

REPORT NO. B-1469

DATE 23 August 1938

SUBJECT FR-1469

Siren, Type S-1, S-2,
Submitted by
Federal Electric Company, Inc.,
Chicago, Illinois.



BY

NAVAL RESEARCH LABORATORY

BELLEVUE, D. C.

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NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report of Test

on

Siren, Type S-1, S-2,

Submitted by

Federal Electric Company, Inc.,

Chicago, Illinois.

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

Number of Pages: Text - 6 Tables - 1 Plates - 2
Authorization: BuEng.ltr. S65-4/L5(7-28-Ds) of 8 August 1938.
Date of Test: August 1938.

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Distribution:
BuEng. (5)

ejh

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APPENDICES

Characteristics of Siren with Various
Port Openings Table 1

Photograph showing assembled sample siren .. Plate 1

Photograph showing disassembled sample
siren Plate 2

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. S65-4/L5(7-28-Ds) of 8 August 1938.
(b) Specifications 17-S-11 (INT) of 15 Feb. 1938.
(c) BuEng.ltr. S65-4/L5 (4-2-Df) of 22 April 1938
to Federal Electric Company.

OBJECT OF TEST

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

ABSTRACT OF TEST

3. The sample siren was set up at this Laboratory in suitable test circuits where its performance was carefully observed for compliance with the specifications. The usual inspection of the samples to ascertain whether the materials, design, and workmanship were in accordance with the requirements concluded the test.

(a) The subject siren, manufactured by Federal Electric Company and submitted for type approval as Navy types S1 and S2, complies with the specifications, reference (b), and is of good workmanship and design, except as follows:

- (1) The feature provided to regulate the sound pressure output is not very effective and does not provide the required 20 decibel reduction. It will be noted in the table that the maximum output was obtained with the ports three-eighths open and that the pitch of note varied greatly with various port openings.
- (2) The weight allowed by the specifications is exceeded by 3 pounds, 11 ounces. However, this was waived by reference (c).
- (3) It is noted that the stator ports have not been provided with guards as in previous samples.
- (4) The stator locking screw does not appear to be of sufficient size.

(a) It is recommended that the subject siren be approved for Naval use subject to the correction of the discrepancies noted under "Conclusions" of this report.

DESCRIPTION OF MATERIAL UNDER TEST

4. The sample siren submitted by Federal Electric Company, Chicago, Illinois, is equipped with a universal series motor. It was submitted for type approval as Navy type S-1 (115 volts d.c.) and S-2 (115 volts a.c.).

5. The motor is housed in a cast aluminum alloy, splashproof case, having three (3) 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 an aluminum alloy casting, which also forms the stator for the siren. The casting is secured to the case with eight (8) No. 10-32 steel fillister headed cadmium plated machine screws. Steel inserts are provided in the case for the securing screws.

7. A rubber gasket, 1/4 inch square, is provided between the stator and case to insure watertightness.

8. Ball bearings packed with grease are provided and can only be reached by disassembling the motor.

9. The area of the five (5) stator ports may be changed by rotating an outer concentric housing. This housing is cap shaped and also serves as an intake guard. A slot in its periphery is provided with a locking screw.

10. Located on the rotor is a threaded split steel bushing and nut for securing the rotor to the armature shaft.

11. The armature and field cores of the motor are constructed of laminated material.

12. A terminal block of phenolic material, provided with lugs in accordance with Bureau of Engineering drawing 9-S-1841-L, is located in the terminal box. A flat rubber gasket is provided between the case and the box cover. Eight (8) No. 6-32 steel fillister headed machine screws thread into steel inserts and secure the cover.

13. Further details in the construction of the siren are shown by photographs, Plates 1 and 2.

METHOD OF TEST

14. The siren, as received, was first tested to determine whether the electrical and acoustical characteristics were in conformance with the specifications.

15. It was next tested for shock integrity by placing it on

of 250 foot pounds each under the conditions specified under paragraph F-2g of the specifications.

16. Then followed tests for resistance to vibration, conducted by placing it on a standard Navy 3 foot pound vibration machine and subjecting it to six periods of 30 minutes each, at frequencies of 100, 150, 200, 250, 300, and 350 blows per minute.

17. Next followed tests for endurance during which it was placed in a compartment having an ambient temperature of 60°C. and operated 750 cycles of "one minute on" and "one minute off." During this test the temperature rise was obtained by the resistance method. It was next operated for 750 cycles of "one minute on" and "one minute off" at an ambient temperature of 0°C.

18. It was next tested for ability to operate when inclined in all planes and supplied from a source varying $\pm 10\%$ in both voltage and frequency as specified in paragraphs B-3 and D-12i.

19. Prior to conducting the splash test the siren was tested for dielectric strength by subjecting it to 1480 volts at 60 cycles for one minute, after which the insulation resistance was determined by a 500 volt megger.

20. The watertight integrity was determined by spraying the siren with a stream of water one inch in diameter under a pressure head of 35 feet for a period of 5 minutes.

21. An inspection of the siren to determine its conformance with the specifications relative to design, quality of materials and workmanship, concluded the test.

RESULTS OF TEST

22. The following test results are tabulated as for two separate sirens.

<u>Requirements</u>	<u>Test Values</u>	
	<u>Type S-1</u>	<u>Type S-2</u>
Voltage: 115 volts.	115 volts.	115 volts.
Current: Alternating and direct.	Direct.	Alternating.
Amperes: Not specified.	1.66 amperes.	1.72 amperes.
Frequency:	- -	60 cycles.
Watts: Not over 200.	195 watts.	175 watts.

	<u>Type S-1</u>	<u>Type S-2</u>
Power factor: Not less than 60%.	--	88%.
Shock integrity: Shall withstand 20 shocks of 250 foot pounds each under conditions 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 100, 150, 200, 250, 300 and 350 blows per minute.	Complied.	Complied.
Endurance: Shall operate 1500 cycles of "one minute on" and "one minute off", the first half at an ambient temperature of 60°C. and the second half at 0°C.	Complied.	Complied.
Inclination: Shall operate satisfactorily in any position at $\pm 10\%$ in both voltage and frequency.	Complied.	Complied.
Dielectric strength: Shall withstand twice the rated voltage plus 1250 at 60 cycles for one minute.	Complied.	Complied.
Insulation resistance: Shall be not less than 5 megohms following the dielectric test.	100 megohms by 500 volt megger.	100 megohms by 500 volt megger.
Splash test: Shall be splashed with a 1-inch stream of water under a pressure head of 35 feet for 5 minutes without any water entering the case.	Complied.	Complied.
Motor bearings: Ball bearings.	Complied.	Complied.

Type S-1Type S-2

Temperature rise: Shall not exceed 45°C. at any time during the endurance test.

38.2°C.

42.1°C.

Pitch of note: 600 to 1200 CPS.

750 CPS.

720 CPS.

Sound pressure output: Shall not be less than 95 decibels and capable of being reduced 20 decibels without changing pitch of note more than 10%.

95 decibels. 95 decibels.
(See table.)

Weight: Shall not exceed 9 pounds.

* 12 pounds, 11 ounces.

Dimensions: Not specified.

7-3/8 inches in diameter and
9-3/4 inches in length.

Nameplate: Shall be in accordance with Navy Department Specifications 42N2.

Nickel-copper alloy.

Terminal block: Phenolic material equipped with wire terminal lugs, Drawing 9-S-1841-L.

Phenolic block equipped with required terminal lugs.

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

Not conducted due to a satisfactory previous test on a similar siren.

Painting: One coat of zinc chromate paint followed by two coats of aluminum paint and finished in gray.

Complied.

Complied.

Case material: Shall be of bronze or cast aluminum alloy.

Cast aluminum alloy.

* Denotes failure to comply with the specifications.

NOTE: Excess weight allowed by reference (c).

23. The subject siren, manufactured by Federal Electric Company and submitted for type approval as Navy types S1 and S2, complies with the specifications, reference (b), and is of good workmanship and design, except as follows:

- (1) The feature provided to regulate the sound pressure output is not very effective and does not provide the required 20 decibel reduction. It will be noted in the table that the maximum output was obtained with the ports three-eighths open and that the pitch of note varied greatly with various port openings.
- (2) The weight allowed by the specifications is exceeded by 3 pounds, 11 ounces. However, this was waived by reference (c).
- (3) It is noted that the stator ports have not been provided with guards as in previous samples.
- (4) The stator locking screw does not appear to be of sufficient size.

OPENINGS.

<u>Area of Port Opening</u>	<u>Sound Output in db.</u>	<u>C.P.S.</u>	<u>Watts</u>	<u>Coasting Time in seconds</u>
0	93	900	145	14.0
1/8	96	825	157	12.25
1/4	99	780	165	11.75
3/8	102	760	172	11.5
1/2	100	740	173	11.0
5/8	98	720	175	10.5
3/4	97	700	180	10.5
7/8	98	685	181	10.25
Full	95	720	175	10.25

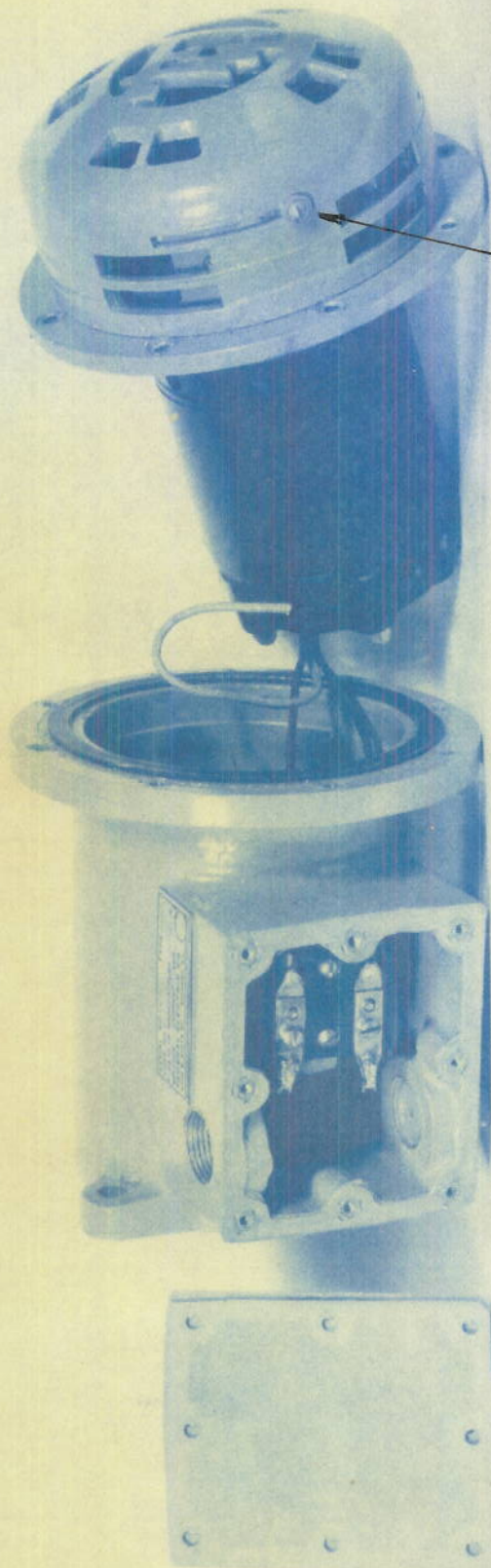
NOTE: The sound pressure output measurements were obtained with the siren located in a sound-proof room, 18 feet from the noise meter and supplied with 115 volts, a.c., before the endurance test.

8 7 6 5 4 3 2 1
RUBBER * SIMPLEX



SERIAL NO. 11585 - TYPE 25 A 5 P
CONT. NO. 11. 1. 1.
DATE OF MANUFACTURE 7/17/30
VOLTAGE 115 - CURRENT 11 AMP
FEDERAL ELECTRIC CO.
1700 S. STATE ST. CHICAGO, ILL.

Plate 1



Stator Locking Screw