.) has complied with the specification except for the shock integrity requirement. At the conclusion of this test, the tungsten contact, piece 40, on the fixed terminal plate, piece 17, was found torn away, due to improper riveting. The performance of the bell, during the endurance test, was satisfactory.

(b) The Z-2 buzzer has complied with the specification except for the dielectric and weight requirements. The breakdown occurred between the winding and the hinged end of the armature, piece 10. A greater clearance should be provided between the coil and the armature which are now in contact.

(c) The allowable weight for the buzzer was exceeded by 5 ounces.

Recommendations

(a) It is recommended that the sample B-2 bell be approved subject to the use of tungsten contacts having larger diameter rivets. The diameter of the present contact rivet is 1/16 inch.

(b) It is also recommended that the sample Z-2 buzzer be approved for Naval use, providing that sufficient clearance is provided between the winding and armature to enable the sample to withstand the required dielectric test and that the excess weight is not considered objectionable.

AUTHORIZATION FOR TEST

1. This test was authorized by reference (a), and other references pertinent to the test are listed as references (b), (c), (d), (e) and (f).

Reference: (a) BuEng. ltr. S65-4/L5(7-21-Ds) of 5 August 1939.
(b) Specification 17S11(INT) of 15 February 1938.
(c) Drwg. 11-T-1285-L(Portsmouth No. 30122) Type B-2 Bell.
(d) Drwg. 11-T-1327-L (Portsmouth No. 30245) Type Z-2 Buzzer.
(e) NRL ltr. report S65-4/L5 (Serial No. 100) of 13 February 1939.
(f) NRL Report B-1485 of 19 October 1938.

OBJECT OF TEST

2. The object of the test was to determine conformance of the sample bell and buzzer with the specification, reference (b), drawings references (c) and (d), and their suitability for Naval use.

ABSTRACT OF TEST

3. The samples, as received, were set up in suitable test circuits where their performance was carefully observed for compliance with the requirements. An inspection of the samples, to determine conformance with the drawings, references (c) and (d), and their compliance with the specification, in the matter of materials, design, and workmanship, concluded the test.

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DESCRIPTION OF MATERIAL UNDER TEST

4. The bell was manufactured by Henschel Corporation, Amesbury, Massachusetts, under drawing, reference (c), as a Navy type B-2.

5. It is of the vibrating type, employs contacts for interrupting the circuit, and is designed to operate on a 115 volts, a.c. 60 cycle supply. The gong is struck by means of a striker arm, extending through a packing gland in the case, on which is located a zinc plated steel ball.

6. The mechanism is mounted on a BE metal case cover which is secured to the cast aluminum alloy case with four (4) fillister headed, zinc plated, steel machine screws, used as through bolts.

7. The electromagnet is made up of thin iron punchings, of "U" shape, and has a single formed winding. The lead wires from this winding are soldered to terminals, one of which is a part of the contact mechanism, located on an insulating block of phenolic material. Terminal lugs, in accordance with Bureau drawing 9-S-1841-L, are located on the terminal block.

8. The case is provided with four (4) mounting lugs and two bosses, one tapped for a 3/4-inch terminal tube. A 1/4-inch square rubber gasket is recessed into the rim of the case to insure watertightness. It also prevents the BE metal case cover from contacting the aluminum case.

9. The inside of the case and cover are finished with black insulating varnish applied over a base coat of zinc chromate paint and the outside with gray paint over zinc chromate paint.

10. An engraved brass nameplate is secured to the case cover with two (2) No. 4-40 nickel plated brass machine screws.

11. The buzzer, manufactured under drawing, reference (d), is similar in design except that it employs no contacts and the noise is produced by an adjustable steel screw on one end of the hinged armature striking the case cover of cast aluminum.

12. The samples submitted are shown by photographs, Plates 1 and 2.

METHOD OF TEST

13. The sample bell and buzzer, as received, were first tested to determine their electrical characteristics and sound pressure output in decibels. The sound measurements were made in a soundproof room with the samples located eighteen (18) feet from a General Radio type 559-A noise meter, and on the axis thereof.

14. They were next tested for endurance by operating them "one minute on" and "one minute off" for a period of 1500 cycles, the first 750 cycles at an ambient temperature of 60° C. and the second half at 0° C. The temperature rises of the windings were obtained by the resistance method during the first half of the endurance test.

15. Following this, they were tested for operation at ±10 per cent of the rated voltage and frequency when inclined in all planes.

16. Then followed tests for ruggedness, conducted by placing them on a standard Bureau of Engineering shock stand and subjecting them to 20 shocks of 250 foot pounds each. As a part of this test, they were subjected to six tests of 30 minutes each, while mounted on a standard Navy 3 foot pound vibration machine, at frequencies of 100, 150, 200, 250, 300 and 350 vibrations per minute.

17. The bell was next tested for splashproofness by subjecting it 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. The buzzer was tested for watertightness by submerging it under 3 feet of standard sea water for 1 hour.

18. Then followed tests for dielectric strength by subjecting them to twice the rated voltage plus 1250 volts, a.c., 60 cycles, for 1 minute, between their electrical circuits and ground, after which their insulation resistance was measured with a 1000 volt megger.

19. An inspection of the samples to determine the effect of the tests and conformance with the specification pertaining to materials, design and workmanship, concluded the tests.

RESULTS OF TEST

20. The test results obtained were as follows:

Requirements	Test Values	
	B-2 Bell	Z-2 Buzzer
Voltage: 115	115 volts	115 volts
Current: Alternating	Alternating	Alternating
Amperes: Not specified	0.118 amperes	0.106 amperes
Frequency: 60 cycles	60 cycles	60 cycles
Watts: Not over 7.5	7.5 watts	6.0 watts

Requirements	Test Values B-2 Bell	Z-2 Buzzer
Power Factor: Shall be not less than 50% for B-2 bell and 40% for Z-2 buzzer.	55.2%	49.2%
Endurance: Shall be operated "one minute on" and "one minute off" for a period of 1500 cycles, the first 750 cycles at an ambient temperature of 60° C. and the second at 0° C.	Complied	Complied
Temperature rise: Shall not exceed 45° C. at any time during the endurance test.	20.9° C.	28.8° C.
Dielectric: Shall withstand twice the rated voltage plus 1250 volts, a.c., 60 cycles, for 1 minute.	Complied	* See "Comments"
Insulation resistance: Shall be not less than 5 megohms by 500 volt megger following the dielectric test.	Complied	* Zero
Weight: Shall not exceed 2 pounds for Type B-2 bell and 16 ounces for Z-2 buzzer.	2 pounds	* 1 pound, 5 ounces
Sound pressure output: Shall be not less than 40 decibels at 18 feet in a soundproof room.	56 db	47 db
Pitch of Note: 100 to 500 CPS.	--	120 CPS
Shock Integrity: Shall withstand 20 shocks of 250 foot pounds each under conditions specified in paragraph F-2g.	* See "Comments"	Complied
Resistance to Vibration: Shall be subjected to six tests on a standard Navy 3 foot pound vibration machine at frequencies of 100, 150, 200, 250, 300 and 350 per minute, for periods of 30 minutes each without injury.	Complied	Complied

Requirements	Test Values	
	B-2 Bell	Z-2 Buzzer
Inclination: Shall operate in any position when supplied with ±10% rated voltage and frequency.	Complied	Complied
Splashproofness: Bell 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 water entering the case.	Complied	--
Watertightness: Buzzer shall not leak when submerged under 3 feet of standard sea water for 1 hour.	--	Complied
Dissimilar materials: Brass shall not be in contact with aluminum.	Complied	Complied
Nameplates: Shall be in accordance with N.D. Specification 42N2.	Complied Nickel plated brass.	Complied Copper-nickel alloy.
Case Material: Shall be of bronze or aluminum alloy as specified in paragraph D3.	Complied Aluminum case with BE metal cover.	Complied Aluminum case and cover.
Terminal Block: Shall be of approved material, equipped with lugs in accordance with BuEng. Drawing 9-S-1841-L.	Complied	Complied
	Cloth inserted phenolic material.	
Painting: Aluminum castings shall be painted with two coats of aluminum paint over zinc chromate paint and finished with gray paint.	Complied	Complied
Prevention of radio interference, paragraph D-8.	* None provided on the B-2 bell.	Design of Z-2 buzzer prevents interference.

* Denotes failure to comply with the specifications.

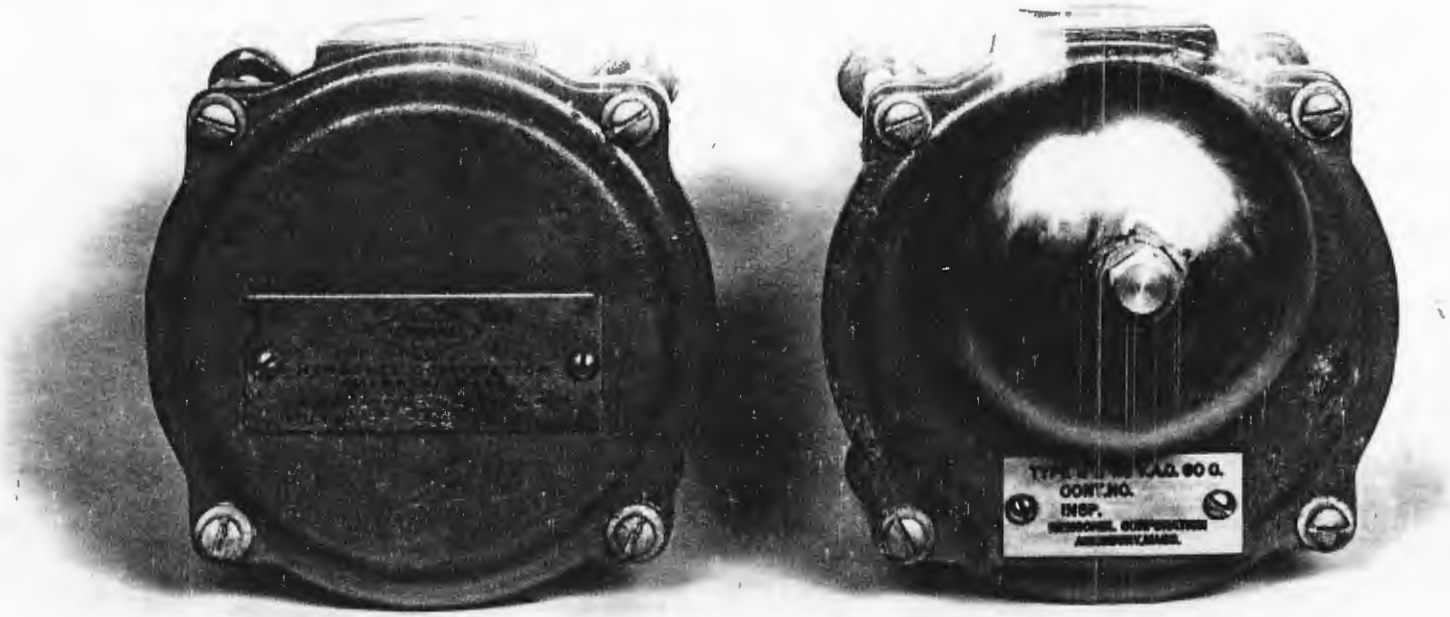
Note: The salt spray test was not conducted as the samples have external construction and finishes identical to those previously tested and reported as being satisfactory under references (e) and (f).

CONCLUSIONS

21. The B-2 bell (115 V., a.c.) has complied with the specification except for the shock integrity requirement. At the conclusion of this test, the tungsten contact, piece 40, on the fixed terminal plate, piece 17, was found torn away, due to improper riveting. The performance of the bell, during the endurance test, was satisfactory.

22. The Z-2 buzzer has complied with the specification except for the dielectric and weight requirements. The breakdown occurred between the winding and the hinged end of the armature, piece 10. A greater clearance should be provided between the coil and the armature which are now in contact.

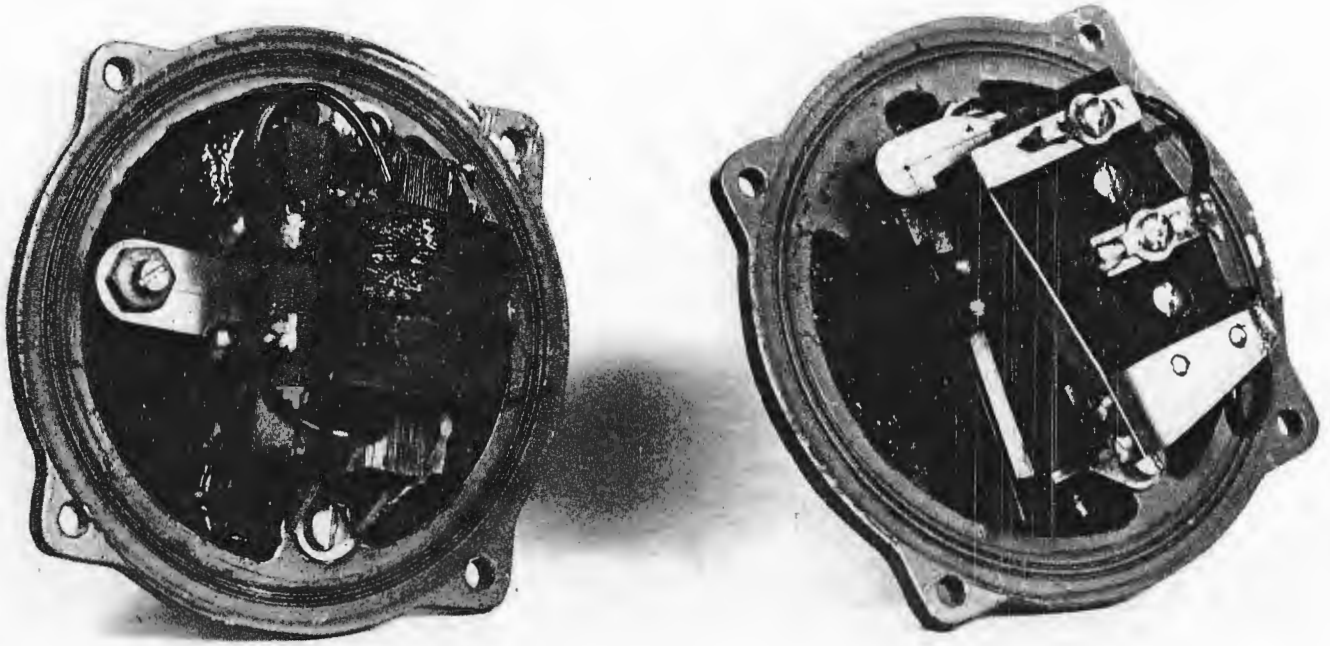
23. The allowable weight for the buzzer was exceeded by 5 ounces.



Type-Z-2
Buzzer

Type-B-2
Bell

PLATE I



Type-Z-2
Buzzer

Type- B-2
Bell

PLATE 2