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DATE 10 January 1963

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ELECTRICAL POTTING COMPOUNDS - SURFACE AND

VOLUME RESISTIVITY AT ELEVATED

TEMPERATURES FOR PROTRACTED TIMES

(PHASE I: PHYSICAL TESTS)

REPORT 9353 SERIAL NO. 19

MCDONNELL AIRCRAFT CORPORATION

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INDEX

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SYSTEMS LABORATORYPROGRESS REPORT NO. 1ELECTRICAL POTTING COMPOUNDS - SURFACE AND VOLUME RESISTIVITY
AT ELEVATED TEMPERATURES FOR PROTRACTED TIMESABSTRACT

Various electrical and electronic systems have circuitry which must have high impedance separation of non-connecting circuits in order to function properly. Additional requirements are that these systems must function at elevated temperatures for protracted times and must also be moisture-proof. This last requirement necessitates the use of a potting compound.

Observations of potting compounds in current use, ostensibly suitable for operation at 300F, indicate that this rating is, at best, optimistic.

Volume and surface resistivity specimens and connector specimens were fabricated from four different potting compounds, Pro-Seal 777, PR-1525, EC-1663, and RTV-60. The specimens were tested electrically by D-255 while being exposed to 300 and 500F for protracted times and results will be reported by D-255.

After exposure to 300F for a period of 300 hours the Pro-Seal 777 and the PR-1525 specimens had charred and reverted to a resinous material. Exposure to 500F for a period of 1000 hours had no effect on the RTV-60 specimens other than a reduction in hardness. EC-1663 specimens suffered localized hardening and shrinkage, but were otherwise unaffected by heating at 500F for 1000 hours.

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LABORATORY REPORTPAGE 2REPORT 9353**PROGRESS REPORT NO. 1****1. INTRODUCTION**

This progress report is concerned with the production and physical testing of the specimens which were then tested electrically by Department 255. This report completes the work which was required to be done by Department 252. Department 255 will issue a final report of electrical tests.

2. OBJECT

To determine the electrical and physical properties of potting compounds that must be capable of continuous operation at elevated temperatures.

3. TEST SPECIMENS AND PREPARATION

Volume and surface resistivity specimens were prepared from each of the four materials to be tested. The specimens were 4.0 inches in diameter and 0.125 inch thick as is prescribed in Reference A.

Twenty-four volume and surface resistivity specimens were prepared from Pro Seal No. 777 material. Six each of these specimens were cured according to the four different cure schedules set forth in Table 4, page 10.

Eighteen volume and surface resistivity specimens were prepared from Product Research's PR 1525 material. Six each of these specimens were cured according to the three cure schedules presented in Table 4.

All connectors were fitted with 20 gage MIL-W-16878 Type E (Teflon) hook-up wire, which had been tetra-etched per MAC P.S. 17165 prior to installation in the connector.

Two Bendix connectors were potted with Pro Seal 777, in accordance with MAC P.S. 17171, and cured according to schedule 5.1.1.3 listed in Table 4. The connector and wires had previously been primed with Pro Seal 777P.

Two Bendix connectors were potted with Product Research's PR 1525 compound using techniques of MAC P.S. 17171 and cured in accordance with schedule 5.1.2.2 presented in Table 4. The connector and wires had been primed with one coat of PR 1521, air dried at room temperature for thirty minutes, followed by one coat of PR 1522, also air dried thirty minutes.

Two Bendix and two Cannon connectors were cleaned and primed with 3M's EC 1694 in accordance with MAC P.S. 17172. The primer was cured two hours at room temperature with the relative humidity at 50% minimum.

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3. TEST SPECIMENS AND PREPARATION (cont'd.)

Two Bendix and two Cannon connectors were cleaned per MAC P.S. 17172 and primed with Hughson Chemical Company EX-B579-1 primer per MAC P.S. 17311. The primer was cured two hours at room temperature.

One Bendix and one Cannon connector with each of the different primer systems (a total of four connectors) were potted according to MAC P.S. 17171 with 3M's EC1663 compound. The material was cured according to schedule 5.1.3 listed in Table 4.

The remaining four connectors were potted with G. E.'s RTV-60 in accordance with MAC P.S. 17171. The RTV-60 was cured according to schedule 5.1.4, listed in Table 4.

Figure 1, page 12, is a photograph of typical volume and surface resistivity specimens before testing. Figures 2 and 3, pages 13 and 14, are photographs of typical potted Bendix and Cannon connectors, respectively.

4. TEST PROCEDURE

The electrical testing was performed by Department 255 in accordance with Reference A and will be reported separately.

The Shore A hardness tests were conducted in accordance with Reference b. The apparent adhesion was tested by gently rotating and flexing the connector wires while observing the wire-potting junction for loss of adhesion.

5. TEST RESULTS

The results of the electrical tests will be presented in the Final Report, to be written by Department 255 upon conclusion of their test work.

Gentle flexing of the connector wires produced no loss of wire-potting adhesion in any of the connector specimens.

The results of Shore A hardness tests are presented in Table 1 and 2, pages 7, and 8.

Figures 4 and 5, pages 15 and 16, are photographs of the volume and surface resistivity specimens after testing at various temperatures as prescribed in Table 5, page 11. Figure 6, page 17, is a photograph of the connector specimens after testing as prescribed in Table 5, page 11.

PROGRESS REPORT NO. 1**5. TEST RESULTS (cont'd.)**

Figure 7, page 18, is a photograph of typical PR 1525 and Pro-Seal 777 specimens after having been tested at 300F for 300 hours. Figure 8, page 19 is a photograph of a Pro-Seal 777 specimen that had reverted to a liquid material after being tested 300 hours at 300F.

Figure 9, page 20, is a photograph of two Bendix connectors, one potted with Pro-Seal 777, the other potted with PR 1525, after having been tested at 300F for 300 hours.

Figure 10, page 21 is a photograph of typical EC 1663 and RTV-60 volume and surface resistivity specimens after having been tested for 1000 hours at 500F. Figure 11, page 22, is a photograph of the Cannon connectors potted with EC 1663 and RTV-60 after having been tested for 1000 hours at 500F.

6. DISCUSSION OF RESULTS

The hardness of many of the Pro-Seal 777 specimens and some of the PR 1525 specimens could not be obtained after life testing 300 hours at 300F. The results that were obtained are thought to be of dubious value since the hardness value varied widely across the specimen, due to charring and reversion of the material.

Most of the Pro-Seal specimens that were life-tested for 300 hours at 300F reverted to a sticky, high viscosity material. The larger part of the PR 1525 specimens charred to a brittle, rigid mass, however, there was some reversion of this material also. The charring of these materials is natural and understandable, however, the mechanism causing these materials to revert to the characteristics of the uncured polymer is not immediately obvious.

The connector specimens, potted with Pro-Seal 777 and PR 1525, darkened and charred. Reversion of the material was not evident, but the connector specimens were not cut open and examined extensively.

The volume and surface resistivity specimens, that were fabricated from EC 1663, and were life-tested 1000 hours at 500F, survived this testing in fairly good shape except for some hardening and shrinking in a small spot in the center of the specimens. The shrinkage actually formed a small void, approximately 0.3 inch in diameter, in the center of the specimens. The hardness of the EC 1663 specimens increased slightly after having been life-tested.

The RTV-60 specimens survived the life-tests in excellent condition, there was no apparent physical damage other than a decrease in hardness.

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LABORATORY REPORTPAGE 5REPORT 9353**PROGRESS REPORT NET 1****6. DISCUSSION OF RESULTS (cont'd.)**

The Cannon connectors potted with EC 1663 and ~~RTV-60~~ were in good condition after having been life-tested 1000 hours at 500F. The EC 1663 material seemed to have shrunk slightly, but no other harmful effects were observed.

The adhesion of all the potting materials to the etched Teflon wire withstood gentle flexing and rotation without failure, however, no effort was made to fail the wire-potting junction so these results cannot be taken as a true measure of the relative adhesive qualities of these materials. Reference C presents more complete adhesion data for these potting compounds.

The PR 1525 material is very difficult to mix and to use. The resin portion must be degassed before mixing and the curing agent must be melted. After mixing, the material has a tendency to gas excessively, and is therefore very difficult to evacuate.

Pro-Seal 777, PR 1525, and EC 1663 specimens were not sufficiently cured to remove from the molds after curing at 75F for 48, 72, and 24 hours (respectively), the prescribed room temperature curing times. RTV-60 was cured sufficiently to be removed from the mold after 24 hours at 75F.

7. CONCLUSIONS

Pro Seal 777 and PR 1525 char and revert to resinous material after exposure to 300F for 300 hours and are therefore unsuitable for use under these conditions.

EC 1663 and RTV 60 withstand heating at 500F for 1000 hours with little damage, however, RTV 60 is somewhat superior to EC 1663.

PR 1525 would be a very difficult material to handle in production.

8. RECOMMENDATION

If RTV 60 is selected for production use, the mixing of the material would be expedited and simplified by the use of one of the ~~paste~~ catalysts since it is rather difficult to measure the small amount of liquid catalyst that is required.

REFERENCES

Reference a - ASTM D257-61
Reference b - ASTM D676-59T
Reference c - TR 513-246.01
MAC P.S. 17171
MAC P.S. 17311
MAC P.S. 17165

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PROGRESS REPORT NO. 1**LIST OF EQUIPMENT AND INSTRUMENTS**

Equipment and instruments used in this test are listed below.
Applicable calibration records are available for inspection.

<u>Item</u>	<u>Manufacturer and Model Number</u>	<u>Serial or Laboratory Number</u>
Air Circulating Oven	Grieve-Hendry Model HX500	MAC A-40255-51
Hardness Tester "A"	Shore Instrument Co.	MAC 90-1-72
Micrometer 0-1 Inch	Brown and Sharpe	- - -
Sealant Gun	Semco Research Co.	- - -

LIST OF MATERIALS USED

<u>Item</u>	<u>Manufacturer</u>
PR 1521 (newly purchased)	Products Research Corporation
PR 1522 (newly purchased)	Products Research Corporation
PR 1525A - Lot A-89121 (newly purchased)	Products Research Corporation
PR 1525B - Lot B-Y-16 (newly purchased)	Products Research Corporation
Pro-Seal 777 (MAC stock)	Coast Pro-Seal and Mfg. Company
Pro-Seal 777P (MAC stock)	Coast Pro-Seal and Mfg. Company
RTV 60 Lot 451 (newly purchased)	General Electric Company
EC 1694 Lot 8F1C(MAC stock)	3M Company
EC 1663A - Lots 751D1C and 85 H1C (MAC stock)	3M Company
EX-B579-1 (MAC stock)	Hughson Chemical Company
Connector, Pygmy, (PT series) (PT01CP-12-10S)	Bendix
Connector, CA3106HR-10SL-48	Cannon
RAM No. 225 release	Garan Chemical Company

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TABLE 1

SPECIMENS TESTED AT VARIOUS TEMPERATURES $\pm$

SYSTEM AND CURE	NO.	THICKNESS (IN)	HARDNESS*		MATERIAL DATE		
			BEFORE TEST	AFTER TEST	USE BEFORE	MFG	USED
PROSEAL 777, CURE - 5.1.1.1	1	0.128	68	46-58	7-17-61		7-5-61
	2	0.127	64-66	36-48	7-17-61		7-5-61
	3	0.128	67-68	38-48	7-17-61		7-5-61
PRO-SEAL 777, CURE - 5.1.1.2	1	0.124	66-68	45-55	7-24-61		7-13-61
	2	0.125	47-48	50-63	7-24-61		7-13-61
	3	0.122	67-68	45-60	7-24-61		7-13-61
PRO-SEAL 777, CURE - 5.1.1.3	1	0.127	65-69	50-55	7-17-61		7-5-61
	2	0.128	68-69	45-60	7-17-61		7-5-61
	3	0.127	67-69	45-55	7-17-61		7-5-61
PRO-SEAL 777, CURE - 5.1.1.4	1	0.123	64-65	58-60	9-11-61		8-29-61
	2	0.119	63-65	56-60	9-11-61		8-29-61
	3	0.122	65-66	56-60	9-11-61		8-29-61
PR-1525, CURE - 5.1.2.1	1	0.140	64-65	65-85		2-61	6-30-61
	2	0.134	63-64	75-85		2-61	6-30-61
	3	0.141	63-65	70-90		2-61	6-30-61
PR-1525, CURE - 5.1.2.2	1	0.121	30-34	60-70		7-61	8-25-61
	2	0.126	30-33	60-65		7-61	8-25-61
	3	0.124	37-38	60-75		7-61	8-25-61
PR-1525, CURE - 5.1.2.3	1	0.125	52-55	60-65		7-61	8-25-61
	2	0.124	54-56	65-65		7-61	8-25-61
	3	0.123	52-56	65-65		7-61	8-25-61
EC-1663, CURE - 5.1.3	1	0.124	54-56	30-45	12-61		9-1-61
	2	0.124	54-55	38-45	12-61		9-1-61
	3	0.125	54-55	33-45	12-61		9-1-61
RTV-60, CURE - 5.1.4	1	0.125	66-68	30-48	1-1-62		9-1-61
	2	0.123	66-68	40-48	1-1-62		9-1-61
	3	0.123	66-68	33-47	1-1-62		9-1-61

* SHORE A $\pm$ As shown in Table 5

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TABLE 2

LIFE TEST AT ELEVATED TEMPERATURES

SYSTEM AND CURE	NO.	THICKNESS (IN.)	HARDNESS *		MATERIAL DATE		
			BEFORE TEST	AFTER TEST	USE BEFORE	MFG	USED
PRO-SEAL 777, CURE-5.1.1.1	1	0.127	67-68	UNABLE	7-17-61		7-5-61
	2	0.130	66-67	TO OBTAIN	7-17-61		7-5-61
	3	0.124	67-68	TEST	7-17-61		7-5-61
PRO-SEAL 777, CURE-5.1.1.2	1	0.128	64-65	UNABLE	7-24-61		7-13-61
	2	0.124	65-66	TO OBTAIN	7-24-61		7-13-61
	3	0.128	64-65	TEST	7-24-61		7-13-61
PRO-SEAL 777, CURE-5.1.1.3	1	0.126	66-67	53-55	7-17-61		7-5-61
	2	0.126	65-67	49-59	7-17-61		7-5-61
	3	0.126	66-67	50-58	7-17-61		7-5-61
PRO-SEAL 777, CURE-5.1.1.4	1	0.122	65-66	UNABLE	9-11-61		8-29-61
	2	0.125	64-66	TO OBTAIN	9-11-61		8-29-61
	3	0.126	65-66	TEST	9-11-61		8-29-61
PR-1525, CURE-5.121	1	0.135	65-66	25-35		7-61	12-14-61
	2	0.123	72-73	25-36		7-61	12-14-61
	3	0.124	72-73	25-35		7-61	12-14-61
PR-1525, CURE-5.122	1	0.126	69-71	UNABLE		7-61	9-15-61
	2	0.125	70-71	TO OBTAIN		7-61	9-15-61
	3	0.125	67-68	TEST		7-61	9-15-61
PR-1525, CURE-5.123	1	0.125	69-71	40-70		7-61	9-15-61
	2	0.128	69-70	UNABLE TO OBTAIN TEST		7-61	9-15-61
	3	0.125	66-67	45-65		7-61	9-15-61
EC-1663, CURE-5.1.3	1	0.121	57-58	55-60	12-15-61		12-8-61
	2	0.123	49-50	55-60	12-15-61		12-8-61
	3	0.127	48-49	56-60	12-15-61		12-8-61
RTV-60, CURE-5.1.4	1	0.125	60-62	53-57	1-1-62		12-8-61
	2	0.123	62-63	51-53	1-1-62		12-8-61
	3	0.127	62-63	51-54	1-1-62		12-8-61

* SHORE A

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TABLE 3
POTTED CONNECTORS

POTTING COMPOUND AND CURE	PRIMER	CONNECTOR	MATERIAL DATE		
			USE BEFORE	MFG.	USED
PRO-SEAL 777, CURE- 5.2.1	PRO-SEAL 777P	BENDIX PYGMY	12-28-61		12-14-61
PR. 1525, CURE- 5.2.2	PR. 1521 & PR. 1522	BENDIX PYGMY		7-61	9-15-61
EC-1663, CURE- 5.2.3(a)	EC-1694	BENDIX PYGMY	12-15-61		12-8-61
EC-1663, CURE- 5.2.3(b)	EX-B579-1	BENDIX PYGMY	12-15-61		12-8-61
RTV-60, CURE- 5.2.4(a)	EX-B579-1	BENDIX PYGMY	1-1-62		12-8-61
RTV-60, CURE- 5.2.4(b)	EC-1694	BENDIX PYGMY	1-1-62		12-8-61
EC-1663, CURE- 5.3.1	EC-1694	CANNON CA3106HR-10SL-45	12-15-61		12-8-61
EC-1663, CURE- 5.3.2	EX-B579-1	CANNON CA3106HR-10SL-45	12-15-61		12-8-61
RTV-80, CURE 5.3.3	EX-B579-1	CANNON CA3106HR-10SL-45	1-1-62		12-8-61
RTV-80, CURE- 5.3.4	EC-1694	CANNON CA3106HR-10SL-45	1-1-62		12-8-61

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TABLE 4

MATERIAL	CURE CODE*	CURE SCHEDULE
PROSEAL 777	5.1.1.1	MINIMUM OF 48 HRS. AT ROOM TEMPERATURE
PROSEAL 777	5.1.1.2	MINIMUM OF 24 HRS. AT ROOM TEMPERATURE FOLLOWED BY 4 HRS. AT 180°F
PROSEAL 777	5.1.1.3	MINIMUM OF 5½ HRS. AT 180°F
PROSEAL 777	5.1.1.4	MINIMUM OF 5½ HRS. AT 220°F
PR 1525	5.1.2.1	MINIMUM OF 72 HRS. AT ROOM TEMPERATURE
PR 1525	5.1.2.2	MINIMUM OF 3 HRS. AT 180°F
PR 1525	5.1.2.3	MINIMUM OF 16 HRS. AT 180°F
EC 1553	5.1.3	MINIMUM OF 24 HRS. AT ROOM TEMPERATURE AND A MINIMUM OF 50% RELATIVE HUMIDITY FOLLOWED BY 10 HRS. AT 180°F
RTV-30	5.1.4	MINIMUM OF 24 HRS. AT ROOM TEMPERATURE AND A MINIMUM OF 50% RELATIVE HUMIDITY FOLLOWED BY 10 HRS. AT 180°F

* Cure code numbers taken from original T.R. to maintain clarity

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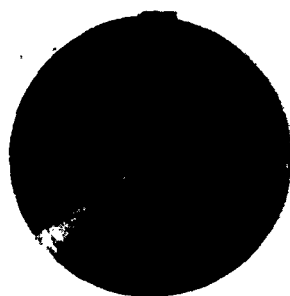
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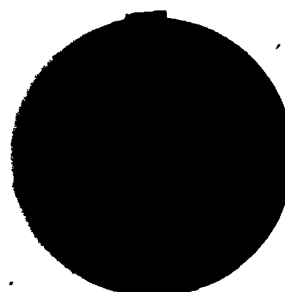
PAGE 11REPORT 9353**PROGRESS REPORT NO. 1***TABLE 5*

<i>Potting Material</i>	<i>Curing Method</i>	<i>Test Temperatures °F</i>
<i>Pro-Seal 777</i>	<i>5.1.1.1</i>	<i>These Specimens were tested at room temperature, 100-150-200-250-300- and 350 after a one hour soak at each temperature</i>
<i>Pro-Seal 777</i>	<i>5.1.1.2</i>	
<i>Pro-Seal 777</i>	<i>5.1.1.3</i>	
<i>Pro-Seal 777</i>	<i>5.1.1.4</i>	
<i>PR-1525</i>	<i>5.1.2.1</i>	
<i>PR-1525</i>	<i>5.1.2.2</i>	
<i>PR-1525</i>	<i>5.1.2.3</i>	
<i>EC-1663</i>	<i>5.1.3</i>	<i>These specimens tested at room temperature, 100, 200, 300, 400, 500 and 600</i>
<i>RTV 60</i>	<i>5.1.4</i>	

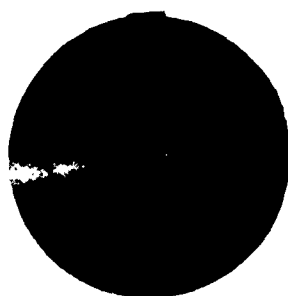
TYPICAL SURFACE AND VOLUME
RESISTIVITY SPECIMENS
(BEFORE TEST)



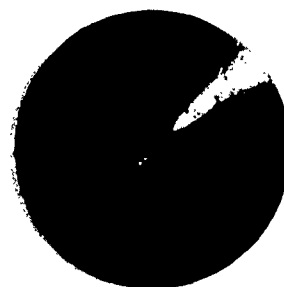
PRO-SEAL 777



RTV 60



EC-1663



PR-1525

POTTED BENDIX PYGMY CONNECTORS

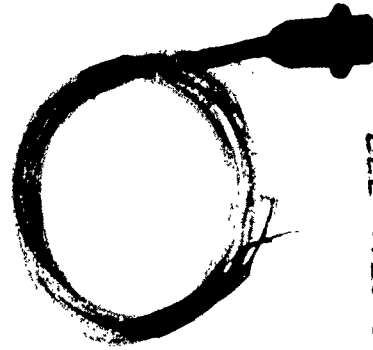
(BEFORE TEST)



RTV 60



EC-1663

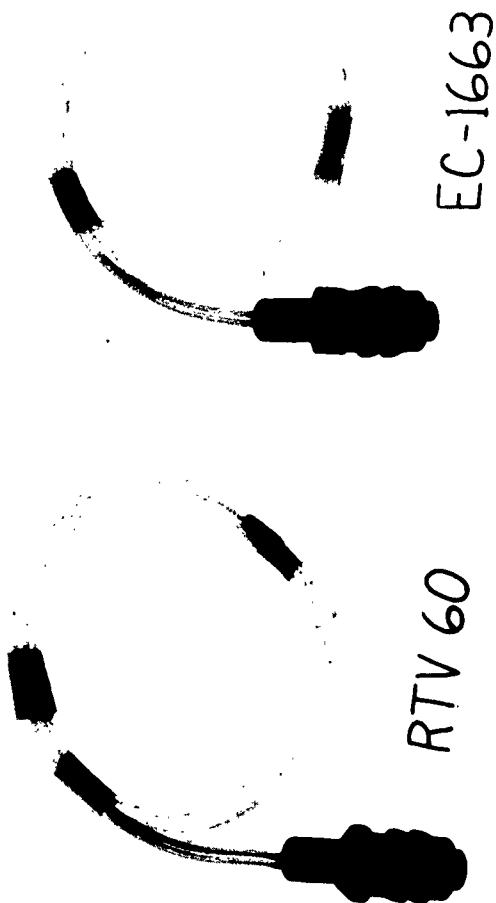


PRO-SEAL 777



PR-1525

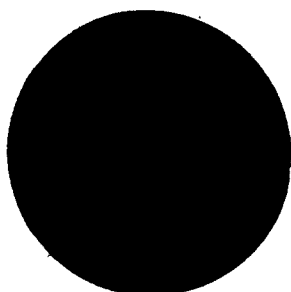
POTTED CANNON CONNECTORS
(BEFORE TEST)



TYPICAL SURFACE AND VOLUME RESISTIVITY SPECIMENS

(AFTER TEST)

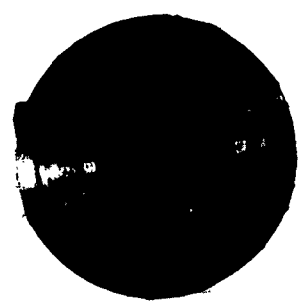
PRO-SEAL 777



4 HR AT RT
10 OVEN CURE



24 HR AT RT
4 HR AT 180 F

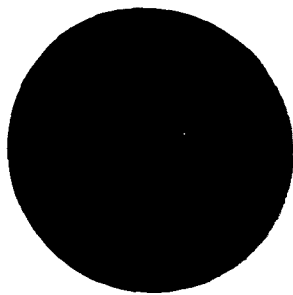


10 HR AT RT
4 HR AT 180 F

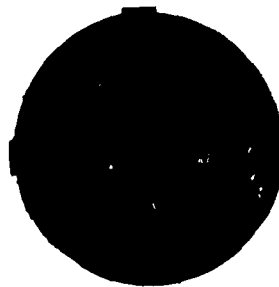
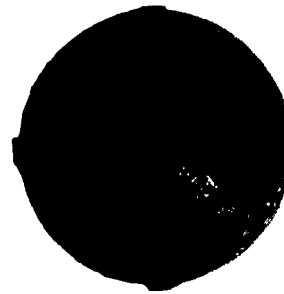


NO RT CURE
5 1/2 HR AT 220 F

TYPICAL SURFACE AND VOLUME RESISTIVITY SPECIMENS (AFTER TEST)

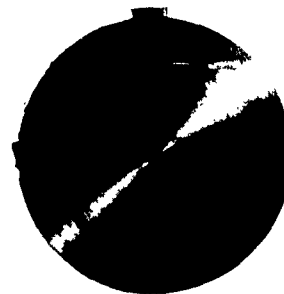


PR-1525



EC-1663

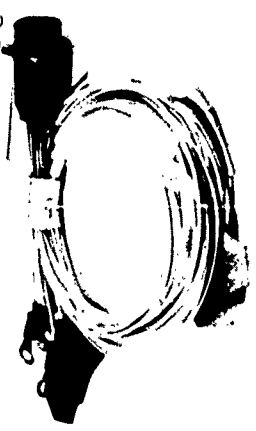
24 hr. AT RT
10 hr. AT 180°F



RTV 60

24 hr. AT RT
10 hr. AT 180°F

REPAIR
SPECIMENS
AFTER TEST AT
VARIOUS TEMPERATURES



RTV-60



PROSEAL 777



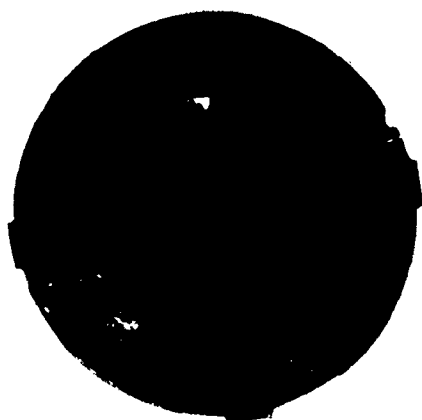
EC-1663



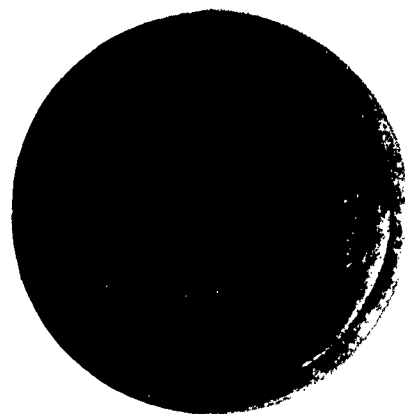
PR 1500

TYPICAL SURFACE AND VOLUME RESISTIVITY SPECIMENS

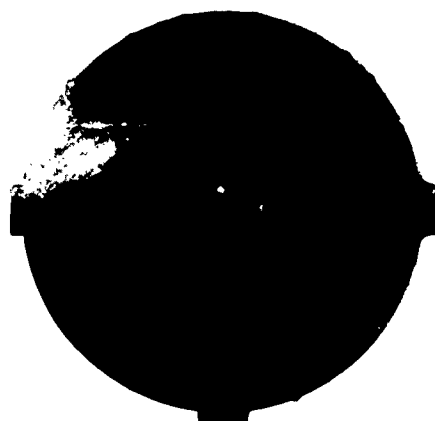
AFTER LIFE TEST
300 HRS. AT 300°F



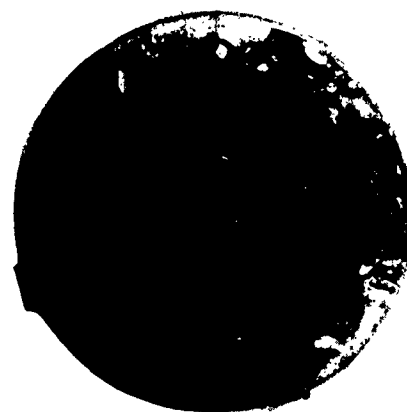
PR 1525
CURE 7 HRS AT 180°F



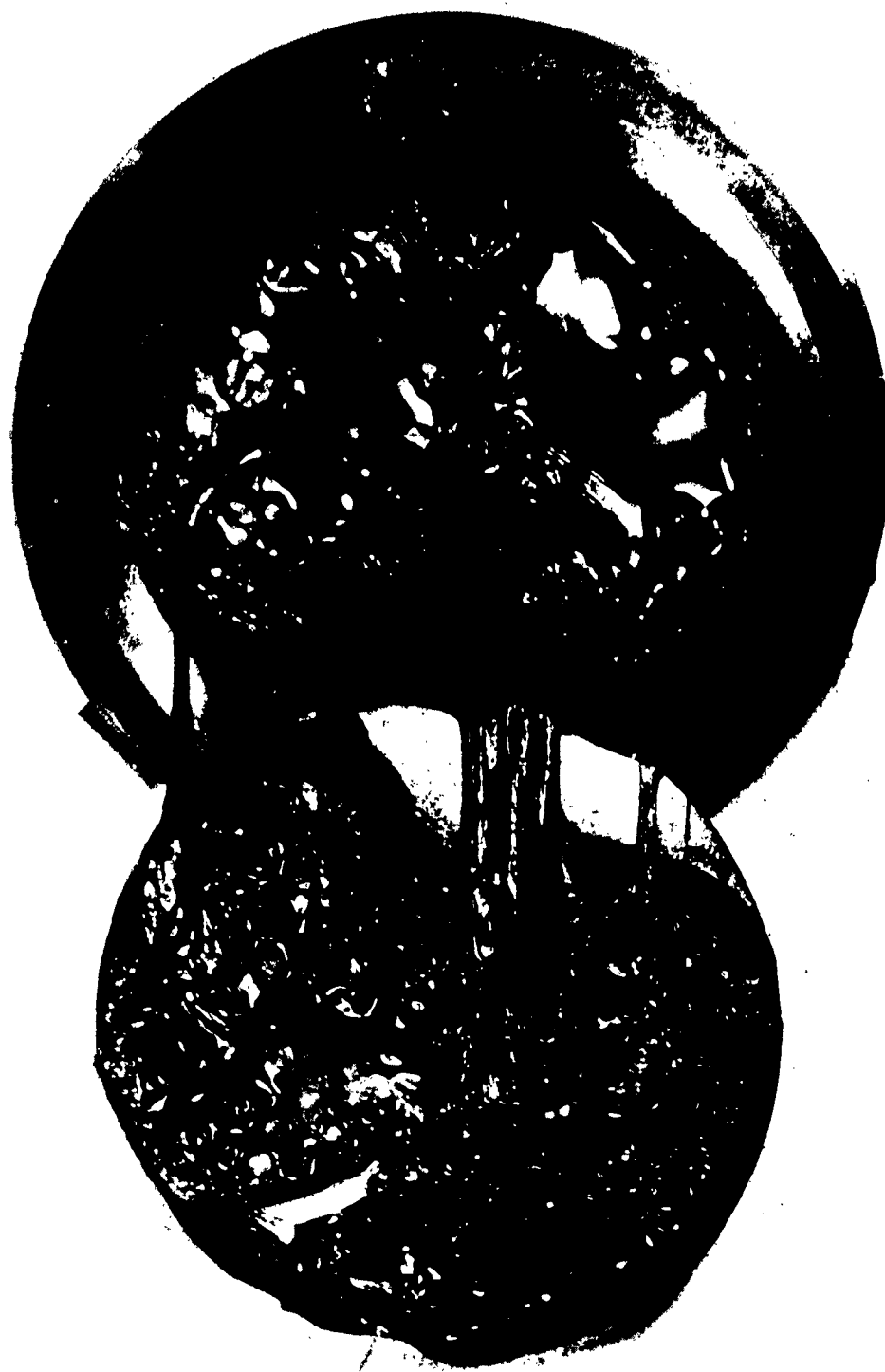
PR 1525
ROOM TEMP CURE



PROSEAL 777
CURE 5 1/2 HRS. AT 180°F



PR 1525
CURE 16 HRS AT 180°F



COLLECTOR
SPECIMENS

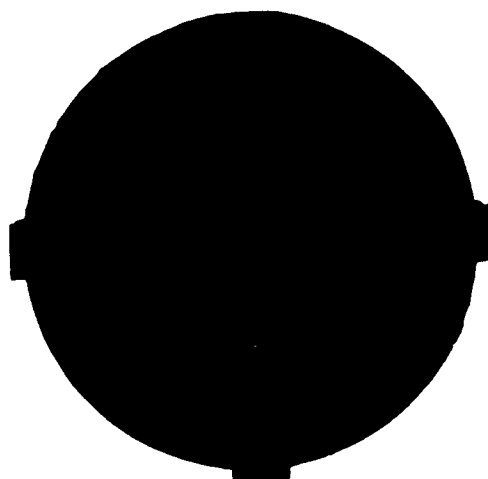
WATER LIFE TEST
120 HRS. AT 300F

120 HRS.

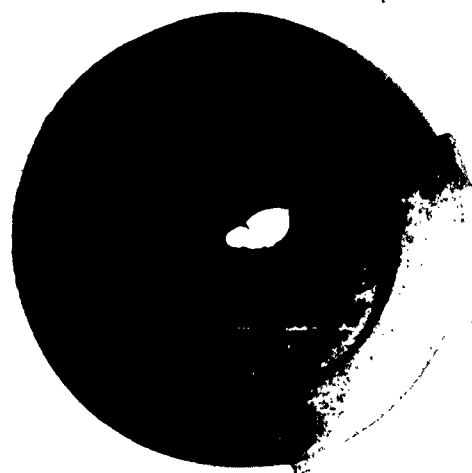
PROSEN 777

TYPICAL SURFACE AND VOLUME RESISTIVITY SPECIMENS

AFTER LIFE TEST
1000 HRS. AT 500°F



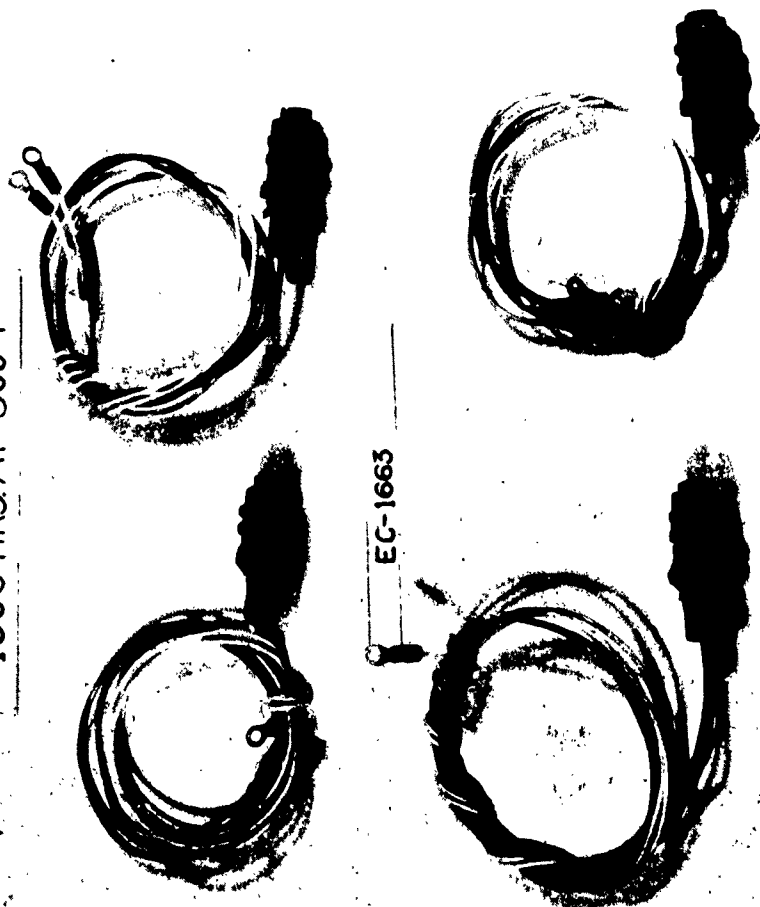
RTV-60



EC-1000

CONNECTOR
SPECIMENS

AFTER LIFE TEST
1000 HRS AT 500°F



EC-1663

RTV-60

L/9

FORM 100-1 (Rev. 1-61)

PAGE 1 OF 6

TEST REQUEST

TITLE ELECTRICAL POTTING COMPOUNDS SURFACE AND VOLUME
RESISTIVITY AT ELEVATED TEMPERATURES FOR PROTRACTED
TIMES

LABORATORY OR DEPT. RESPONSIBLE FOR TEST

Dept. 655 DB/EMP/4.1-61

MODEL

Misc.

TEST PARTS ON IEM ☐ ON TPL NO.

APL/EL

PRODUCTION PARTS FOR TEST NOT REQUIRED ☒

None

WORK REQUESTED

OBJECTIVE (GIVE PURPOSE OF TEST, WORK AND DATA REQUIRED,
INCLUDING SERVICE HISTORY AND BACKGROUND INFORMATION)

1.0 OBJECT:

To determine the electrical and physical properties of
potting compounds that must be capable of continuous
operation at elevated temperatures.

2.0 HISTORY:

Recent observations of test specimens that included a
potting compound ostensibly suitable for 300°F
continuous service indicated that this rating may be
in excess of time capability.

3.0 JUSTIFICATION

Various communication, navigation, flight control,
and weapons control systems employ electrical and
electronic circuitry that must have high impedance
separation of non-connecting circuits if proper
operation is to be achieved. As a further require-
ment, in many cases, electrical connectors employed
in these circuits must be able to provide this high
impedance insulation while subjected to elevated
temperatures for protracted periods of time. Since,
at other periods of time, these same connectors must
be moisture-proof, they must be sealed with a potting
compound.

4.0 MATERIALS:

4.1 Coast Pro-Seal 777 (from MAC stock)

4.2 Coast Pro-Seal 777P (primer from MAC stock)

4.3 Products Research PR-1525 (provided by Dept. 684)

**Applicable To IDEP: Report Summary Sheet req'd. Complete
Report summary sheet (MAC MOB TRS) and forward w/ volume
copy of complete Report To MAC IDEP DATA COORDINATOR
H.S.H. BR*

REFERENCES OR ENCLOSURES

1. MAC P.S. 17171 (Rev.B)
2. MAC P.S. 17172 (Rev.B)
3. MAC P.S. 17311 (16 Nov. 60)
4. Product Reserch Technical Data Sheet "PR-1525"
(Dec. 60)
5. MIL-S-8516C
6. ASTM D675-59T

via Pink

OK for IDEP

- 4.4 Products Research PR-1521 and PR-1522 Primers (provided by Department 684)
- 4.5 General Electric R.T.V.-60 (provided by Department 684)
- 4.6 Hughson Chemical Co. EX-3579-1 Primer (from MAC stock)
- 4.7 3M Co. EC-1663 (from MAC stock)
- 4.8 3M Co. EC-1694 Primer (from MAC stock)
- 4.9 20 Gage MIL-W-16878 Type E (Teflon) Hook-up Wire
- 4.10 Bendix Pygmy (PT Series) Connectors - 8 Required

5.0 TEST SPECIMEN PREPARATION:

- 5.1 Make 54 "surface and volume resistivity" specimens per MIL-S-8516C, paragraph 4.7.3.4 except mix and cure the potting compound as follows:
 - 5.1.1 Coast Pro-Seal 777 per MAC P.S. 17171 Revision "B" dated 22 November 1960. Make two sets of specimens (each set consisting of 3 specimens) with the following cures:
 - 5.1.1.1 48 hours at room temperature and no oven cure (record room temperature). Total of 6 specimens required.
 - 5.1.1.2 24 hours at room temperature followed by 4 hours at 180°F. Total of 6 specimens required.
 - 5.1.1.3 No room temperature cure but 5-1/2 hours at 180°F. Total of 6 specimens.
 - 5.1.1.4 No room temperature cure but 5-1/2 hours at 220°F. Total of 6 specimens.
 - 5.1.2 Products Research PR-1525 per Products Research data sheet dated December, 1960. Make two sets of specimens each with the following cures:
 - 5.1.2.1 72 hours at room temperature and no oven cure. Record room temperature. Total of 6 specimens required.
 - 5.1.2.2 No room temperature cure but 3 hours at 180°F. Total of 6 specimens required.
 - 5.1.2.3 No room temperature cure but 16 hours at 180°F. Total of 6 specimens required.
- CAUTION:** Do NOT mix the A and B components of PR-1525 while they are above room temperature as the work life of the resulting compound will be drastically reduced.

5.1.3 3M Co. EC-1663 per MAC P.S. 17172 Revision "B" dated 9 May 1960. During the 24 hour room temperature cure that precedes the 10 hours at 180°F to 200°F oven cure, keep specimens in an area where the relative humidity is a minimum of 50% or preferably greater. Total of 6 specimens required.

5.1.4 General Electric RTV-60. Prepare a total of 6 specimens in the same manner as the 3M Co. EC-1663 shown in paragraph 5.1.3.

NOTE: Vacuum deaerate all potting compounds before making test specimens in paragraphs 5.1 and 5.2.

5.2 Eight connector specimens shall be made using Bendix Pygmy resilient insert (PT series) connectors and 20 gage MIL-W-16878 Type E (Teflon) hook-up wire. Tetra-etch the teflon wire per P.S. 17165 dated 23 August 1960 prior to installing in the connectors.

For the wire used with PR-1525, etch for 3 to 5 minutes. A total of 8 specimens will be required. Prime the wires and connectors and pot the connectors as follows:

5.2.1 For Pro-Seal 777 specimens, prime with Pro-Seal 777P and pot per P.S. 17171. Cure 5-1/2 hours at 180°F immediately after potting. Two specimens required.

5.2.2 For PR-1525 specimens, apply a thin coat of PR-1521 and allow it to air dry at room temperature for 30 minutes. Then apply a thin coat of PR-1522 and allow it to dry at room temperature for 30 minutes. Using techniques of P.S. 17171 pot with PR-1525 and cure at 180°F for 3 hours immediately after potting. Two specimens required.

5.2.3 For 3M Co. EC-1663 specimens, prime with 3M Co. EC-1694 per P.S. 17172. Be very careful to allow the primer to dry for a minimum of 20 hours at room temperature in an area where the relative humidity is at least 50%. After primer has dried, pot with 3M Co. EC-1663 per P.S. 17172. Two specimens required.

5.2.4 For General Electric RTV-60 specimens, prime with Hughson Chemical Co. EX-B579-1 Primer per P.S. 17311 dated 16 November 1960. Clean the connector prior to priming per P.S. 17172, NOT per P.S. 17311. After priming, pot with General Electric RTV-60 per P.S. 17172.

6.0 TESTING PROCEDURE: **

6.1 Determine volume and surface resistivity in accordance with MIL-S-8516C paragraph 4.7.3.4 and as shown in Tables I and II. Perform the elevated temperature tests in a circulating-air-type oven. Suspend the specimens or support them on a wide grid wire mesh so air can circulate freely about them. Locate a thermocouple as close to the specimens as practical to determine actual specimen temperature. Tests specimens in Table I shall be stabilized for one hour before determining resistance. Surface and volume resistivity shall be determined for each specimen at all temperatures and times shown in Table I and Table II.

**** NOTE:** All tests shown in Tables I and III shall be run before tests shown in Tables II and IV.

POTTING MATERIAL	CURING METHOD	NO. OF SPECIMENS	TEST TEMPERATURES (°F)
-777 -777 -777 -777	5.1.1.1 5.1.1.2 5.1.1.3 5.1.1.4	3 3 3 3	All of these specimens shall be tested at Room Temperature - 100 - 150 - 200 - 250 - 300 - 350
PR-1525	5.1.2.1	3	
PR-1525	5.1.2.2	3	
PR-1525	5.1.2.3	3	
EC-1663	5.1.3	3	These specimens to be tested at Room Temperature - 100 - 200 - 300 - 400 - 500 - 600
G.E. RTV-60	5.1.4	3	

TABLE I

NOTE: Use different specimens for tests shown in Table I and Table II.

POTTING MATERIAL	CURING METHOD	NO. OF SPECIMENS	TESTING TEMP.	TEST READING TIMES IN HOURS
-777	5.1.1.1	3	300°F	0.5 - 1.0 - 5.0 - 10. - 25 - 50 - 75 - 100 - 150 - 200 - 250 - 300 ↓
-777	5.1.1.2	3	300°F	
-777	5.1.1.3	3	300°F	
-777	5.1.1.4	3	300°F	
PR-1525	5.1.2.1	3	300°F	
PR-1525	5.1.2.2	3	300°F	
PR-1525	5.1.2.3	3	300°F	
EC-1663	5.1.3	3	500°F	
G.E. RTV-60	5.1.4	3	500°F	

TABLE II

NOTE: Reading times shown in Table II may be varied slightly to fit in with laboratory shift schedule.

6.2 Measure typical contact-to-contact and contact-to-shell resistance of the potted electrical connector specimens under conditions shown in Table III and Table IV. Use different specimens for each type of test.

POTTING MATERIAL	CURING METHOD	NO. OF SPECIMENS	TEST TEMPERATURES (°F)
777	5.2.1	1	All specimens shall be tested at
PR-1525	5.2.2	1	Room Temperature - 100 - 150 - 200 -
EC-1663	5.2.3	1	250 - 300 - 350
G.E. RTV-60	5.2.4	1	

TABLE III

POTTING MATERIAL	CURING METHOD	NO. OF SPECIMENS	TESTING TEMP.	TEST READING TIMES IN HOURS
777	5.2.1	1	300°F	0.5 - 1.0 - 5.0 - 10. -
PR-1525	5.2.2	1	300°F	25 - 50 - 75 - 100 -
EC-1663	5.2.3	1	500°F	150 - 200 - 250 -
G.E. RTV-60	5.2.4	1	500°F	300

TABLE IV

7.0 DATA REQUIRED:

7.1 Record in the report for each specimen:

7.1.1 Manufacturer's batch number.

7.1.2 "Use Before" or "Manufactured" date (both if available).

7.1.3 Whether taken from MAC production stock or newly supplied.

7.1.4 Date specimens were made.

7.1.5 Dates of all tests.

7.2 Color photos of volume and surface resistivity specimens both before and after tests.

7.3 Black and white photos of connector specimens both before and after tests.

7.4 Show results of durometer hardness measurements of specimens in accordance with ASTM D 676-59T both before and after tests (with specimens at room temperature).

- 7.5 Plot volume and surface resistivity versus temperature for each specimen of each material.
- 7.6 Plot volume and surface resistivity at elevated temperatures versus time for each specimen of each material.
- 7.7 Plot ~~contact-to-contact~~ and ~~contact-to-shell~~ resistances versus temperature for each specimen of each material.
- 7.8 Plot ~~contact-to-contact~~ and ~~contact-to-shell~~ resistance at elevated temperatures versus time for each material.
- 7.9 Record any apparent deterioration of the potting compounds observed during or after the tests.
- 7.10 Record room temperatures in which measurements were made.

8.0 SPECIMEN DISPOSITION:

At conclusion of tests, send all specimens to Department 684.