



TABLE OF CONTENTS

<u>SUBJECT</u>	<u>PAGE</u>
1. AUTHORIZATION.....	1
2. OBJECT OF TEST.....	1
3. ABSTRACT OF TEST.....	1
(a) Conclusions.....	1a
(b) Recommendation.....	1a
4. DESCRIPTION OF MATERIAL UNDER TEST.....	2
5. METHOD OF TEST.....	2
6. PROBABLE ERROR OF RESULTS.....	2
7. RESULTS OF TEST.....	2
8. CONCLUSIONS.....	4

Appendices

Measured capacity and D.C. Leakage of Potter Capacitors No. 8260... Table 1.

## AUTHORIZATION

1. This work was authorized by Bureau of Engineering letter, reference (a). The governing specifications are listed as reference (b), and other pertinent references as (c) and (d).

Reference: (a) BuEng. let. NOs44565 (3-24-W8) of 2 April 1936.  
(b) BuEng. Specifications RE 13A 488B dated 9 Jan. 1934.  
(c) INM, Chicago, Conf.ltr. L4-3(9536) of 24 Mar. 1936.  
(d) NRL Report No. R-1248 of 13 March 1936.

## OBJECT OF TEST

2. The object of the test was to determine whether the capacitors complied with the specifications, reference (b), particularly paragraphs 4-1 to 4-4, with respect to accuracy of capacity, d.c. leakage when dry, d.c. flash test, and efficacy of the sealing method employed, in protecting the capacitors against salt water immersion.

## ABSTRACT OF TEST

3. The capacity and d.c. leakage of the capacitors were measured at rated voltage when dry; the capacitors were subjected to a momentary d.c. overvoltage; and the efficacy of the seal in protecting the capacitors against salt water immersion was tested by measurement of the d.c. leakage after immersion in salt water. One of the capacitors which passed the test was cut open. A capacitor of the construction shown on the right in Plate 1 of reference (d) and which failed, was cut open to compare the construction of its terminals which are externally similar in appearance to those involved in the present test.

CONCLUSIONS

(a) These capacitors comply with the requirements of the specifications except as to dimensions.

(b) These capacitors are considered suitable for Naval use.

RECOMMENDATION

(a) It is recommended that this particular type of Potter capacitor be considered suitable for Naval use.

#### DESCRIPTION OF MATERIAL UNDER TEST

4. Six foil paper capacitors manufactured by the Potter Company and submitted by the Submarine Signal Company were tested. These capacitors have a rated capacity of 1 mfd. There was no voltage rating on the label. They do not conform to any of the dimensions specified in reference (b). The size of the metal case is 1-3/4 x 1-5/8 x 4-3/8 inches. The terminals are formed of rubber-insulated braid covered cable projecting from one end of the metal case through metal eyelets in insulating washers.

#### METHOD OF TEST

5. The capacity of the capacitors was measured with a 60 cycle microfarad meter.

6. The d.c. leakage of the capacitors was measured by the use of a microammeter at a potential of 350 volts with a protective resistance in series. (This potential was stated by the Bureau as the rated d.c. working voltage.)

7. Each condenser was given a d.c. flash test of 875 volts for 15 seconds between terminals and between each terminal and case.

8. The salt water immersion test to determine the efficacy of the seal in protecting the capacitors against deterioration from absorption of moisture consisted in soaking the units in a salt water solution at 50°C for 2 hours, transferring them to a similar solution at 0°C for 2 hours and then allowing them to remain in a third salt solution for 24 hours at room temperature. The capacitors were then thoroughly rinsed in fresh water, wiped dry and allowed to dry for 1 hour after which the d.c. leakage was again measured.

9. Two of the capacitors were heated gradually in salt water from room temperature to 60°C, rinsed and wiped dry, and allowed to dry 3 hours after which the d.c. leakage from terminal to terminal was again measured.

10. One of the capacitors which had passed the tests was opened and examined. Since the terminals of these capacitors are similar in outward appearance to those of the capacitor show at the right of Plate 1 of reference (d), both specimens of which had failed, one of those capacitors was opened for comparison of the terminal structure.

#### PROBABLE ERROR OF RESULTS

11. The measured capacity is believed to be accurate within 0.01 microfarad. The leakage current is believed accurate to within 0.05 microamperes.

#### RESULTS OF TEST

12. The initial numerals below refer to paragraphs of the specification, reference (b).

3-1. The material and workmanship appears to be excellent.

3-2. These capacitors are ruggedly constructed.

- 3-3. The capacitors comply with this paragraph.
- 3-4. The containers are of sheet iron with a protective coating, probably of tin. A black enamel outer coat peels off readily when the coating is once broken.
- 3-5. Two of the capacitors showed a few bubbles issuing at one terminal in the 50°C salt water immersion test. One of these, #6, which passed the salt water immersion test was opened several days later and at that time there was no evidence of salt water inside.
- 3-6. The flexible cable leads are not adapted to rigidly support a bare wire. The individual strands are tinned.
- 3-7. The terminal material met the requirement of this paragraph.
- 3-8. See comment on paragraph 3-5.  
The terminal bushings include a plate of laminated resin material cemented to the inside of the top of the container, and a pair of 11/16 inch washers on the outside, each fastened with an eyelet crimped on the inside. The conducting strands of the terminal leads substantially fill the hole of the eyelet and were sweated in with solder, the rubber insulation and braid covering ending at the outside of the eyelet.
- The terminals of the condenser of the construction shown on the right of Plate 1 of ref. (d) and cut open for comparison included an inner and outer washer fastened with an eyelet, but with the rubber insulated braid covered cable passing through the eyelet, the seal depending on the wax inside the case.
- 3-9. These capacitors do not conform in size or shape with dimensions given on sheets 9B, 10B or 11A of ref. (b), but are a distinctly different type as described in paragraph 4 above.
- 3-10. These capacitors do not comply with this paragraph; they have a paper label cemented to the case on which is stated capacity rating, type number, and name and address of manufacturer.
- 3-11. The two of these capacitors heated to 60°C gave no sign of bulging of the case nor of wax oozing out.
- 3-12. Each capacitor unit consisted of 2 sheets of foil, separated by 5 sheets of paper approximately 0.0005 inch thick, wound into a tight roll. The foil is laid in such a manner that the 2 sheets extend beyond the edges on opposite sides and the projecting edges of successive layers of each sheet are sweated together with solder. The roll is protected by approximately 8 turns of 0.0005 inch paper.

- 3-13,3-14. These capacitors comply with these paragraphs.
- 3-15. These capacitors have 5 sheets of paper 0.0005 inch thick as the dielectric.
- 3-16. Only one of these capacitors was opened. It complied substantially with the requirement of this paragraph.
- 3-17. In the one capacitor opened, there was no indication of corrosion by the impregnating compound on case, leads or foil.
- 4-1,4-2,4-3. All of these condensers met the requirements as to capacity, leakage prior to immersion, and d.c. flash test. Measured capacity and leakage are given in Table 1.
- 4-4. One out of six capacitors tested failed to pass the salt water immersion test, there being a short circuit between terminals and from each terminal to case. A deposit of salt on one lead next the terminal connection appeared after several days, indicating evaporation of water from within the case.
- 4-5. The accelerated life test was not made.

#### CONCLUSIONS

13. These capacitors comply with the requirements of the specifications except as to dimensions.
14. These capacitors are considered suitable for Naval use.

TABLE NO. 1

Measured capacity, and D. C. Leakage of  
Potter Capacitors, No. 8260.

Sample No.	Capacity Microfarads	D.C. Leakage, Microamperes			
		Between Terminals*		Terminals to Case - After Immersion	
		Before Immersion	After Immersion	Left Terminal to can	Right Terminal to can
1	1.005	0.04	0.06	0.05	0.06
2	1.000	0.10	Shorted	Shorted	Shorted
3	.998	0.16	0.17	0.00	0.00
4	.983	0.14	0.18	0.03	0.03
5	.990	0.12	0.10	0.02	0.02
6	1.005	0.13	0.20	0.01	0.01

\*Specification limit before immersion, 0.8 microamps per mfd.  
Specification limit after immersion, 2.0 microamps per mfd.