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APPENDICES

Photostat of acoustical analyses of sample horns . . .	Plate 1
Photograph of H-8 horn assembled and H-9 horn disassembled.	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), (c), (d), (e), and (f).

References: (a) BuShips ltr. S65-4(355) of 24 December 1941
(b) Specification 17S11c of 1 May 1940.
(c) Benjamin Drawing No. 191503 (Type H-8)
(d) Benjamin Drawing No. 191504 (Type H-9)
(e) Benjamin Electric Co. ltr. of 9 December 1941
to Bureau of Ships, copy to NRL.
(f) NRL Report No. B-1777 of 29 August 1941.

OBJECT OF TEST

2. The object of this test was to determine conformance of the sample horns with the specification, reference (b), and their suitability for Naval use.

ABSTRACT OF TEST

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

CONCLUSIONS

(a) The sample horns, manufactured by Benjamin Electric and Manufacturing Company, Des Plaines, Illinois, and submitted for qualification tests as Types H-8 and H-9, complied with the majority of the specification requirements. The principal exception was short life of diaphragms; only two of five completed the required 50-hour endurance test.

(b) The results of the tests definitely show marked improvement of these horns over the samples previously tested and reported by reference (f). Both horns now incorporate the original diaphragm assembly, wherein a ratchet strikes an anvil on the diaphragm, resulting in a note of good quality.

(c) The case design is considered excellent, in that it affords free access to the adjustment screw which was very difficult to reach in the previous design.

(d) The manufacturer advises that drawings, references (c) and (d), will be mailed to the Laboratory and Bureau of Ships not later than January 23rd.

RECOMMENDATIONS

(a) It is recommended that the sample horns be approved for Naval use subject to the correction of the minor depatures from the specification reported herein.

(b) Although diaphragm life is shorter than the desideratum, and some early replacements may be necessitated, it is considered that some leniency may be permitted in this regard in view of expressed urgent need for horns of these types. Service performance. should in general, prove satisfactory.

(c) It is recommended that the manufacturer be required to continue the development of a completely satisfactory diaphragm.

DESCRIPTION OF MATERIAL UNDER TEST

4. The sample horns, manufactured by Benjamin Electric Manufacturing Company, Des Plaines, Illinois, were submitted as Navy types H-8 (115 V. d.c.) and H-9 (115 V. a.c.) motor operated horns. They are identical in design, except for the windings of the motors.

5. The acoustical analyses of the sample horns are given by photostat, Plate 1. Further details are shown by drawings, references (c) and (d) and by photograph, Plate 2.

METHOD OF TEST

6. The sample horns, following tests to determine their electrical and acoustical characteristics at rated voltage and frequency, were subjected to further tests in the following order:

- (a) Inclination
- (b) Endurance and temperature rise
- (c) Sound pressure output following endurance
- (d) Shock
- (e) Vibration
- (f) Dielectric
- (g) Insulation resistance
- (h) Watertight

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

RESULTS OF TEST

8. The test results obtained were as follows:

<u>Requirements</u>	<u>Test Values</u>	
	Type H-8	Type H-9
Voltage: 115 volts	Tested at 115 volts d. c.	Tested at 115 volts a. c.
Amperes: Not specified	0.42	0.71
Watts: Shall not exceed 75 watts	48.3	70.5
Sound pressure output: Shall be not less than 90 decibels at 18 feet in a soundproof room under the follow- ing conditions:		
(a) Before the endurance test	107 db	107 db
(b) Following the endurance test	104 db	106 db

Requirements

Test Values

	Type H-8	Type H-9
Pitch of note: 100-600 c.p.s.	See Plate 1	See Plate 1
Inclination: Shall operate in any position when supplied with rated voltage and frequency ± 7 volts and 5 cycles	Complied	Complied
Endurance test: Shall operate 1500 cycles on "one minute on" and "one minute off", the first 750 cycles at 60° C. and the second at 0° C ambient temperatures.	Original diaphragm fractured after 82 cycles (2-3/4 hours) First replacement fractured after 885 cycles (29 1/2 hours). Second replacement completed 1500 cycles. (50 hours)	Original diaphragm fractured after 720 cycles (24 hours) Replacement diaphragm completed 1500 cycles (50 hours)
Temperature rise: Maximum temperature shall not exceed 115° C during the endurance test. (55° C rise at 60° C ambient temperature).	Complied 20.0° C at 60° C	Complied 30.0° C at 60° C
Shock test; Shall withstand 20 shocks of 250 foot pounds each as specified in paragraph F-2g.	Complied	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	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.	*Insulation failure in armature.	Complied
Insulation resistance: Shall be not less than 5 megohms at not less than 500 volts, d.c.	*Zero by 500 volt megger	Complied Greater than 100 megohms by 500 volt megger.
Watertight integrity: Shall be submerged under 3 feet of standard sea water for a period of 3 hours without the entry of water into the case.	Complied	Complied

Requirements

Test Values
Type H-8 Type H-9

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.

Not conducted due to previous satisfactory tests on both types

Weight: Shall not exceed 15 pounds.

14 lbs. 2 oz.

14 pounds, 2 oz.

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

Copper-nickel alloy with engraved letters

Copper-nickel alloy with engraved letters

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

Complied

Complied

Protection of diaphragms: Shall be given one coat of zincchromate primer and one coat of an approved paint.

Complied

Complied

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.

Complied

Complied

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

Complied

Complied

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

Armature windings are of silk covered enameled copper wire. Field windings are of enameled copper wire.

Armature windings are of silk covered enameled copper wire. Field windings are of enameled copper wire.

Requirements

Test Values

Type H-8

Type H-9

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

Armature windings are not covered. Field windings are covered with cotton tape.

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

Complied

Complied

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

Complied

Complied

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

Complied

Complied

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

Complied

Complied

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

Complied

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. Complied

Complied

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

Complied

Requirements

Test Values

Type H-8

Type H-9

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.

*Drawing referred to in paragraph 9 of reference (e) was not submitted.

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* Denotes failure to comply with the specifications.

CONCLUSIONS

9. The sample horns, manufactured by Benjamin Electric and Manufacturing Company, Des Plaines, Illinois, and submitted for qualification tests as Types H-8 and H-9, complied with the majority of the specification requirements. The principal exception was short life of diaphragms; only two of five completed the required 50-hour endurance test.

10. The results of the tests definitely show marked improvement of these horns over the samples previously tested and reported by reference (f). Both horns now incorporate the original diaphragm assembly, wherein a ratchet strikes an anvil on the diaphragm, resulting in a note of good quality.

11. The case design is considered excellent, in that it affords free access to the adjustment screw which was very difficult to reach in the previous design.

12. The manufacturer advises that drawings, references (c) and (d), will be mailed to the Laboratory and Bureau of Ships not later than January 23rd.