

19 June 1940

NRL Report No. B-1627

NAVY DEPARTMENT

Report of Test

on

Horn - Navy Type H-1

submitted by

Navy Yard  
Portsmouth, New Hampshire

NAVAL RESEARCH LABORATORY  
ANACOSTIA STATION  
WASHINGTON, D. C.

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Authorization: BuEng. and BuC&R ltr. S65-4 (4-24-SS) of 27 April 1940

Date of Test: May and June 1940

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## AUTHORIZATION FOR TEST

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

- Reference:
- (a) Bueng. and BuC&R ltr. S65-4(4-24-SS) of 27 April 1940.
  - (b) Comdt. Navy Yard, Portsmouth Ltr. S65-4 (99159-2MG) of 29 May 1940
  - (c) Specifications 17S11 (INT) of 1 October 1939.
  - (d) Portsmouth Plan MS-8034 (BuEng. No.11-T-1391-L-Alt.O)
  - (e) NRL Report B-1529 of 20 April 1939.

## OBJECT OF TEST

2. The object of this test was to determine conformance of the sample horn with the specifications, reference (c), and its suitability for Naval use.

## ABSTRACT OF TEST

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

## Conclusions

- (a) The horn twice failed to meet the requirements of the endurance test when phosphor bronze contact springs were used, piece 9. Following the installation of a beryllium copper spring, piece 9, it operated satisfactorily for the required 1500 cycles of the endurance test. This replacement is covered by reference (b).

Recommendations

- (a) It is recommended that the subject horn be approved for Naval use using beryllium copper for piece 9.

## DESCRIPTION OF MATERIAL UNDER TEST

4. The sample horn, manufactured as a type H-1, by Portsmouth Navy Yard, is designed to operate on 115 volts, direct potential.

5. The mechanism is mounted on a removable cover, which is secured to the case by four (4) brass cap screws passing through inserted steel bushings and threaded into steel inserts. Both cover and case are of cast aluminum alloy. The case is provided with two (2) bosses, one tapped for a 3/4-inch (IPS) Navy standard terminal tube, and two (2) mounting lugs with clearance holes for 5/16-inch bolts.

6. The noise is produced by a hammer, mounted on the armature and striking the diaphragm.

7. Further details are shown by photographs, Plates 2 and 3 and drawing, reference (d).

## METHOD OF TEST

8. The sample horn was first tested to determine its electrical characteristics. Following a sound analysis, it was subjected to tests in the following order:

- (a) Endurance test of 1500 cycles of "one minute on" and "one minute off", the first 750 cycles at an ambient temperature of 60°C. and the second at 0°C. During the first half of this test, the temperature rise was determined by the resistance method.
- (b) Sound analysis to determine any change as a result of the endurance test.
- (c) Shock test of 20 shocks of 250 foot pounds each as specified in paragraph F-2g and vibration test as specified in paragraph F-2h.
- (d) Inclination in all planes while supplied with rated voltage  $\pm$  10 per cent.
- (e) Dielectric test of twice the rated voltage plus 1250 volts, 60 cycles, for 1 minute between the electrical circuit and ground followed by tests for insulation resistance with 1000 volt megger.
- (f) Test for watertight integrity.

9. The tests were concluded with a careful examination of the sample to determine compliance with the specifications, 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:

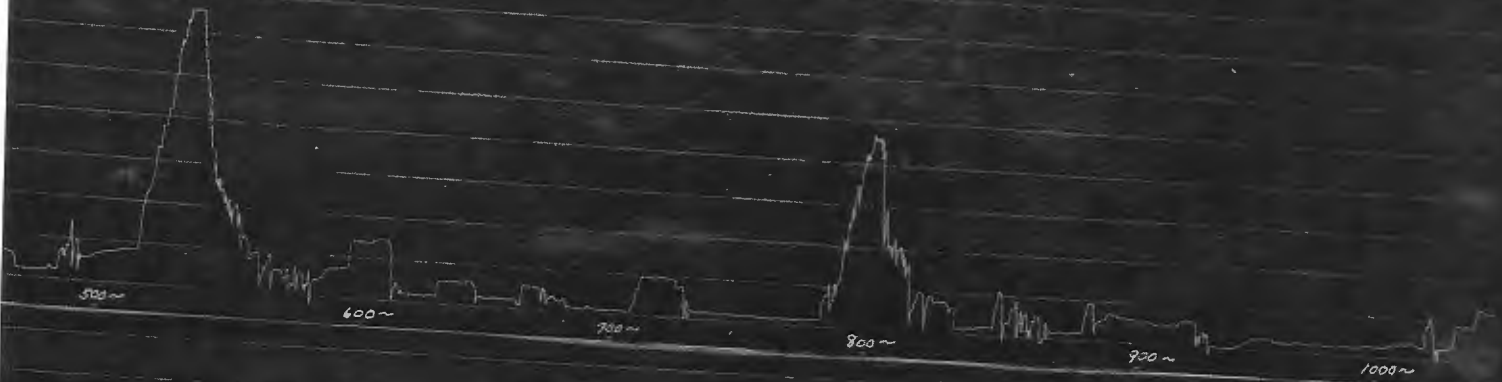
<u>Requirements</u>	<u>Test Values</u>	
Voltage: 115 volts	115 volts	
Current: Direct	Direct	
Amperes: Not specified	0.08 amperes	
Watts: Shall not exceed 25	9.2 watts	
Pitch of Note: 100 to 600 C.P.S.	Complied See Plate 1	
Sound pressure output: Shall be not less than 75 decibels at 18 feet in a soundproof room under the following conditions:	Complied	
(a) At rated voltage before the endurance test.	<u>Flat Response</u> 95 db.	<u>Ear 40 Response</u> 95 db.
(b) At rated voltage following the endurance test.	95 db.	95 db.
(c) At -10% rated voltage.	94 db.	94 db.
Weight: Shall not exceed 6 pounds.	Complied, 4 pounds, 7 ounces.	
Endurance test: Shall operate 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 after 2 replacements of pc. 9, one phosphor bronze and one beryllium copper. (See "Conclusions" and reference (b).)	
Temperature rise: Maximum temperature shall not exceed 115°C. during the endurance test (55°C. rise).	Complied. 26.5°C. rise at 60°C.	
Shock integrity: 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 100, 150, 200, 250, 300, and 350 shocks per minute.	Complied.	

<u>Requirements</u>	<u>Test Values</u>
Retest of acoustical output as specified in paragraph F-2n.	Complied.
Inclination: Shall operate in any position when supplied with rated voltage <u>±</u> 10 per cent.	Complied.
Dielectric test: Shall withstand twice the rated voltage plus 1250 volts, 60 cycles for one minute between electrical circuits and electrical circuits and ground.	Complied.
Insulation resistance: Shall be not less than 5 megohms at not less than 500 volts D. C.	Complied. 200+ megohms with 1000 volt megger.
Watertight integrity: Shall be sub- merged under 3 feet of standard sea water for 3 hours without the entry of water into the case.	Complied.
Salt spray test: Paragraph F-2p.	Not conducted due to case and cover being identical to that tested and re- ported satisfactory under reference (c).
Nameplate: Shall be in accordance with N.D. Specification 42 N 2.	Complied. Laminated phen- olic material.
Diaphragm: Shall be of nickel- chromium alloy.	Complied.
Painting: Shall be protected with a priming coat of zinc chromate followed by two coats of gray paint.	Complied.
Contacts: Shall be of tungsten.	Complied.
Terminal block: Shall be of phenolic material equipped with 9-S-1841-L terminals.	Complied.
Coil windings: Shall be of single or double silk or cotton covered enameled copper wire.	Complied. Single silk enameled copper wire.
Protective covering for coils: Shall be non-hygroscopic and not cemented to the coil.	Complied. Varnished cambric covering used.

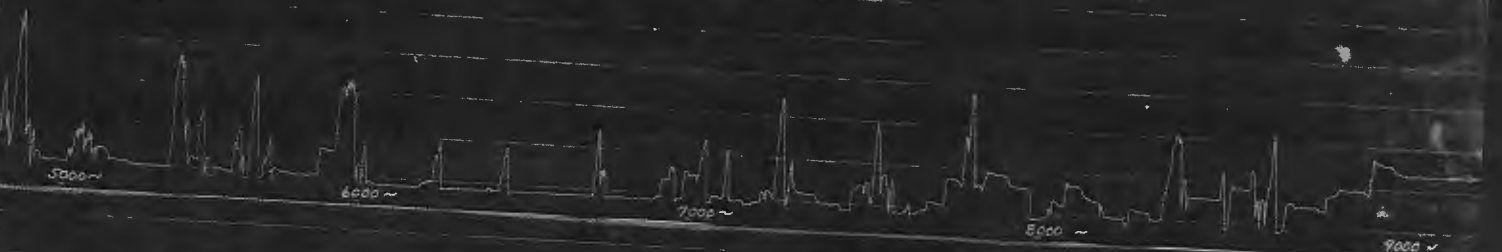
## CONCLUSIONS

11. The horn twice failed to meet the requirements of the endurance test when phosphor bronze contact springs were used, piece 9. Following the installation of a beryllium copper spring, piece 9, it operated satisfactorily for the required 1500 cycles of the endurance test. This replacement is covered by reference (b).

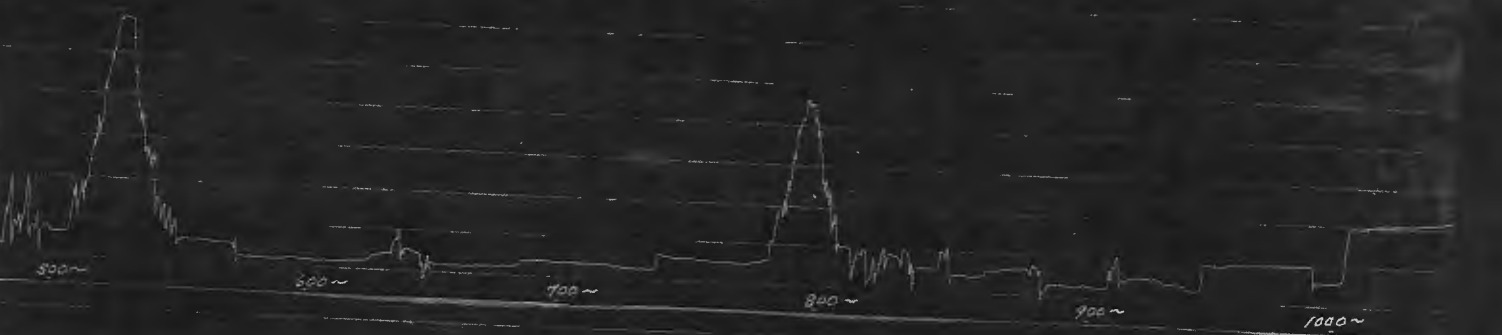
PORTSMOUTH NAVY YARD  
TYPE H-1 HORN  
D-FREQUENCY ANALYSIS



2



3



4



PLATE 1

NOISE

PORTSMOUTH NAVY YARD  
TYPE H-1 HORN  
SOUND-FREQUENCY ANALYSIS

FLAT RESPONSE



NOISE

FLAT RESPONSE



NOISE

EAR 40 RESPONSE



NOISE

EAR 40 RESPONSE



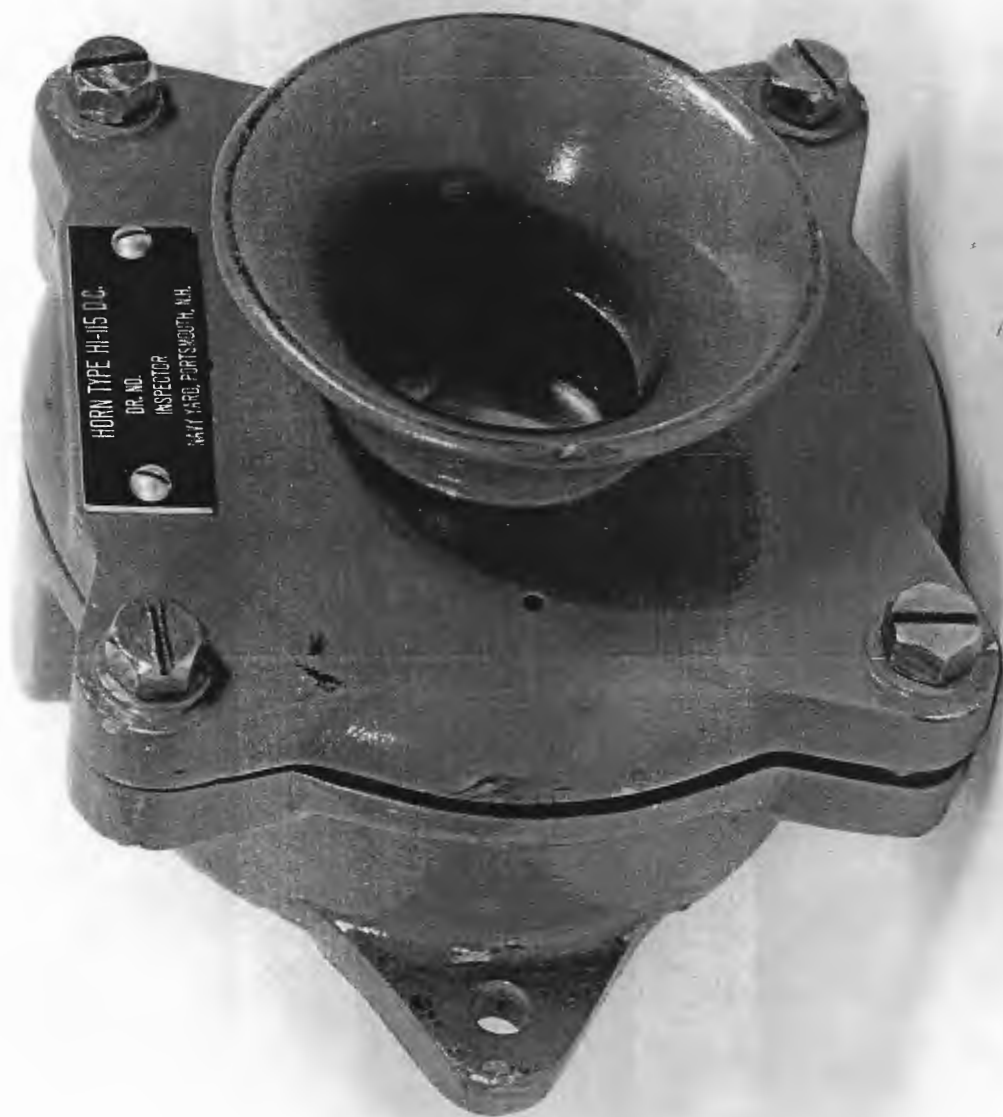


Plate 2

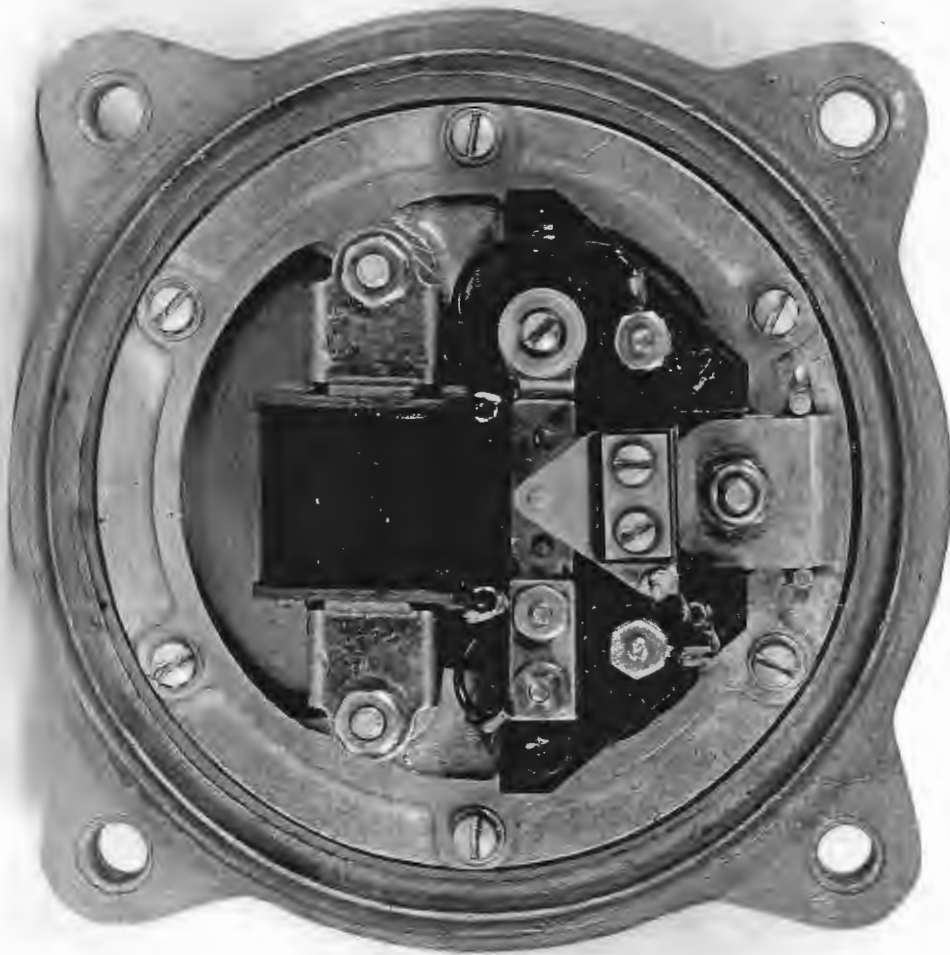


Plate 3

