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NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report

of

Test on Incandescent Lamps, 6 - 8 Volt, 1 CP,
G-3-1/2 Bulb - "Mazda 51".
General Electric Company, Exhibitor.

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON DC

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AUTHORIZATION FOR TEST

1. This test was authorized by reference (a).

Reference: (a) Bu.Eng.ltr.S64-5/L5(6-19-Ds) of 21 June 1935.

OBJECT OF TEST

2. The object of this test was to determine the suitability of the lamps, manufactured and submitted by the General Electric Company, as instrument lamps for the Naval Service. It was particularly desired to ascertain their ability to withstand shock and vibration.

ABSTRACT OF TEST

3. The sample lamps were set up at this Laboratory in several groups, supplied with a constant voltage, and tested for life, shock and vibration.

It is also recommended that the Service consider the possibility of requiring all manufacturers submitting lamps for suitability tests to submit at least 50 lamps of each type submitted. This will enable the Laboratory to obtain more satisfactory results.

DESCRIPTION OF MATERIAL UNDER TEST

4. Nineteen lamps, "Mazda 51", 6 - 8 volts, miniature bayonet base, G-3-1/2 bulb, 1-CP, were submitted for test.

5. The filament is of the concentrated coil type supported only by the two lead wires. Dimensions of the lamp are given on Plate 1.

METHOD OF TEST

6. In order to conduct the tests, it was first necessary to make several sockets to accommodate the lamps as none was furnished by the manufacturer. The sockets constructed held the lamps firmly.

7. In accordance with oral instructions from the Bureau, all tests were made at a potential of 6 volts. See Plate 1 for test circuit.

8. Five lamps were supplied with current from a battery, floating across a charging circuit, maintaining a voltage of 6 volts plus or minus 0.1 volt. These were mounted base down and tested for length of life.

9. Four lamps were supplied with current from a similar circuit and mounted on a General Electric "Vib-rac" lamp testing machine to determine their life under vibration. During this test the rack was operated continuously at 500 VPM, 0.062 amplitude.

10. The lamps tested, as described in the preceding paragraphs, were also subjected to shock tests at various intensities, together with the remaining sample lamps.

RESULTS OF TEST

11. The five lamps tested for length of life at a potential of 6 volts appeared to be in good condition after burning 1048 continuous hours. The bulbs were not visibly discolored, nor was the shape of the filaments changed to any great extent.

12. The four lamps tested on the vibrating machine as described in paragraph 9 also appeared to be in good condition after burning 864 continuous hours. During this test the lamps were mounted, bulb down.

13. Four additional lamps were mounted, base horizontal, and tested on the vibrating machine for a period of 168 continuous hours. These lamps also appeared to be in good condition when the test was concluded.

14. The four lamps tested under paragraph 12 were mounted on a Bureau of Engineering shock stand, base toward vertical bulkhead, and given 5 25-foot pound blows while burning. The effect of these shocks was that the filaments were badly deformed and partly shorted.

15. The lamps tested under paragraph 13 were also mounted on the shock machine in the same manner and given 25 50-foot pound blows while burning. These filaments were even more deformed than those tested as described in the preceding paragraph.

16. Two of the remaining untested lamps were placed on the shock machine, base toward vertical bulkhead, and given 25 25-foot pound blows while burning. As a result, these filaments also became deformed and partly shorted.

17. Two of the remaining four lamps were mounted in the same way and given 25 50-foot pound blows with the filaments not burning, without noticeable effect. This shock was then increased to 25 100-foot pound blows, causing the filaments to bend slightly at the point of connection to the lead wires.

18. The candle power of the two remaining lamps, as determined at potentials of 7.2 volts and 6.0 volts, using a Macbeth illuminometer, was 1.075 and 0.505 CP, respectively.

19. The average current consumption of these lamps is 0.18 amperes at a potential of 6 volts.

COMMENTS ON RESULTS OF TEST

20. The test results indicate that a life of over 1048 hours may be expected from these lamps when operated at a potential of 6 volts.

21. The lamps tested under vibration might also be expected to have a life in excess of 1000 hours, as they appeared to be in good condition after a test of 864 continuous hours.

22. In every instance where lamps were tested under shock, with filaments burning, the filaments became deformed and partly shorted between turns. The new lamps, tested with filaments not burning, were only slightly damaged.

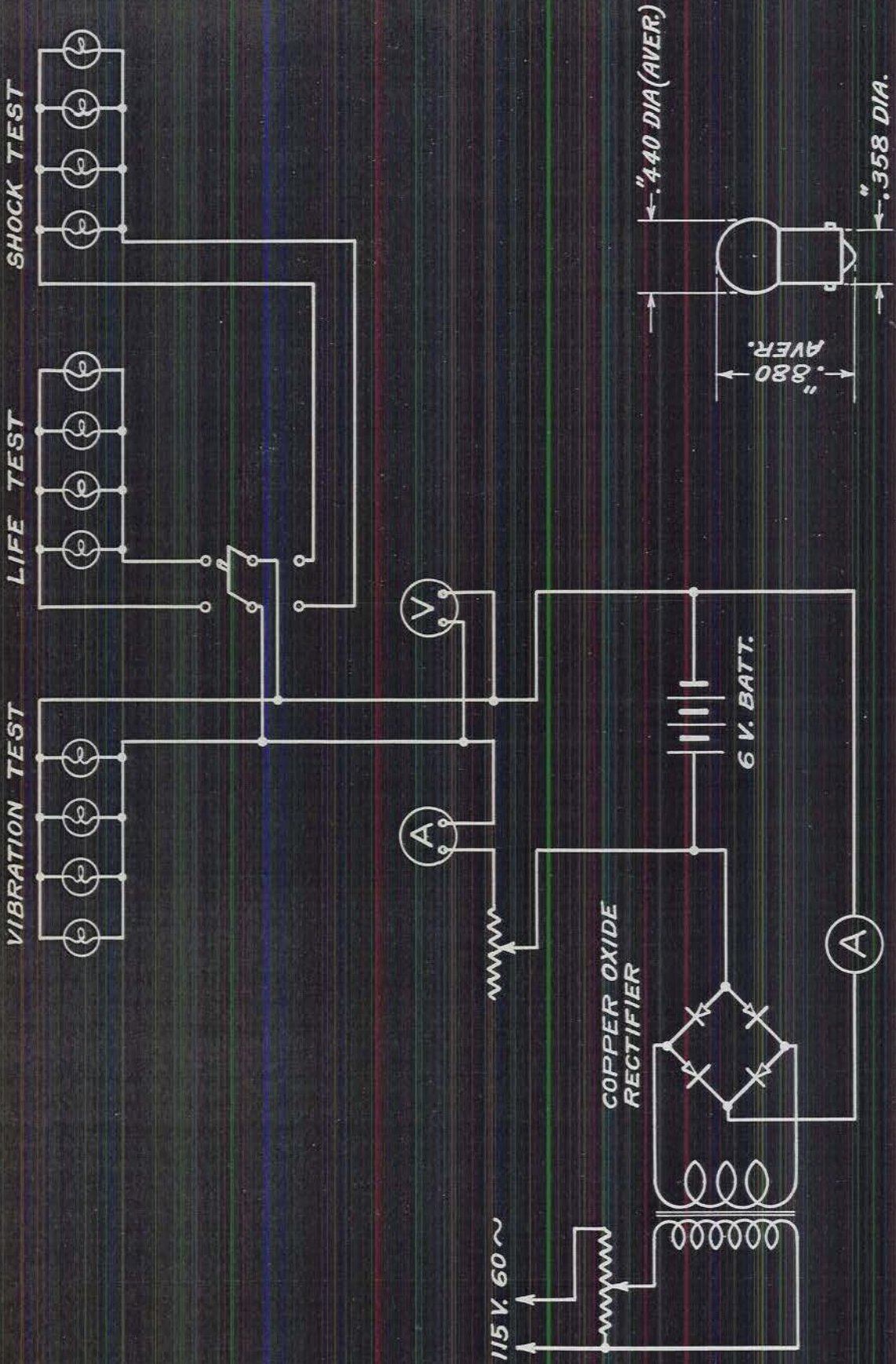
23. The shock tests were discontinued when it was obvious that the filaments were so badly damaged that their lives would be greatly shortened.

24. The satisfactory results obtained from the lamps under life and vibration tests are attributed to their being tested at a potential of 6 volts. The manufacturer's rating of 1 CP is based on a potential of 7.2 volts, at which voltage a life of 1000 hours is claimed.

CONCLUSIONS

25. These lamps, as manufactured and submitted by the General Electric Company for suitability tests for instrument lighting, proved to be satisfactory under life and vibration tests.

26. Due to the small number of lamps furnished, it was difficult to reach a conclusion as to the ability of these lamps to withstand shock. However, the tests indicate that a new lamp of this type will satisfactorily withstand 25 25-foot pound shocks.



TEST SET UP - 6-8 VOLT LAMPS