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NAVY DEPARTMENT  
BUREAU OF ENGINEERING

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Report of

Test on Lamps, Incandescent, Types  
T-51 and T-55, 6-8 Volts.  
Tung-Sol Lamp Company, Exhibitor.

NAVAL RESEARCH LABORATORY  
ANACOSTIA STATION  
WASHINGTON DC

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Prepared by: W.B. Roberts, Pr.Eng.Aide, Chief of Section  
Reviewed by: W.M. Haynsworth, Jr., Lieut., USN.  
Approved by: H.M. Cooley, Captain, USN, Director.  
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#### AUTHORIZATION

1. This test was authorized by Bureau of Engineering letter S64-1/L5 (8-28-Ds) of 31 August 1935.

#### OBJECT OF TEST

2. The object of this test was to determine the suitability of the lamps, manufactured and submitted by the Tung-Sol Lamp Company, for use in connection with I.C. instrument lighting in the Naval Service.

#### ABSTRACT OF TEST

3. Two of each type of lamp submitted were supplied with a potential of 6 volts and their C.P. measured. Ten of the remaining lamps were tested for ruggedness under constant vibration while continuously lighted from a supply of 6 volts. All lamps, except the two broken at the conclusion of the vibration test, were subjected to shocks of 25 foot pounds until failure of the filaments.

## CONCLUSIONS

(a) In view of the performance of these lamps while under the vibration test, they should be considered for use as instrument lamps for the Naval Service.

(b) As to the shock integrity of these lamps, the test results should not be considered as conclusive, in view of the fact that too small a quantity of lamps was submitted to cover both the vibration and shock tests. Should the Bureau desire more definite information in regard to the shock integrity of these lamps, it is requested that at least thirty (30) of each type of lamp be obtained from the Tung-Sol Company and competitive manufacturers. This will enable this Laboratory to make comparative and more conclusive tests.

(c) Considering the limited number of lamps available for tests, a comparison of the Type 55 lamp with the Type 51 lamp is rather difficult. However, results obtained indicate that in ruggedness the Type 51 lamp is superior.

## RECOMMENDATION

(a) In the event that the Bureau decides to use lamps of either of these types, it is recommended that, in view of its apparent superior ruggedness, approval of the Type 51 lamp be given more consideration than the Type 55 lamp.

#### DESCRIPTION OF MATERIAL UNDER TEST

4. Sixteen (16) lamps were submitted for test, eight (8) Type 55 and eight (8) Type 51. Two (2) of the Type 55 lamps were broken in transit.

5. The manufacturer's rating of the Type 55 lamps is 1-1/2 C.P. 6-8 volts, and 1 C.P. 6-8 volts for Type 51.

6. The lamps are of the miniature bayonet base type, clear bulb, embodying concentrated coil type filaments, supported by the two (2) lead wires.

7. The dimensions of the sample lamps and schematic wiring diagram of the test circuit are shown on Plate 2.

#### METHOD OF TEST

8. Prior to the start of the tests, the Bureau informed this Laboratory, orally, that all tests should be conducted at a constant potential of 6 volts.

9. Two Type 55 and three Type 51 lamps were mounted, base horizontal, in special miniature sockets on a vibrating lamp test rack. An additional group of five lamps was mounted, base up. During this test, a constant potential of 6 volts was maintained at the lamps and the rack was vibrated continuously at 500 V.P.M. at an amplitude of 1/16". A photograph of the rack is shown on Plate 1.

10. The candlepower of the lamps, at potentials of 6 volts, was obtained by the use of a Leeds and Northrup Macbeth Illuminometer, Type No. 6800.

11. The remaining lamps were tested for shock integrity by mounting them on a Bureau of Engineering shock machine, base toward vertical bulkhead, and subjecting them to shocks of 25 foot pounds until failure of the filaments. During this test the lamps were burning at a potential of 6 volts. One lamp of each type was also tested with the filament not burning.

12. At the conclusion of the vibration test, these lamps were also tested for shock integrity while burning at a potential of 6 volts.

13. Plate 1 of this report shows ten (10) sample lamps mounted on a vibrating lamp test rack.

#### RESULTS OF TEST

14. At the conclusion of the vibration test of 856 hours at approximately 500 V.P.M., 1/16" amplitude, while supplied with an uninterrupted potential of 6 volts, the lamps were all burning.

15. An examination of the lamps after the vibration test showed no visible discoloration of the glass nor change in the shape of the filament. However, the filament in two of the Type 55 lamps broke when removing the lamps from their respective sockets.

16. The shock test was conducted by mounting the lamps in their sockets, base toward the vertical bulkhead of the standard Bureau of Engineering shock machine and subjecting them to shocks of 25 foot pounds. The results of the tests are as follows:

#### Type 55

- No. 1 - Filament broke when removing lamp after vibration test.
- No. 2 - Filament broke when removing lamp after vibration test.
- No. 3 - After vibration test, filament lighted, failed at 2nd blow.
- No. 4 - Same as No. 3, except it failed at 3rd blow.
- No. 5 - New lamp, filament lighted, failed at 8th blow.
- No. 6 - New lamp, filament not lighted, failed at 11th blow.

#### Type 51

- No. 1 - After vibration test, filament lighted, failed at 4th blow.
- No. 2 - Same, except filament partly shorted at 4th blow.
- No. 3 - Results same as No. 2 lamp.
- No. 4, 5, 6 - Same, except filament partly shorted at 2nd blow.
- No. 7 - New lamp, filament lighted, partly shorted at 4th blow.
- No. 8 - New lamp, filament not lighted, failed at 11th blow.

17. The average C.P. of two lamps of each type tested at a potential of 6 volts was 1.1 C.P. for Type 55 and 0.5 C.P. for Type 51.

#### COMMENTS ON RESULTS OF TEST

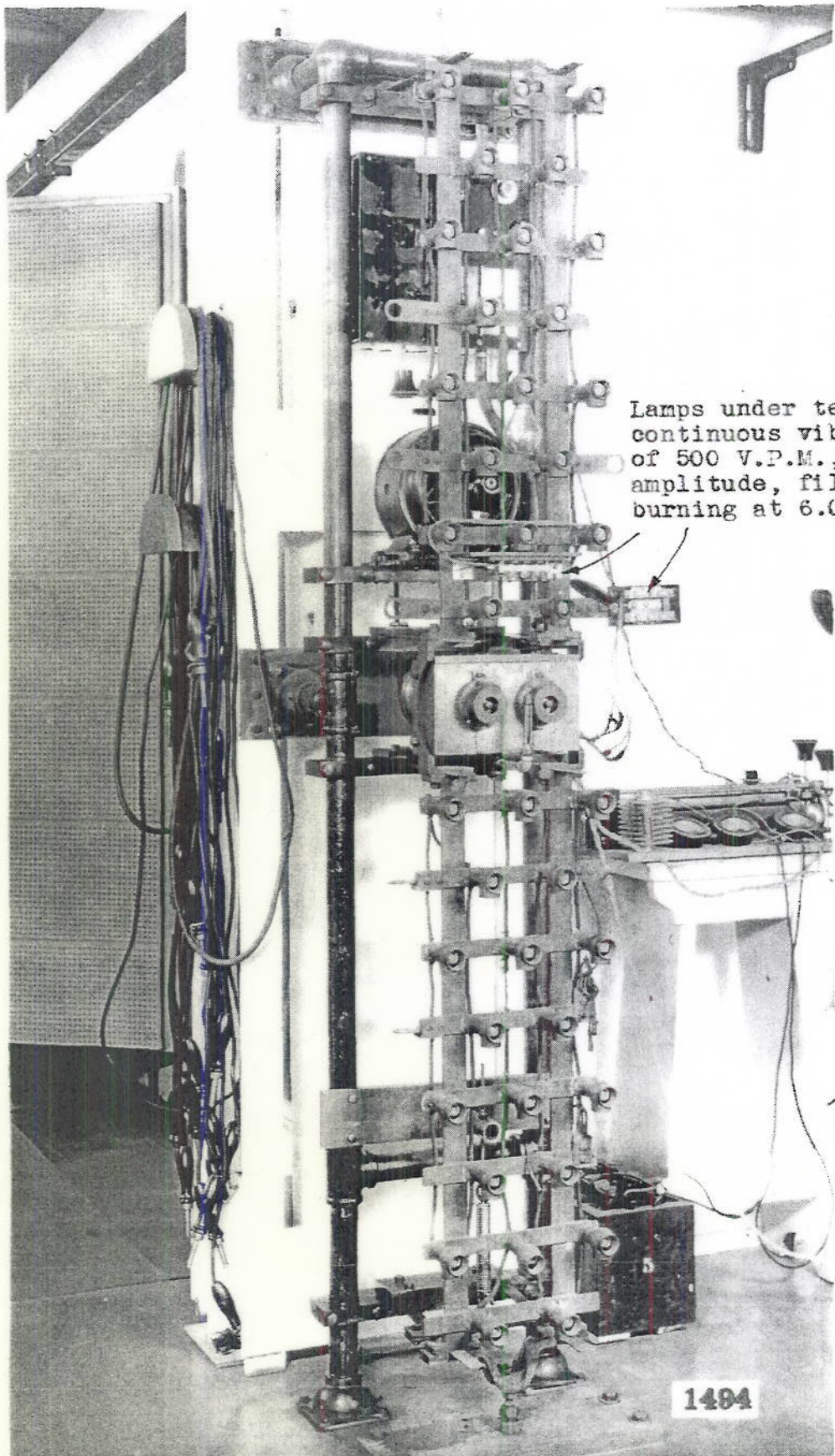
18. Inasmuch as the potential at these lamps in the service will be approximately the same as that supplied to the filaments during the 856 hour vibration test, these lamps may be expected to have a reasonable length of life in the service.

19. Due to the small quantity of lamps submitted, it is difficult to form an opinion as to the shock integrity of the lamps. However, the Type 51 lamps tested and reported in NRL Report No. B-1193 of 11 September 1935 appear to be more rugged than the subject Type 51 lamps.

#### CONCLUSIONS

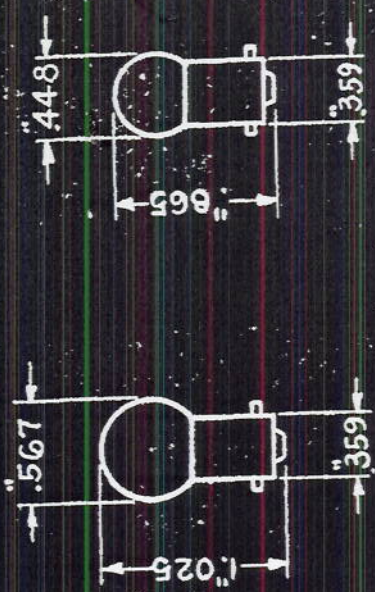
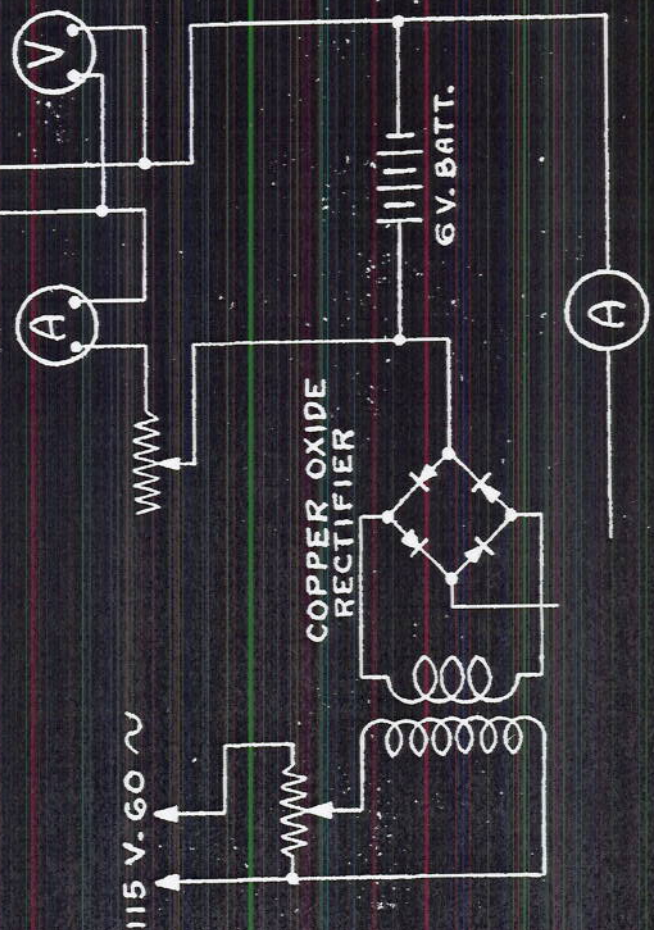
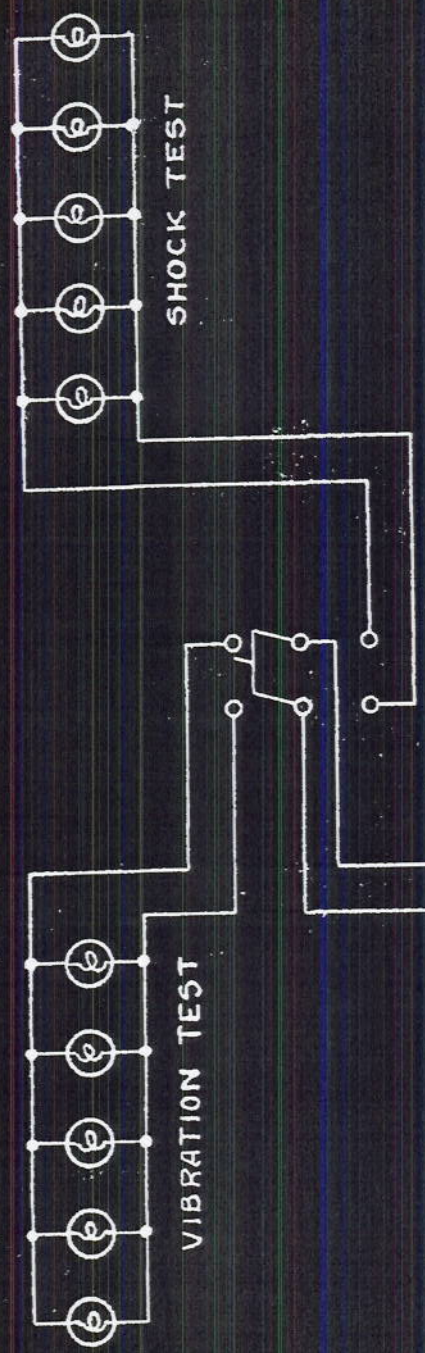
20. In view of the performance of these lamps while under the vibration test, they should be considered for use as instrument lamps for the Naval Service.

21. As to the shock integrity of these lamps, the test results should not be considered as conclusive in view of the fact that too small a quantity of lamps was submitted to cover both the vibration and shock tests. Should the Bureau desire more definite information in regard to the shock integrity of these lamps, it is requested that at least thirty (30) of each type of lamp be obtained from the Tung-Sol Company and competitive manufacturers. This will enable this Laboratory to make comparative and more conclusive tests.



Lamps under test,  
continuous vibration  
of 500 V.P.M., 1/16" amplitude,  
filaments burning at 6.0 volts.

1484



TYPE 55  
TYPE 51  
(AVERAGE DIMENSIONS)