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NAVY DEPARTMENT
BUREAU OF ENGINEERING

REPORT

ON

Test of Clear Bakelite.

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

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AUTHORIZATION FOR TEST

1. This problem was authorized by Bureau letter, reference (a).

Ref. (a) Bu.Eng. letter L5/NPL4(2-12-Ds) of
27 March 1934.

OBJECT OF TEST

2. The object of this test is to determine the suitability of this product for use as windows for instrument dials in the Naval Service.

ABSTRACT OF TEST

3. The bakelite was tested for the effect of exposure to weather lubricating oil, and salt water. These tests included measurements of oil and water absorption and optical transmissions within the visible spectrum.

CONCLUSIONS

(a) Although the tests show that the samples of bakelite were not appreciably damaged by exposure to weather, salt water and oil baths, it is not considered suitable for use as windows for instrument dials. The material is soft and easily damaged, and once scratched, the surface becomes frosted and the transmission of light is greatly reduced.

RECOMMENDATIONS

(b) That clear bakelite as submitted be not approved for use as windows for instrument dials in the Naval Service.

DATA REPORTED DURING THE TEST

6. Photographs of the tested specimens are shown on Plate 1.

7. The optical transmission curves of samples tested after exposure to weather, salt water and oil baths, are given by Plates 2 and 3.

8. An optical transmission curve of clear glass 2 mm thick is given for comparison purposes on Plate 3, Curve 3.

RESULTS OF TEST

9. With the eye the samples of bakelite subjected to the tests described in this report did not materially change. There was a gain of 0.1% in weight in sample #1 when immersed in salt water, and a loss of weight of 0.05% in sample #2 when immersed in oil.

10. The sample #3 subjected to the weather showed no change in appearance. There was also a small change in the optical transmission characteristics of the different samples. It would appear from an examination of curves 1, 2, 3, and 4 on Plates 2 and 3, that the optical transmission is improved in those samples, 1 and 2, subjected to salt water and oil baths at 150 degrees F. This may be the case, as bakelite in general, as it comes from the manufacturer, is optically not homogeneous and heat treatment may improve the homogeneity of the material.

11. As a result of subjecting the samples of bakelite to the respective tests, and in the handling in the laboratory, the following

DESCRIPTION OF MATERIAL UNDER TEST

4. This material is standard clear transparent bakelite.

METHOD OF TEST

5. Four pieces were cut from the sample submitted for test. Sample #1 was submerged in salt water at a temperature of 150°F for 15 hours. Sample #2 was placed in an oil bath at a temperature of 150°F for 15 hours. No very marked change was noted in the appearance of the bakelite. Sample #3 was exposed to the weather and sun light for over a period of more than a year and again no marked change was noted. Sample #4 was not subjected to any test, but kept in the laboratory as a comparison specimen.

6. The optical transmission of the visible range of the spectrum of all four samples was measured by means of a Bausch and Lomb spectro photometer. The results are exhibited by plates 2 and 3 together with the transmission characteristics of a piece of plate glass 9 mm thick for comparison.

7. Samples 1 and 2 were weighed before the immersion in salt water, and oil, and were again weighed when taken from the bath. A change was noted in the weights which is discussed more fully at another place in the report.

DATA RECORDED DURING THE TEST

8. Photographs of the tested specimens are shown on Plate 1.

9. The optical transmission curves of samples tested after exposure to weather, salt water and oil baths, are given by Plates 2 and 3.

10. An optical transmission curve of clear glass 9 mm thick is given for comparison purposes on Plate 3, Curve 5.

RESULTS OF TEST

11. While to the eye the samples of bakelite subjected to the tests described in this report did not materially change, there was a gain of 0.3% in weight in sample #1 when immersed in salt water, and a loss of weight of 0.05% in sample #2 when immersed in oil.

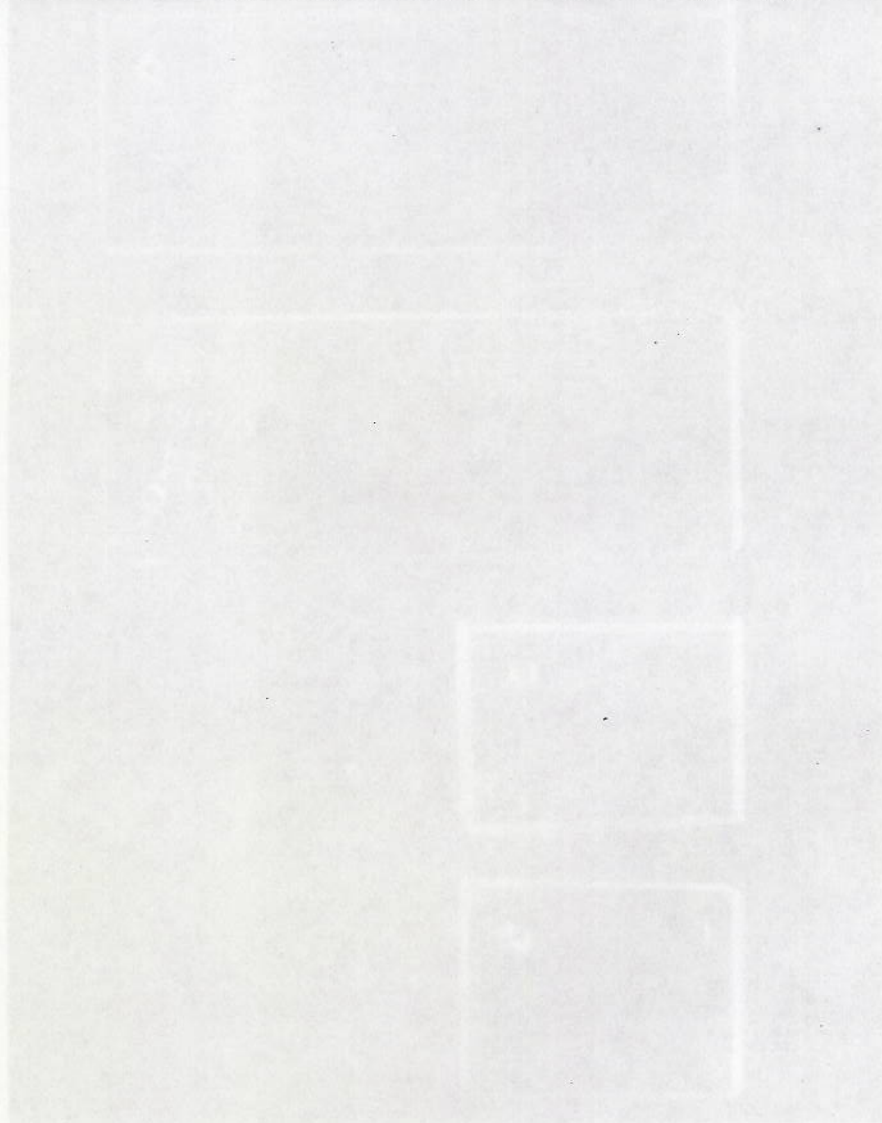
12. The sample #3 subjected to the weather showed no change in appearance. There was also a small change in the optical transmission characteristics of the different samples. It would appear from an examination of curves 1, 2, 3, and 4 on Plates 2 and 3, that the optical transmission is improved in those samples, 1 and 2, subjected to salt water and oil baths at 150 degrees F. This may be the case, as bakelite in general, as it comes from the manufacturer, is optically not homogeneous and heat treatment may increase the homogeneity of the material.

13. As a result of subjecting the samples of bakelite to the respective tests, and to the handling in the laboratory, the polished

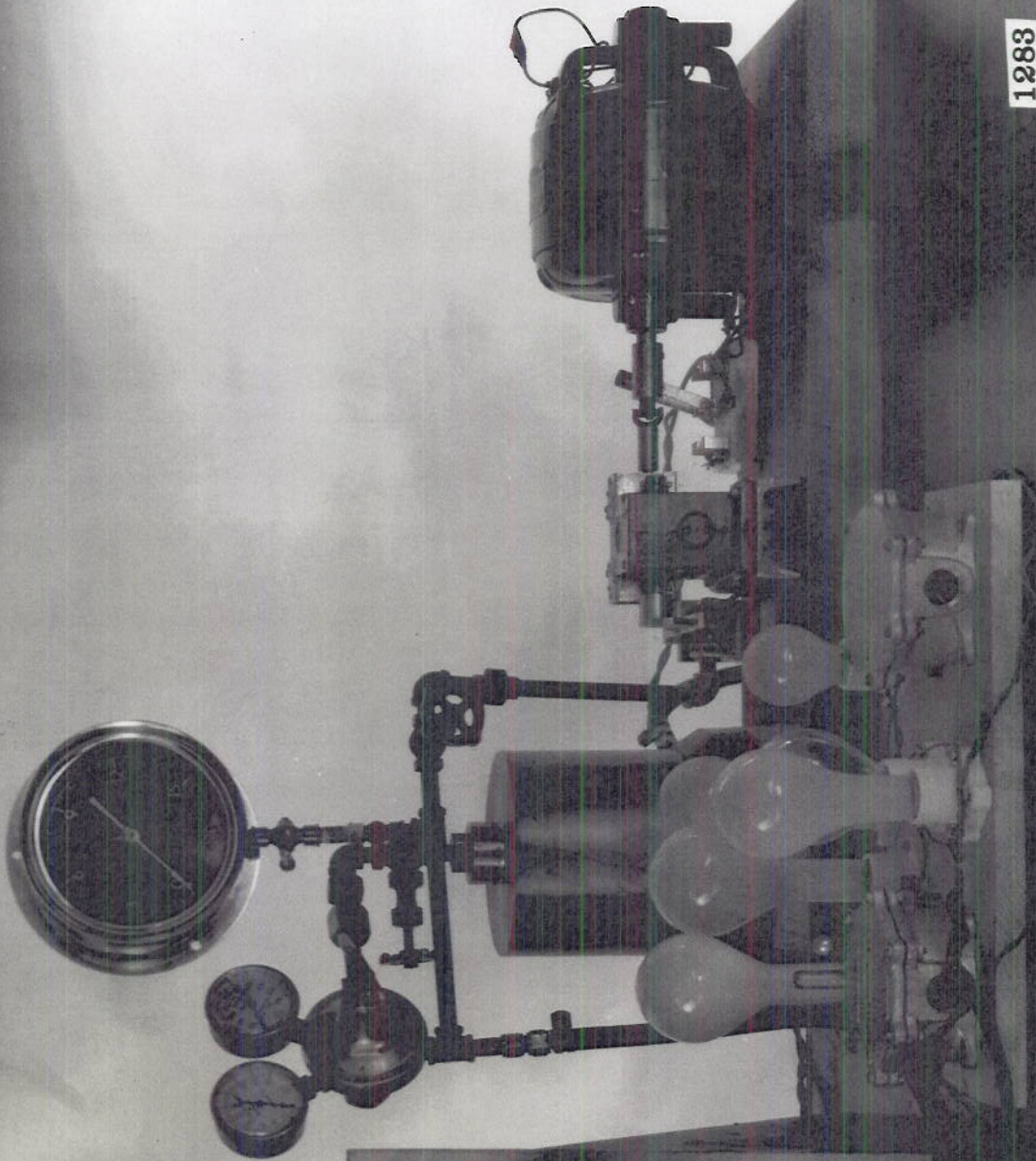
surfaces became easily scratched which resulted in poor optical surfaces with a resulting decrease in the transmission characteristics.

CONCLUSIONS

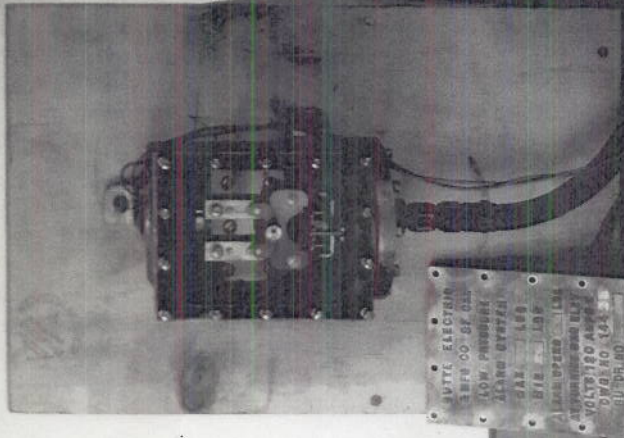
14. Although the tests show that the samples of bakelite were not appreciably damaged by exposure to weather, salt water and oil baths, it is not considered suitable for use as windows for instrument dials. The material is soft and easily damaged, and once scratched the surface becomes frosted and the transmission of light is greatly reduced.



1
2
3
4
1-SALTWATER TEST
2-OIL TEST
3-EXPOSED TO WEATH
4-UNEXPOSED TO WEATH



1283



WATTS ELECTRIC
3000 CO. ST. LOUIS
LOW PRESSURE
ALUM. BRASS
SER. 1169
SIZE 3 1/2"
APPROXIMATE MAX. WEIGHT
VOLTS 110 AMPERE
0.90 1.00 1.25
10 20 30 40

SET 2 1 1904

PLATE I

SAMPLES OF BAKELITE 12 MM. THICK

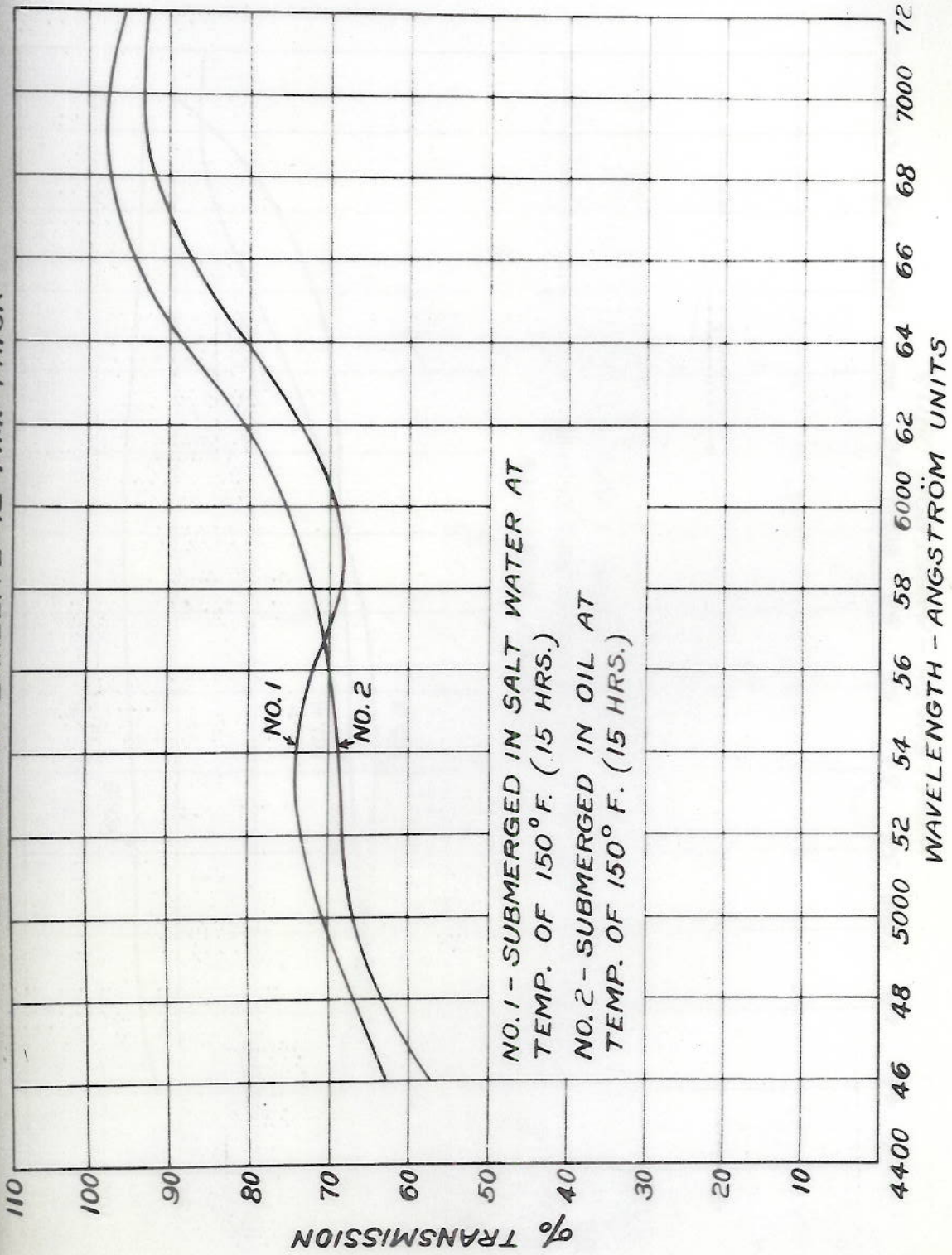


PLATE 2

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