25 August 1938

NRL Report No. B-1470.

FR-1470

NAVY DEPARTMENT

BUREAU OF ENGINEERING

Report of Test

on

Sirens, Types S-3, S-4

Submitted by

Clark Cooper Company,
153-159 Jefferson Street,
Philadelphia, Pennsylvania.

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

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Authorization: BuEng.ltr. S48-25/L5(7-20-Ds) of 1 August 1938.

Date of Test: August 1938.

Tested by: _____
J. R. Coomes, Senior Engineering Aide.

Prepared by: _____
W. B. Roberts, Principal Engineering Aide,
Chief of Section.

Reviewed by: _____
R. A. Gano, Lieutenant, USN.

Approved by: _____
H. M. Cooley, Captain, USN, Director.

Distribution:
BuEng. (5)

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APPENDICES

AUTHORIZATION FOR TEST

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

Reference: (a) BuEng.ltr. S48-25/L5 (7-20-Ds) of 1 August 1938.
(b) Specifications 17-S-11 (INT) of 15 February 1938.
(c) NRL Report No. B-1399 of 22 September 1937.

OBJECT OF TEST

2. The object of this test was to determine conformance of the sample sirens with the specifications, reference (b), and their suitability for Naval use as types S3 and S4.

ABSTRACT OF TEST

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

Conclusions

(a) The sample sirens, manufactured by Clark Cooper Company, Philadelphia, Pennsylvania, and submitted for type approval as types S3 and S4, failed to comply with the specifications, reference (b), as follows:

(1) Sound pressure output.

(2) Temperature rise.

(3) Dielectric strength and insulation resistance.

(4) Type S4 pitch of note too low.

(5) Type S3 wattage too high.

(6) Provision for reducing the sound pressure output 20 decibels.

(7) The intake to the rotor is not equipped with guards to prevent injury to personnel.

Recommendations

(a) It is recommended that the subject sirens be not approved for Naval use.

(b) As these sirens show little or no improvement over the samples tested and reported under reference (c), it is recommended that no further tests be authorized on new samples until the manufacturer submits test results demonstrating that the deficiencies have been corrected.

DESCRIPTION OF MATERIAL UNDER TEST

4. The sample sirens, manufactured and submitted by Clark Cooper Company, Philadelphia, Pennsylvania, as Navy types S3 and S4, are identical in design, each being equipped with a universal series motor. They are suitable for use on either alternating or direct current circuits having a potential of 115 volts. For test purposes, one was marked S3 and tested on direct current, the other S4 and tested on alternating current.

5. The motor is housed in a cast aluminum alloy, splash-proof case having four (4) mounting lugs and a terminal box cast integral with the case. Two (2) bosses tapped for 3/4 inch Navy terminal tubes are located on the terminal box.

6. The motor is supported by a cast aluminum alloy plate which serves as an end bell and is held in place between the rotor housing and the case with four (4) 8-32 steel fillister headed cadmium plated machine screws used as through bolts. A flat rubber gasket is provided between this plate and the case to insure water-tightness.

7. The conical rotor is of aluminum alloy cast in one piece, and has fourteen (14) apertures in its periphery. It is clamped to the armature shaft when a hexagon steel nut is screwed down on a split steel sleeve, secured to the rotor by a force fit and steel drive pins.

8. The rotor housing also has fourteen (14) apertures in its periphery. It is conical in shape and is provided with two (2) steel wires slightly recessed in the metal at the port openings to prevent injury to personnel.

9. Further details in the construction of the sirens are given by Plates 1 and 2.

METHOD OF TEST

10. The subject sirens, as received, were first tested to obtain the electrical and acoustical characteristics. One was then placed on a standard Bureau of Engineering shock stand and subjected to 20 blows of 250 foot pounds each, under conditions specified in paragraph F-2g of the specifications.

11. One was next tested for resistance to vibration 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 vibrations per minute.

12. Following this, the sirens were tested for endurance by operating them 1500 cycles of "one minute on" and "one minute off,"

the first half of the test at an ambient temperature of 60°C. and the second half at 0°C. During this test, the temperature rise of the sirens was determined by the resistance method.

13. They were next tested for inclination, operation at over and under voltage and frequency, dielectric strength and insulation resistance, and splashproof integrity. Only one was tested for resistance to corrosion.

14. The tests were concluded with an inspection of the sample sirens for conformance with the specifications pertaining to design and quality of workmanship and materials.

RESULTS OF TESTS

15. The test results obtained were as follows:

Requirements	Test Values	
	Type S-3	Type S-4
Voltage: 115 volts.	115 volts.	115 volts.
Current:	Direct.	Alternating.
Amperes: Not specified.	2.28 amperes.	1.84 amperes.
Watts: Not over 200.	* 262 watts.	168 watts.
Power factor: Not less than 60%.	- -	79.4%.
Weight: Not over 9 pounds.	8 lb., 2 oz.	8 lb., 2 oz.
Pitch of note: 1750 to 2500 cycles per second.	1980 CPS.	* 1700 CPS.
Sound pressure output: Shall be not less than 95 decibels at 18 feet in a soundproof room and capable of 20 decibel reduction.	* 91 decibels, no feature for reduction.	* 94 decibels, no feature for reduction.
Shock integrity: Shall withstand 20 blows of 250 foot pounds each under conditions specified under paragraph F-2g.	Complied.	Not tested, due to fractured mounting lug when received.
Vibration tests: Shall be mounted on a standard Navy 3 foot pound vibration machine and subjected to 6 tests of 30 minutes each at 100, 150, 200, 250, 300 and 350 blows per minute.	Complied.	Not tested, due to fractured mounting lug when received.

Requirements	Test Values	
	Type S-3	Type S-4
Endurance: Shall be operated "one minute on" and "one minute off" for a period of 1500 cycles, the first half at an ambient temperature of 60°C. and the second half at 0°C.	Complied.	Complied.
Temperature rise: Shall not exceed 45°C. at any time during the endurance test.	* 94.2°C.	* 66.2°C.
Dielectric test: Shall withstand a dielectric test of twice the rated voltage plus 1250 volts, at 60 cycles, for a period of one minute.	*Unsatisfactory, breakdown occurring in armature.	*Unsatisfactory, breakdown occurring in armature.
Insulation resistance: Shall be not less than 5 megohms, with a 500 volt megger, after the dielectric test.	* 50,000 ohms.	* 150,000 ohms.
Dissimilar materials: Brass shall not be in contact with aluminum.	Complied.	Complied.
Wire: Type SICP shall be used.	Complied.	Complied.
Inclination: Shall operate in any position when supplied with ± 10% of rated voltage and frequency.	Complied.	Complied.
Splashproof integrity: Shall be splashed with a 1-inch stream of water under a pressure head of 35 feet, played from a hose from a distance of 5 feet, for 5 minutes without any water entering the case.	Complied.	Complied.

Requirements	Test Values	
	Type S-3	Type S-4
Salt spray test: Shall be subjected under ultra-violet light to a 20% 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 for a period of 100 hours. Shall show no serious corrosion and shall operate satisfactorily at the end of the test.	Satisfactory, except for slight rusting of lockwashers and nameplate securing pins.	Not tested (identical).
Nameplates: Shall be in accordance with Navy Department Specifications 42N2.	Complied, copper nickel alloy.	Complied, copper nickel alloy.
Case material: Shall be of bronze or aluminum alloy as specified in paragraph D-3.	Complied, aluminum alloy.	Complied, aluminum alloy.
Painting: Shall be finished with one coat of zinc chromate paint followed by two coats of aluminum paint, and final coat of grey paint.	Complied.	Complied.
Terminal block: Shall be of approved material equipped with terminal lugs in accordance with BuEng.Drwg. 9-S-1841-L.	Complied.	Complied.

* Denotes failure to comply with the specifications.

CONCLUSIONS

16. The sample sirens, manufactured by Clark Cooper Company, Philadelphia, Pennsylvania, and submitted for type approval as types S3 and S4, failed to comply with the specifications, reference (b), as follows:

(1) Sound pressure output.

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(7) The intake to the rotor is not equipped with guards to prevent injury to personnel.

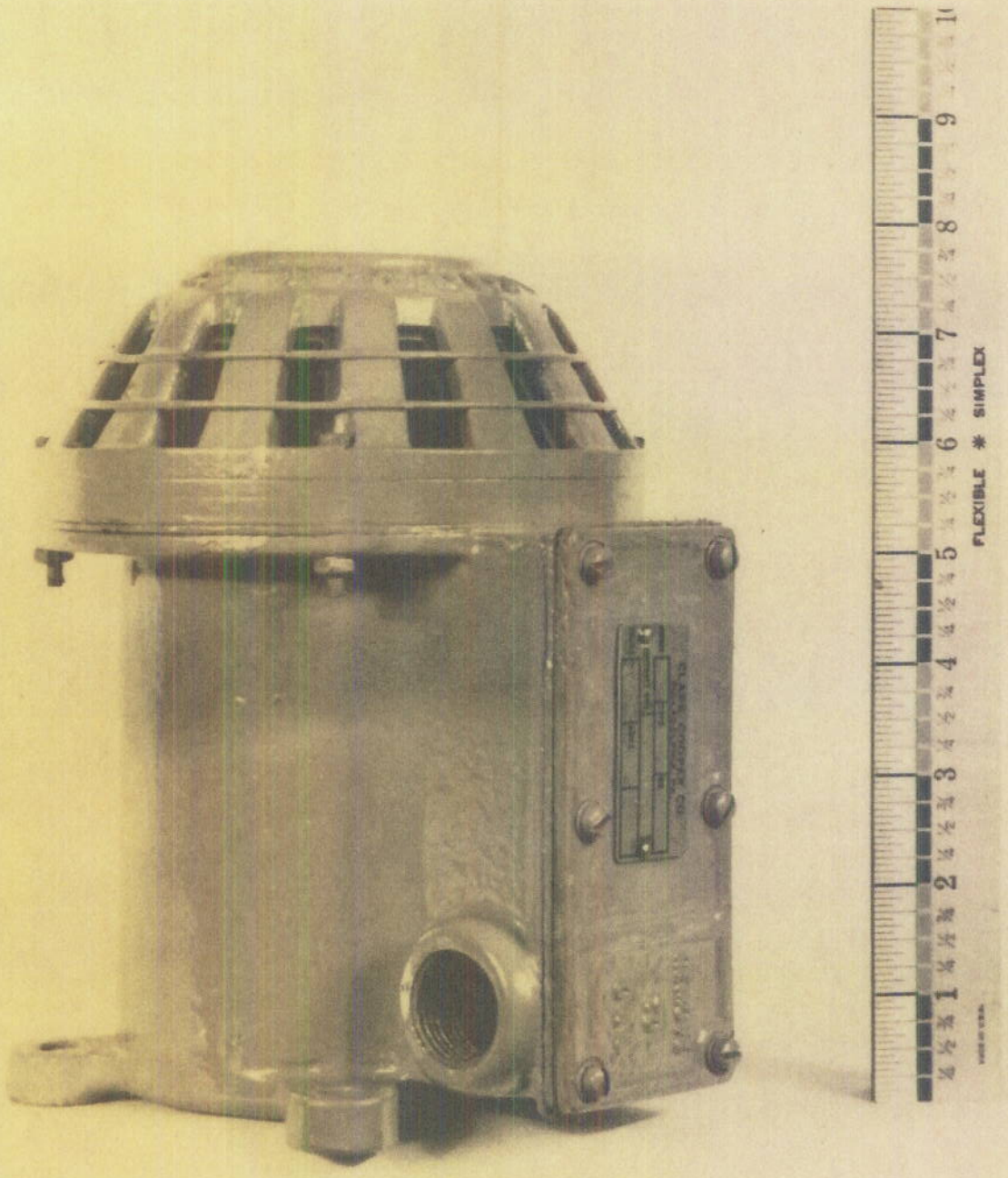

Plate 1

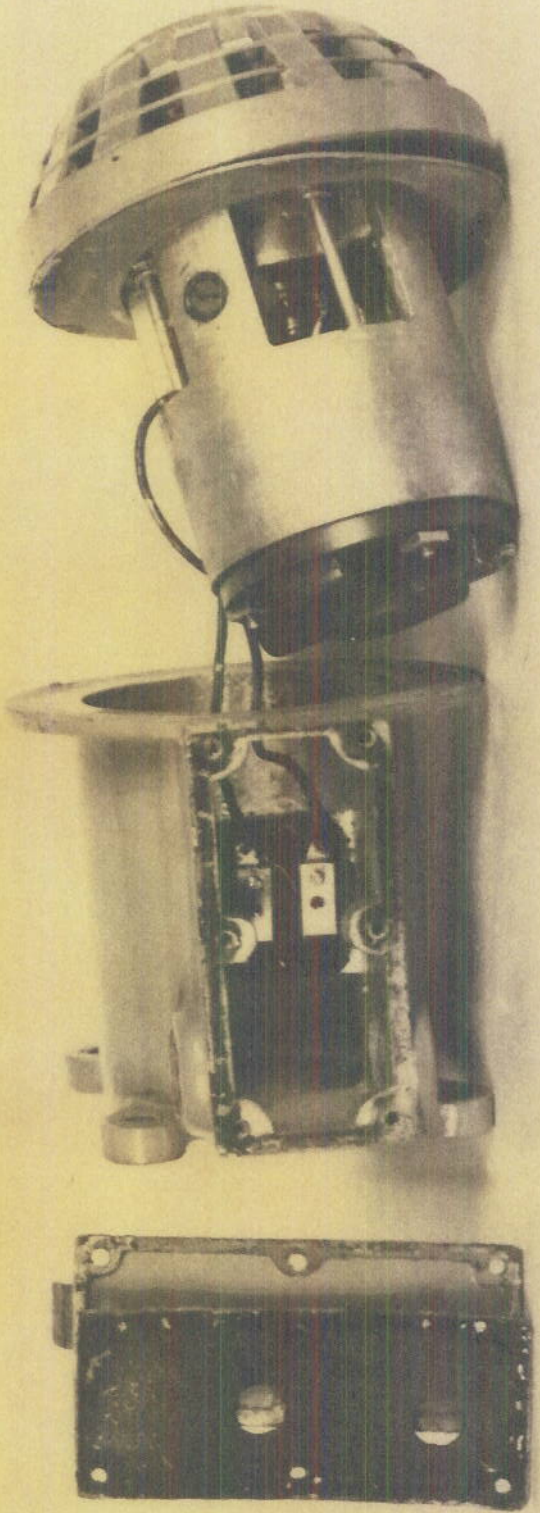

Plate 2