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NUCLEAR AEROSPACE RESEARCH FACILITY

# MEASURED EFFECTS OF THE VARIOUS COMBINATIONS OF NUCLEAR RADIATION, VACUUM, AND CRYOTEMPERATURES ON ENGINEERING MATERIALS

## Quarterly Progress Report

**1 June 1963 through 31 August 1963**

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GENERAL DYNAMICS | FORT WORTH

This report was prepared by General Dynamics/Fort Worth under Contract No. NAS8-2450, Modification 3, Measured Effects of the Various Combinations of Nuclear Radiation, Vacuum, and Cryo-temperatures on Engineering Materials, for the George C. Marshall Space Flight Center of the National Aeronautics and Space Administration. The work was administered under the technical direction of the Propulsion and Vehicle Engineering Divison, Engineering Materials Branch of the George C. Marshall Space Flight Center, with Eugene C. McKannan acting as project manager.

## SUMMARY

This report covers the work performed during the third quarter of operation under Modification 3 to NASA Contract No. NAS8-2450. Provisions of this modification are for the continuation of a series of tests initiated under the original contract to measure the effects of various combinations of nuclear radiation, high vacuum, and cryotemperature on a select group of nonmetallic spacecraft materials.

During this reporting period the work described below was accomplished.

Radiation-Vacuum Tests

Data resulting from the static tests have been reduced during this quarter and is presented in the Appendix of this report. The results from the High-Force Tester and a few static materials tests have not been completely evaluated. Final results will be available by the end of the quarter and published at that time with a complete description of the test materials, together with plots of the vacuum and temperature data. The Bearing Tester has been checked out and is scheduled for irradiation during the first week of September.

Radiation-Cryotemperature Tests

A considerable amount of test-specimen work and rework was performed during this period. Fabrication, assembly, and preliminary operational checkout of six thermal conductivity testers was done, and a 20-hour $LN_2$ irradiation test was made

in an attempt to demonstrate a feasible route to safe, explosion-free irradiation tests which involve the boil-off of large quantities of $LN_2$.

Radiation-Vacuum-Cryotemperature Test

Test specimens were prepared for all of the materials scheduled for the Electrical Tester; complete checkout of the tester has been completed at ambient and cryogenic temperatures; final preparation has been completed for the irradiation scheduled the first week of September. The detail design of the Mechanical Test has been completed, and the fabrication is approximately 40% complete. Test-material selection is complete, and sample fabrication has been initiated.

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# I. INTRODUCTION

Many of the component parts of nuclear-powered spacecraft will be exposed, during flight, to environments composed of the various combinations of nuclear radiation, high vacuum, and cryotemperatures. The first known tests to measure the engineering properties of nuclear radiation and high vacuum and of nuclear radiation and cryotemperatures were conducted by the Nuclear Aerospace Research Facility at General Dynamics/Fort Worth during 1962. Annual progress reports covering the work have been published (Refs. 1 and 2).

The effort during 1963 (outlined and described in Modification 3 to the original contract) is a continuation of that work which was started last year and includes an additional phase of work designed to demonstrate the effects on materials of the triple environment of nuclear radiation, high vacuum, and cryotemperature. The work performed during the first and second quarter of 1963 is described in previous quarterly progress reports (Refs. 3 and 4). The work performed during the third quarter is reported in this document.

Material categories covered in tests performed during the first year included adhesives, seals, thermal insulations, electrical insulations, structural laminates, thermal-control coatings, potting compounds, and lubricants. Representative tests were those suitable for measuring lap-shear strength, ultimate tensile strength, ultimate elongation, stress-strain characteristics, weight loss, lubricity, compressive strength and spectral reflectivity.

During the second year's work, essentially the same tests are being performed on a new group of materials selected from the same material categories. Additional tests include the measurement of thermal conductivity, dissipation factor, dielectric strength, T-peel strength, and potted-wire pull-out strength. The thermal-control-coating test has been deleted.

## II. COMBINED EFFECTS OF RADIATION AND VACUUM

This section of the experimental program is designed to measure the combined effects of reactor radiation and vacuum on selected engineering materials and to show the difference between the effects of radiation in air and vacuum. The mechanical properties of materials were determined in air after irradiation in air, and in vacuum and air after irradiation in vacuum. The materials tested were from the following categories: adhesives, laminates, potting compounds, electrical insulations, dielectric materials, thermal insulations, seals, and lubricants.

This report covers the work performed during the third quarter of operation in this contract year; however, the data presented in this section and in the Appendix is the result of the year's efforts. All but two of the irradiation tests scheduled in this program were completed by the end of this quarter. The remaining tests for the lubricants are scheduled for irradiation during the first week of September and the middle of October.

The results from irradiations of the High-Force Tester and a few static materials tests are not given in this quarterly, but they will be presented in the annual report to be published in late December. Also to be published at that time are (1) a complete description of the test materials, (2) curves of the vacuum pressure and temperature during irradiation, and (3) test results, together with special problems encountered in obtaining these results.

## 2.1 Equipment

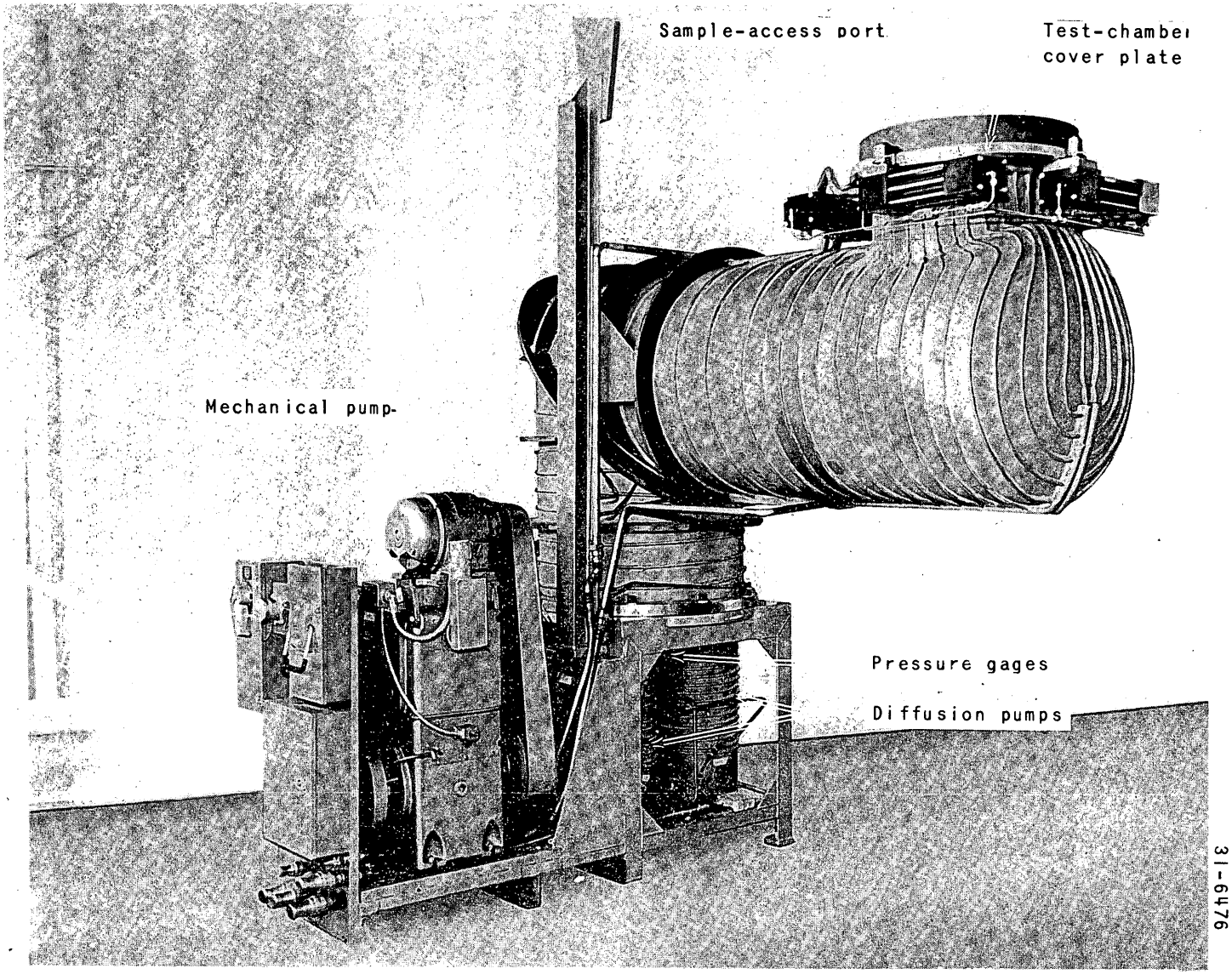
### 2.1.1 Radiation Source

The radiation source used in these tests is the Ground Test Reactor (GTR). The GTR, a highly enriched swimming-pool-type nuclear reactor is positioned in a closet that is built into the pool separator wall. The separator wall divides the pool into a wet (reactor) and dry (irradiation cell) side. With this arrangement, three faces of the reactor are available for irradiation testing in the dry side of the pool. A complete description of the reactor is given in Reference 5.

### 2.1.2 Vacuum Systems

Two vacuum systems designed by GD/FW and built by Consolidated Vacuum Corporation were used for this experiment. Both of the vacuum systems are identical in regard to pumping characteristics and equipment, and differ only in that one was designed to be mounted in the space available on the east irradiation position and the other on the west irradiation position.

Figure 2.1 is a photograph of one of the vacuum assemblies. It consists principally of (1) a nominal 30-inch-diameter, polished, stainless-steel duct extending some 109 centerline inches from front face to pump throats and two CVC PMC 4100 oil diffusion pumps backed by a Stokes 212 H roughing pump. Each of the systems has a measured pumping speed in excess of 3200 liters/second at $1 \times 10^{-6}$ torr at the sample position. The ultimate pressure of the system is $1.2 \times 10^{-7}$ torr. A complete description of the systems is given in Reference 1.

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31-6476

Figure 2.1 Vacuum-Irradiation System

### 2.1.3 Test Equipment

The test materials which were exposed to the vacuum-irradiation environment were evaluated by two test methods, designated as static and dynamic tests. The static tests were tests in which postirradiation testing was conducted using an Instron tester in a standard laboratory environment. In the dynamic tests, the materials were irradiated and tested in the vacuum chambers while the pressure in the vacuum chamber was maintained at approximately $5 \times 10^{-7}$ torr. Special testers built for the dynamic tests are the High-Force Tester, the Low-Force Tester, the Bearing Lubricant Tester, and two Dielectric Testers. The Dielectric Testers are discussed in Section 4.2, and the Low-Force Tester is discussed in Section 2.4. The operational principles of the High-Force Tester and the Bearing Lubricant Tester are discussed in Reference 1. A complete description of the operating techniques and principles of the Mechanical Testers is also given in Reference 1.

## 2.2 Vacuum Irradiations Tests

To date, under this year's program, irradiation tests have been conducted during two 1-week periods. The first week of testing occurred in April, the second in June. During these irradiations, static samples in vacuum were subjected to the following nominal radiation exposures prior to testing in air: $5 \times 10^7$, $1 \times 10^8$, $5 \times 10^8$, $1 \times 10^9$, $5 \times 10^9$, $1 \times 10^{10}$, and $3 \times 10^{10}$ ergs/gm(C) gamma radiation. (It should be pointed out that in describing the level of

radiation exposures, only the nominal gamma radiation is referred to and that each gamma dose is accompanied by its respective neutron flux. Where specific gamma doses are referred to, the neutron flux will be described.) Dynamic vacuum samples were exposed to nominal doses of $1 \times 10^8$ and $5 \times 10^8$ ergs/gm(C) gamma radiation in the Low-Force Tester and to $1 \times 10^{10}$ and $3 \times 10^{10}$ ergs/gm(C) in the High-Force Tester. Static samples in air were subjected to nominal doses of $5 \times 10^7$, $1 \times 10^8$, $5 \times 10^8$, $1 \times 10^9$, $5 \times 10^9$, $1 \times 10^{10}$, and $3 \times 10^{10}$ ergs/gm(C) gamma radiation during this period.

2.2.1 Static Test Results

The results of the static tests which are complete at this time are presented in the Appendix in Tables A-1 through A-7. Data for materials under the following categories are presented: adhesives, structural laminates, potting compounds, electrical insulation, dielectric materials, thermal insulation and seals. Table 2.1 lists the materials tested, specimen configurations, measured properties,and test procedures. Test techniques used in this test are the same as the ones used and described in Reference 1.

Table 2.1

Material and Test Procedures Used in Static Test

| Material Category | Material Trade Name | Test Specimen Configuration | Mechanical Properties Measured | Test Procedure |
|---|---|---|---|---|
| Adhesives (Results given in Table A-1) | FM-1000 | Lap shear specification | Ultimate shear strength | ASTM D-1002-53T |
| | Shell 929 | Lap shear specification | Ultimate shear strength | ASTM D-1002-53T |
| | Shell 934 | Lap shear specification | Ultimate shear strength | ASTM D-1002-53T |
| | Apco 1252 | Lap shear specification | Ultimate shear strength | ASTM D-1002-53T |
| | Metlbond 4021 | Lap shear specification | Ultimate shear strength | ASTM D-1002-53T |
| | FM-47 | Lap shear specification | Ultimate shear strength | ASTM D-1002-53T |
| | HT-424 | Lap shear specification | Ultimate shear strength | ASTM D-1002-53T |
| | Narmco A | Lap shear specification | Ultimate shear strength | ASTM D-1002-53T |
| | Narmco C | Lap shear specification | Ultimate shear strength | ASTM D-1002-53T |
| Structural Laminates (Results given in Table A-2) | Mobiloy 81-AH | Tensile specification per ASTM D-638 | Tensile strength ultimate elongation | ASTM D-638-58T |
| | Paraplex P-43 | Tensile specification per ASTM D-638 | Tensile strength ultimate elongation | ASTM D-638-58T |
| | Selectron 5003 | Tensile specification per ASTM D-638 | Tensile strength ultimate elongation | ASTM D-638-58T |

Table 2.1 (continued)

| Material Category | Material Trade Name | Test Specimen Configuration | Mechanical Properties Measured | Test Procedure |
|---|---|---|---|---|
| Structural Laminates (continued) | DC-2104 | Tensile specification per ASTM D-638 | Tensile strength ultimate elongation | ASTM D-638-58T |
| | Silicone | Tensile specification per ASTM D-638 | Tensile strength ultimate elongation | ASTM D-638-58T |
| | HRP Honeycomb | 2-in.-sq compressive specimen | Compressive strength | ASTM D-638-58T |
| Potting Compounds (Results given in Table A-3) | RTV-501 | Compressive specification per ASTM D-575-46 | Load deflection | ASTM D-575-46 |
| | EC-2273 | Compressive specification per ASTM D-575-46 | Load deflection | ASTM D-575-46 |
| | Scotchcast 212 | Compressive specification per ASTM D-695-54 | Compressive strength | ASTM D-695-54 |
| | Durock | Compressive specification per ASTM D-695-54 | Compressive strength | ASTM D-695-54 |
| | RTV-60 | Wire pulls | | |
| | RTV-501 | Wire pulls | | |
| | EC-2273 | Wire pulls | | |
| | Scotchcast 212 | Wire pulls | | |
| Electrical Insulation (Results given in Table A-4) | DC-7-170 | Tensile specification per ASTM D-412-51T | Modulus values ultimate tensile strength, ultimate elongation | ASTM D-412-51T |

Table 2.1 (continued

| Material Category | Material Trade Name | Test Specimen Configuration | Mechanical Properties Measured | Test Procedure |
|---|---|---|---|---|
| Electrical Insulation (continued) | Geon 2046 | Tensile specification per ASTM D-412-51T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-412-51T |
| | Estane 5740X1 | Tensile specification per ASTM D-412-51T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-412-51T |
| | Geon 8800 | Tensile specification per ASTM D-412-51T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-412-51T |
| | Kel-F-81 | Tensile specification per ASTM D-638 | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-638 at 2.0 in/min x head speed |
| | Duroid | Tensile specification per ASTM D-638 | Ultimate elongation and ultimate tensile strength | ASTM D-638 |
| | Mylar A | Tensile specification per ASTM D-882-56T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-882-56T |
| | Mylar C | Tensile specification per ASTM D-882-56T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-882-56T |
| | Kynar | Tensile specification per ASTM D-882-56T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-882-56T |

Table 2.1 (continued)

| Material Category | Material Trade Name | Test Specimen Configuration | Mechanical Properties Measured | Test Procedures |
|---|---|---|---|---|
| Dielectric Materials (Results given in Table A-5) | Marlex 6002 | Tensile specification per ASTM D-882-56T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-882-56T |
| | Teflon TFE (10 mil) | Tensile specification per ASTM D-882-56T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-882-56T |
| | Teflon TFE (10 mil) | Tensile specification per ASTM D-882-56T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-882-56T |
| | Tedlar | Tensile specification per ASTM D-882-56T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-882-56T |
| | H-film | Tensile specification per ASTM D-882-56T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-882-56T |
| | Teflon TFE (40 mil) | Tensile specification per ASTM D-412-51T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-882-56T |
| | Teflon FEP (40 mil) | Tensile specification per ASTM D-412-51T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-882-56T |
| | Thermofit | Tensile specification per ASTM D-412-51T | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-882-56T |

Table 2.1 (continued)

| Material Category | Material Trade Name | Test Specimen Configuration | Mechanical Properties Measured | Test Procedure |
|---|---|---|---|---|
| Thermal Insulation (Results given in Table A-6) | CPR-20 | Compressive specification per ASTM D-1565-58T | Compulsion strength at 25% deflection | ASTM D-1565-58T |
| | CPR-1021-2 | Compressive specification per ASTM D-1565-58T | Compulsion strength at 25% deflection | ASTM D-1565-58T |
| Seals (Results given in Table A-7) | Natural Rubber (RA-33860) | O-rings | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-1414-56T |
| | PRP-19007 | O-rings | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-1414-56T |
| | PRP 737-70-FLX | O-rings | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-1414-56T |
| | PRP-2277 | O-rings | Modulus values, ultimate tensile strength, ultimate elongation | ASTM D-1414-56T |
| | 66-581 | O-rings | Modulus values ultimate tensile strength, ultimate elongation | ASTM D-1414-56T |

### 2.2.2 Dynamic Test Results

Dynamic tests have been completed with the High-Force and Low-Force Testers in the April and June vacuum irradiations. Dynamic tests with the Bearing Tester are to be performed during the vacuum irradiation scheduled for the week of 4 September 1963.

Control experiments have been completed for the Bearing Tester; however, reduction of the data from control experiments has not yet been completed. Furthermore, data reduction has not been completed for the high-force tests already performed. The results of these tests will be reported in the 1963 annual report.

In this report, consequently, it will be possible to present the dynamic data obtained only in the low-force tests of April and June 1963. The materials tested in the Low-Force Tester are as follows: Buna N O-rings, Neoprene O-rings, Teflon TFE films, CPR-20 compression buttons, CPR-1021 compression buttons, and Kel-F-81 flexure specimens. A complete description of the test samples is given in Table 2.2. One of the Buna N O-rings and the two Kel-F-81 flexure specimens in Run I (April irradiation) did not pull properly in the test and the resulting data was rejected. Data obtained from all of the other specimens are reported. Stress-strain curves for all materials tested in low-force-test Run I (24 April 1962) and Run II (4 June 1963) are given in Figures 2.2 through 2.12. Also presented in the plots is some of the data from control and static samples tested in the Instron located at the

Irradiated Materials Laboratory. In addition, Tables 2.3 and 2.4 list the environmental conditions of the test and specific property measurements obtained on these materials in the low-force tests. The sample size used for Teflon TFE film was one inch wide and 0.010 inch thick. The film is wound around special jaws of the small split-spool type. These jaws have proven satisfactory in all but one test, namely, the $1.7 \times 10^8$ ergs/gm(C) irradiation. In this test the film broke at the front edge of the spools; this breakage was attributed to the overtightening of the preloading bolts. Portions of Figure 2.12 that show stress-strain for specimens 1 and 2 are considered to be reliable, but the ultimate values are not considered to give a true representation of the material. Specimen 3 was found to be squeezed more than the other two samples - which probably accounts for the shape of that curve. The specimens for Run II all broke in the gage length and are considered reliable

## 2.3 Test Plan

The Bearing Tester is now ready and is scheduled to be irradiated in vacuum during the week of 4 September 1963. Two of the Bearing Tester motors were damaged in the return shipment from Miniature Precision Bearing Co., so that it will be possible to test only eight motors instead of ten. In spite of the loss of two motors, all five types of lubricants originally scheduled for testing will be tested. After the vacuum irradiation test, new bearings containing the test lubricants will be installed in the test motors for the air irradiation in October.

Table 2.2

Materials and Test Procedures Used in Dynamic Tests

| Material Trade Name | Manufacturer | Specimen Configuration | Procedures | Test Specimen Pull Rate |
|---|---|---|---|---|
| Teflon | E. I. du Pont de Nemours Co. | Thin film-straight side | D-882-56T | 0.5 in./min |
| 66-581 (Buna N) | Parker Seal Co. | O-ring | D-1414-56T | 0.5 in./min |
| PRP-2277 Neoprene | Precision Rubber Products | O-ring | D-1414-56T | 0.5 in./min |
| CPR-20 | Chemical Plastic Research | Compression button | D-1565-58T | 0.05 in./min |
| CPR-1021 | Chemical Plastic Research | Compression button | D-1565-58T | 0.05 in./min |
| Kel-F-81 | Minnesota Minning and Manufacturing Corp. | Flexure specimen | D-790-58T | 0.05 in./min |

Table 2.3

Low-Force Dynamic Test Results: Run I, April 24, 1963

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm$^2$): Thermal | Neutron (n/cm$^2$): E > 2.9 Mev | Neutron (n/cm$^2$): E > 8.1 Mev | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Teflon TFE Film | Vacuum Irradiation | 1.68(8) | 1.7(12) | 1.9(13) | --- | 1120<br>1430<br>1460<br>1337/201 | 1080<br>1610<br>1770<br>1487/408 | ----<br>----<br>---- | 1630<br>1890<br>1000<br>1507/526 | 58.8<br>78.8<br>71.4<br>69.7/11.8 | 85 | | 2.3(-7) | |
| Buna N O-rings | Vacuum Irradiation | 1.68(8) | 1.7(12) | 1.9(13) | --- | 93<br>94<br>93.5/1 | 169<br>175<br>122/5 | 285<br>277<br>281/7 | (not reached in test) | | 85 | | 2.3(-7) | |
| Neoprene O-rings | Vacuum | 1.68(8) | 1.7(12) | 1.9(13) | --- | 110<br>140<br>125/13 | 210<br>200<br>205/9 | 455<br>496<br>476/36 | (not reached in test) | | 85 | | 2.3(-7) | |
| CPR-20 Compression Buttons | Vacuum Irradiation | 1.68(8) | 1.7(12) | 1.9(13) | --- | Compression Strength (psi): 97.6<br>141.0<br>102.2<br>118.7<br>110.1<br>106.0<br>112.6/17.1 | ----<br>----<br>----<br>----<br>----<br>---- | ----<br>----<br>----<br>----<br>----<br>---- | ----<br>----<br>----<br>----<br>----<br>---- | ----<br>----<br>----<br>----<br>----<br>---- | 85 | | 2.3(-7) | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table 2.4

Low-Force Dynamic Test Results: Run II, June 4, 1963

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Teflon TFE Film | Vacuum Irradiation | 5.08(8) | 8.31(12) | 6.98(13) | 2.77(12) | 2090<br>2160<br>2065<br>2105/56 | 2225<br>2180<br>2120<br>2175/62 | 2575<br>2350<br>2320<br>2415/151 | 2650<br>2460<br>2860<br>2657/236 | 109.1<br>114.2<br>159.3<br>127.5/29.7 | 87 | | 2.5(-7) | |
| Buna N O-rings | Vacuum Irradiation | 5.08(8) | 8.31(12) | 6.98(13) | 2.77(12) | 110<br>125<br>134<br>123/14 | 200<br>205<br>210<br>205/6 | 347<br>356<br>377<br>360/18 | (not reached in test) | | 87 | | 2.5(-7) | |
| Neoprene O-rings | Vacuum Irradiation | 5.08(8) | 8.31(12) | 6.98(13) | 2.77(12) | 195<br>173<br>184/20 | 333<br>300<br>317/29 | 560<br>500<br>530/53 | (not reached in test) | | 87 | | 2.5(-7) | |
| | | | | | | Compression Strength (psi) | | | | | | | | |
| CPR-20 Compression Buttons | Vacuum Irradiation | 5.08(8) | 8.31(12) | 6.98(13) | 2.77(12) | 142.5<br>120.0<br>111.0<br>124.5/18.6 | ----<br>----<br>---- | ----<br>----<br>---- | ----<br>----<br>---- | ----<br>----<br>---- | 87 | | 2.5(-7) | |
| CRR-1021 Compression Buttons | Vacuum Irradiation | 5.08(8) | 8.31(12) | 6.98(13) | 2.77(12) | 50.6<br>48.0<br>44.5<br>49.4/3.6 | ----<br>----<br>---- | ----<br>----<br>---- | ----<br>----<br>---- | ----<br>----<br>---- | 87 | | 2.5(-7) | |
| | | | | | | Flexural Strength: Maximum Fiber Stress (psi) | Maximum Fiber Strain (psi) | Modulus (psi) | | | | | | |
| Kel-F-81 | Vacuum Irradiation | 5.08(8) | 8.31(12) | 6.98(13) | 2.77(12) | 12,278<br>9,300 | 0.092<br>0.076 | 185,679<br>187,070 | | | | | | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

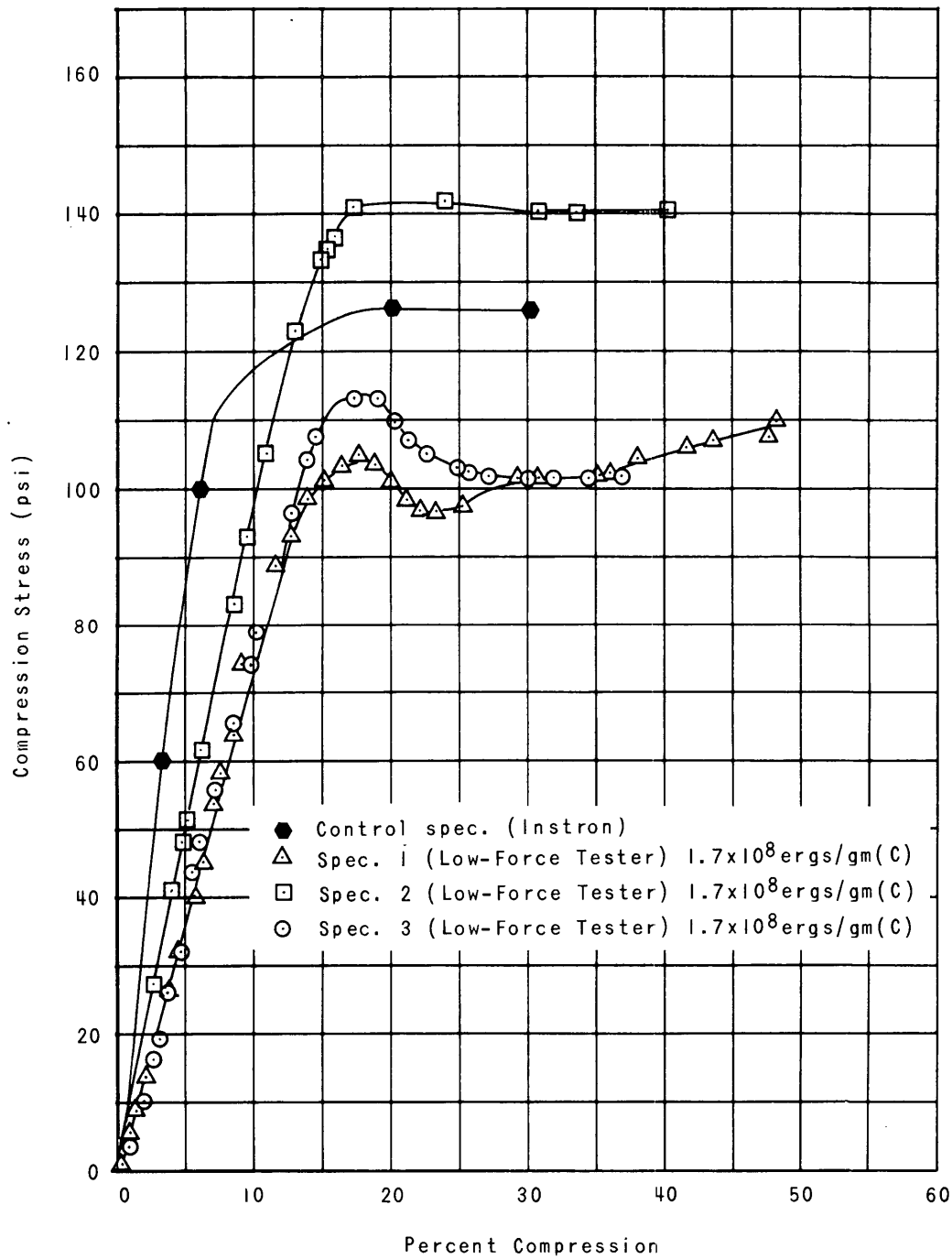


Figure 2.2 Compression-Deflection Curves of Thermal Insulation CPR-20: Run I, Specimens 1, 2, and 3

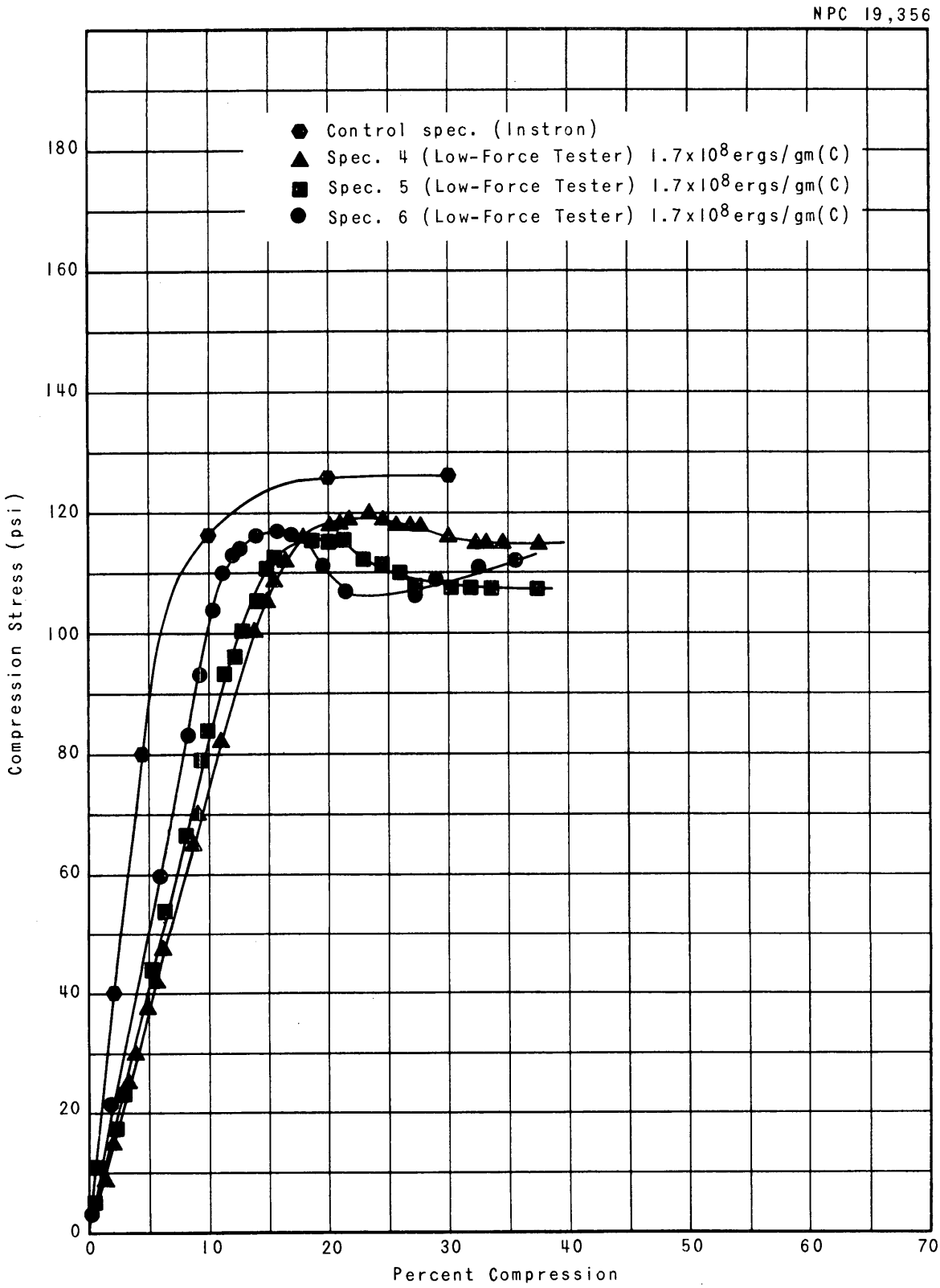


Figure 2.3 Compression-Deflection Curves of Thermal Insulation CPR-20: Run I, Specimens 4, 5 and 6

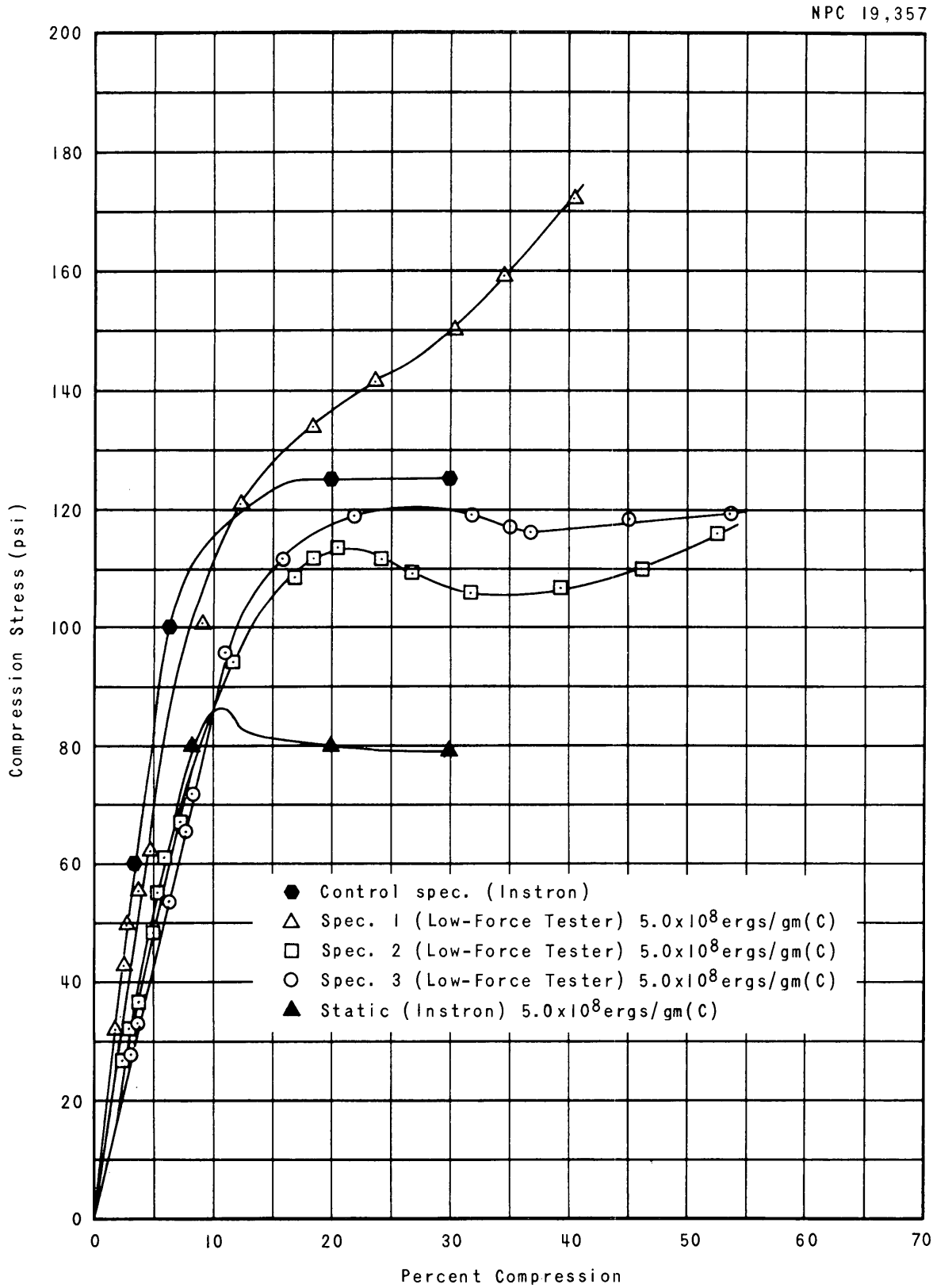


Figure 2.4 Compression-Deflection Curves of Thermal Insulation
CPR-20: Run II

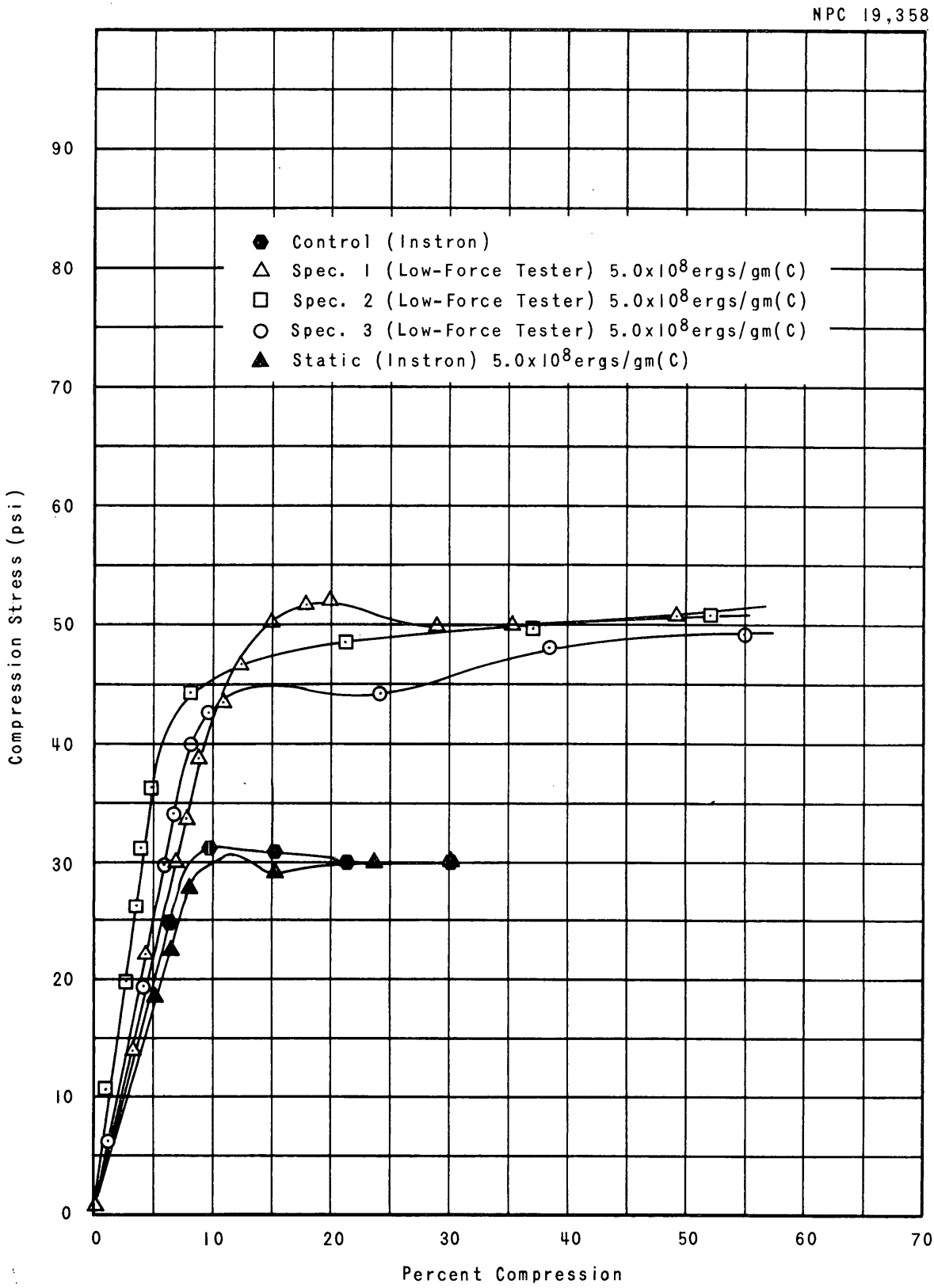


Figure 2.5 Compression-Deflection Curves of Thermal Insulation
CPR-1021: Run II

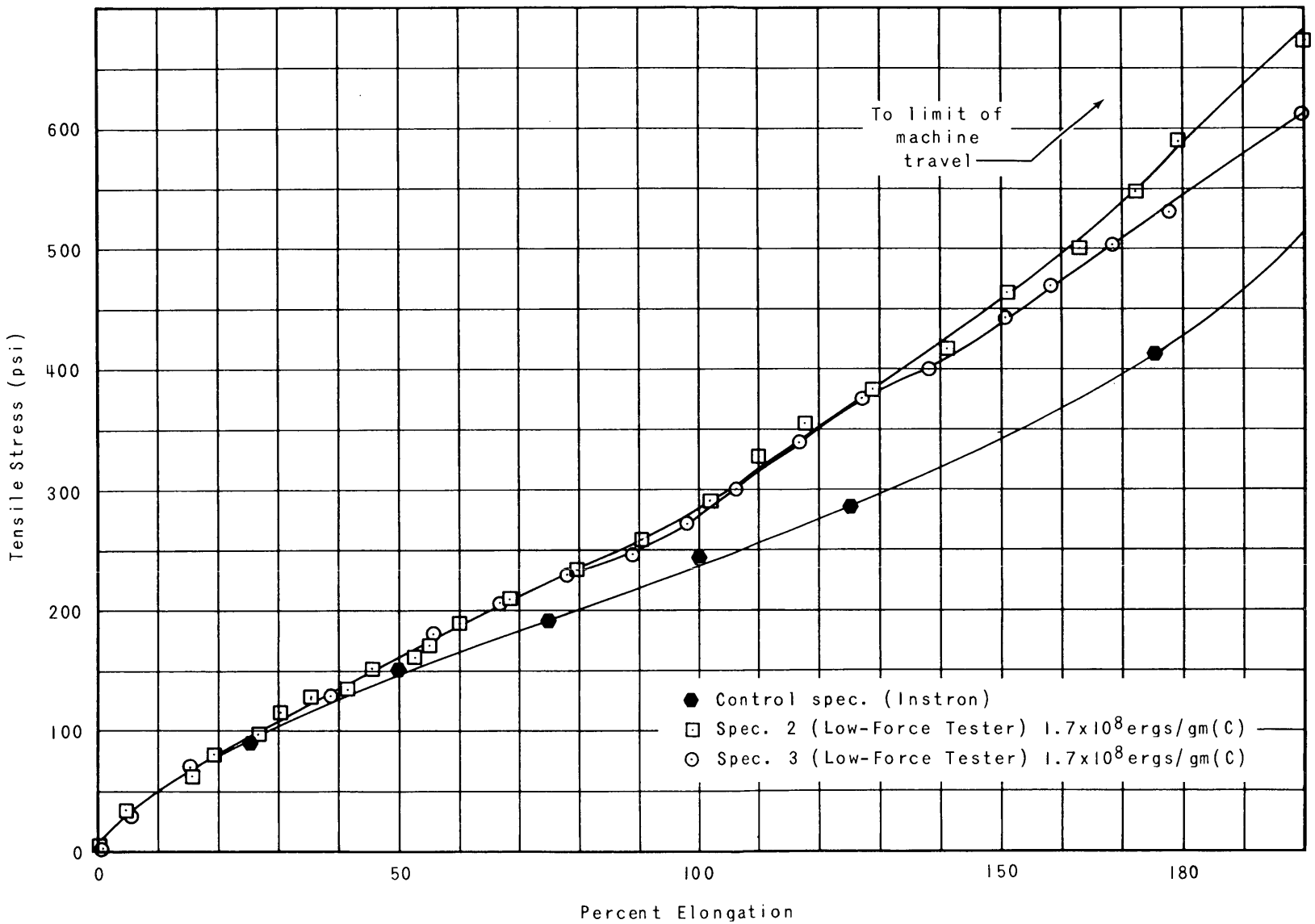


Figure 2.6 Stress-Strain Curves of Buna N O-Rings: Run I

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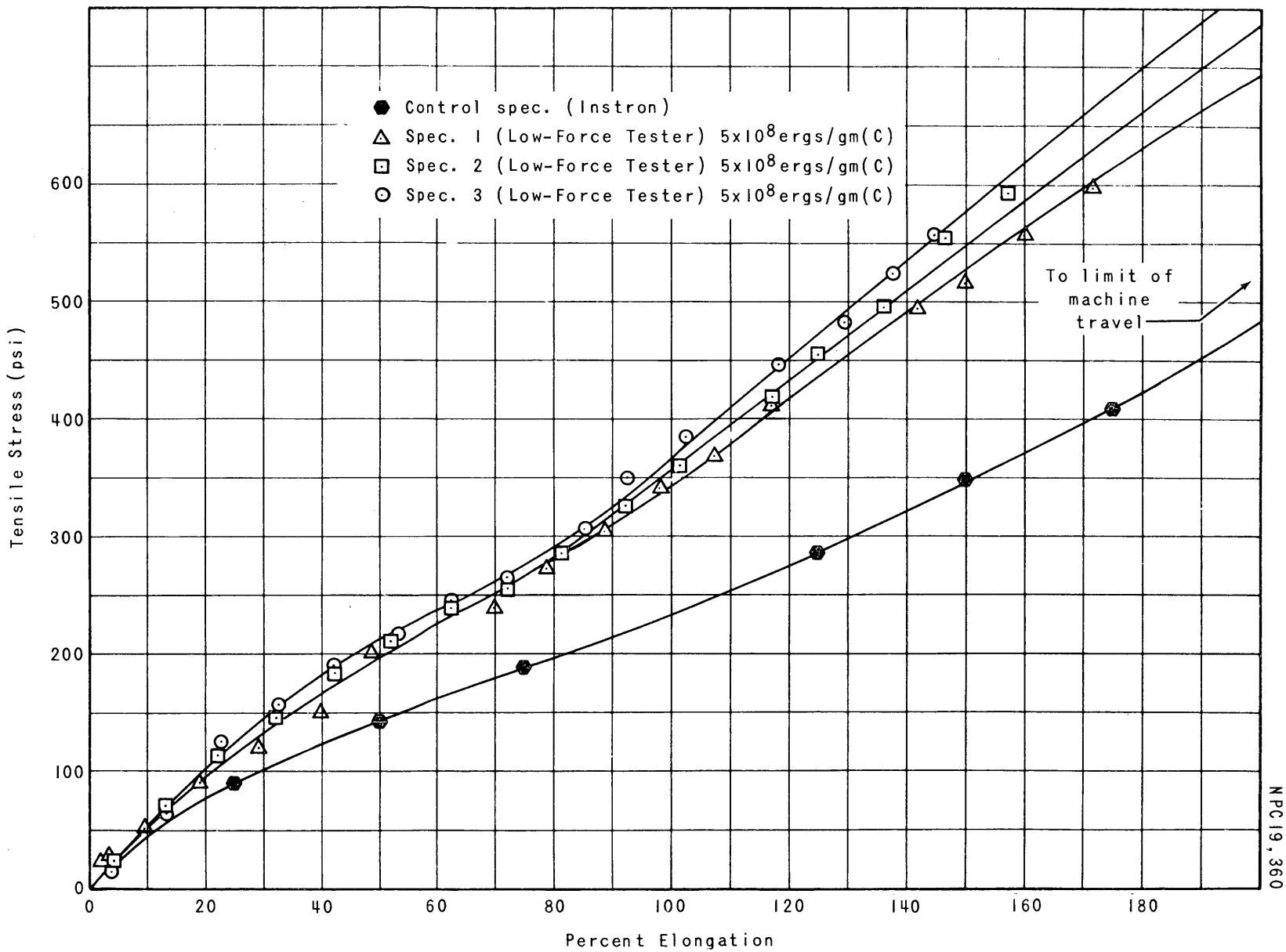


Figure 2.7 Stress-Strain Curves of Buna N O-Rings: Run II

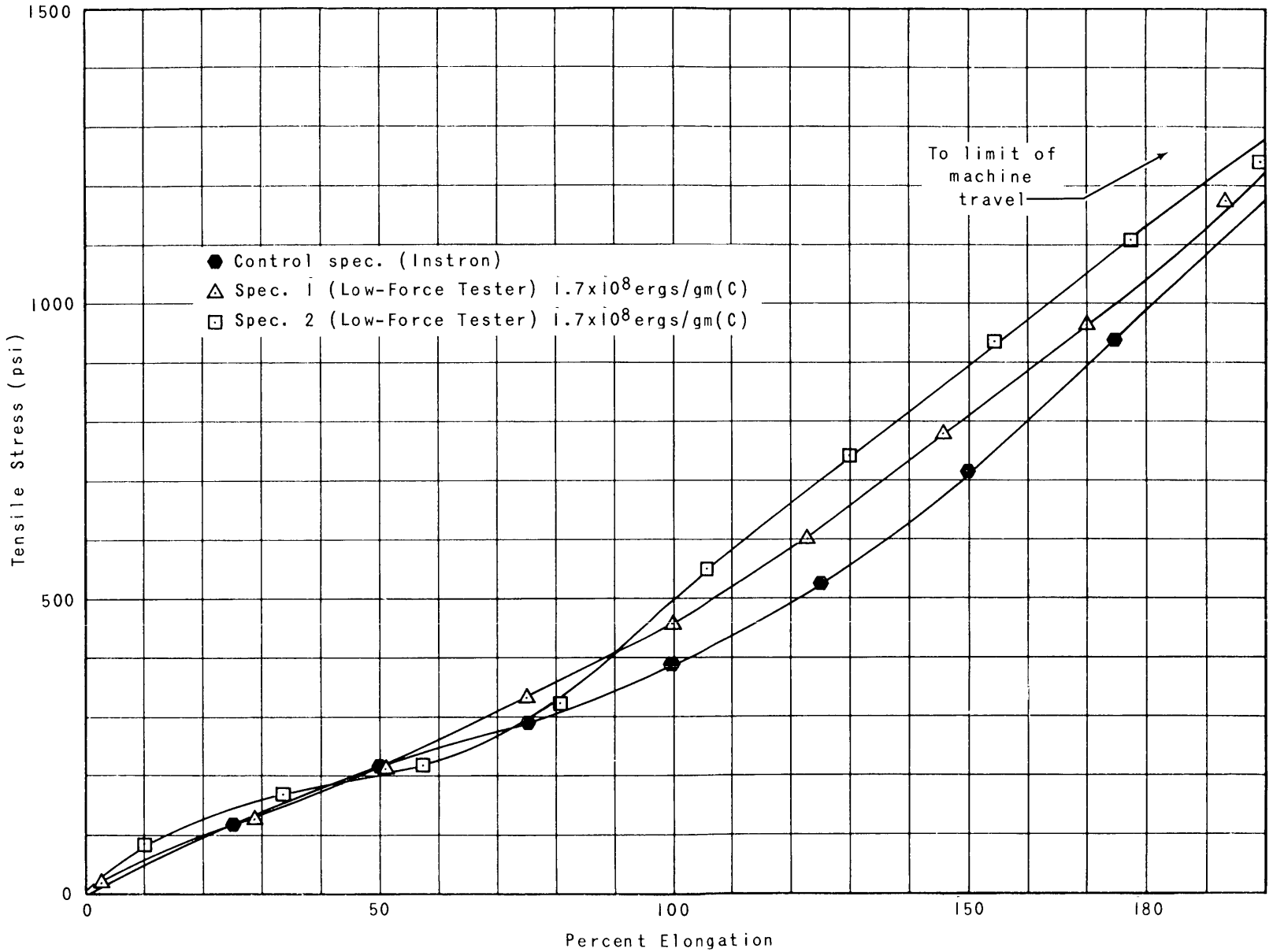


Figure 2.8 Stress-Strain Curves of Neoprene O-Rings: Run I

NPC 19,361

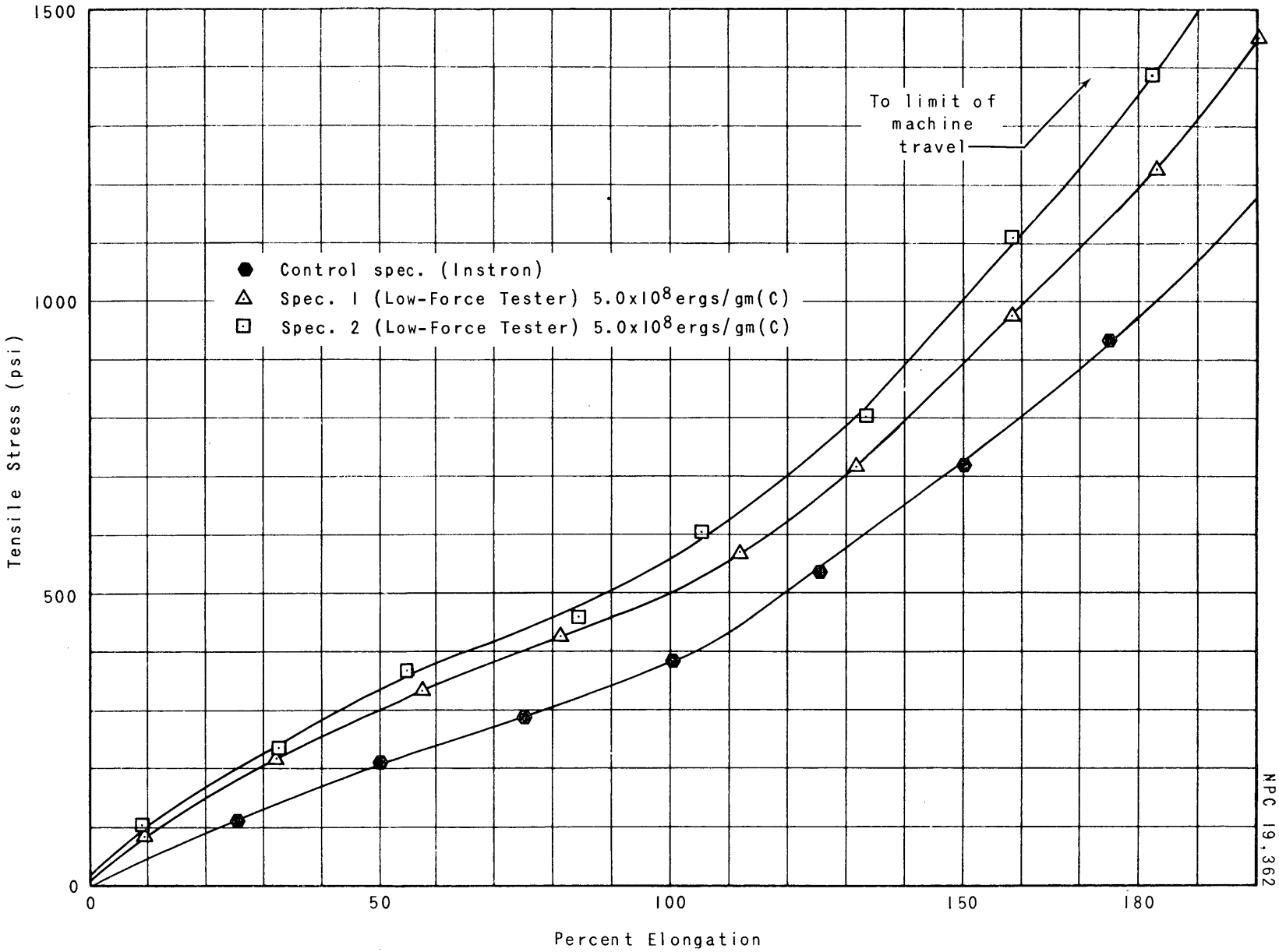


Figure 2.9 Stress-Strain Curves of Neoprene O-Rings: Run II

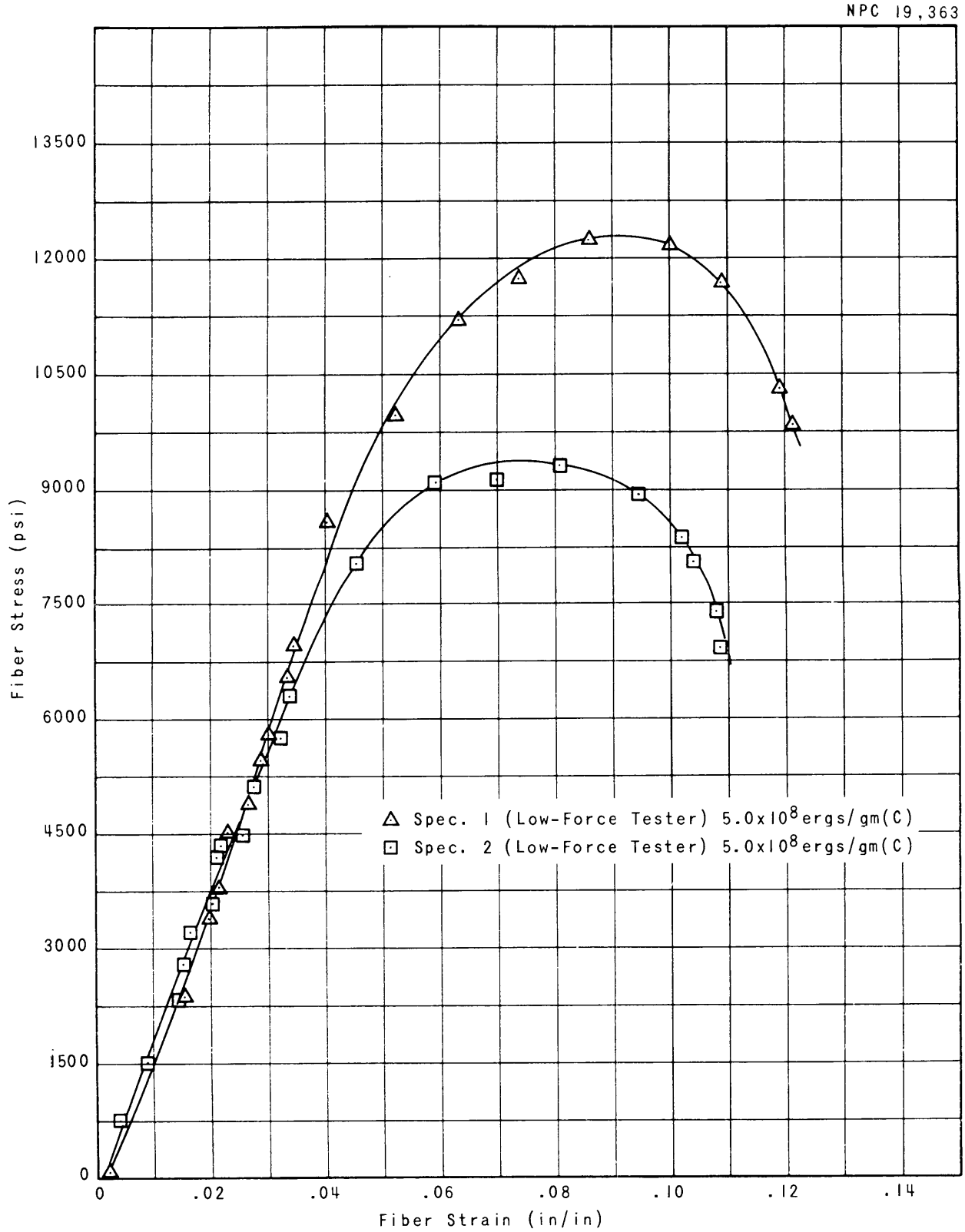


Figure 2.10 Flexural Load-Deflection Curves of Electrical Insulation Kel F-81: Run II

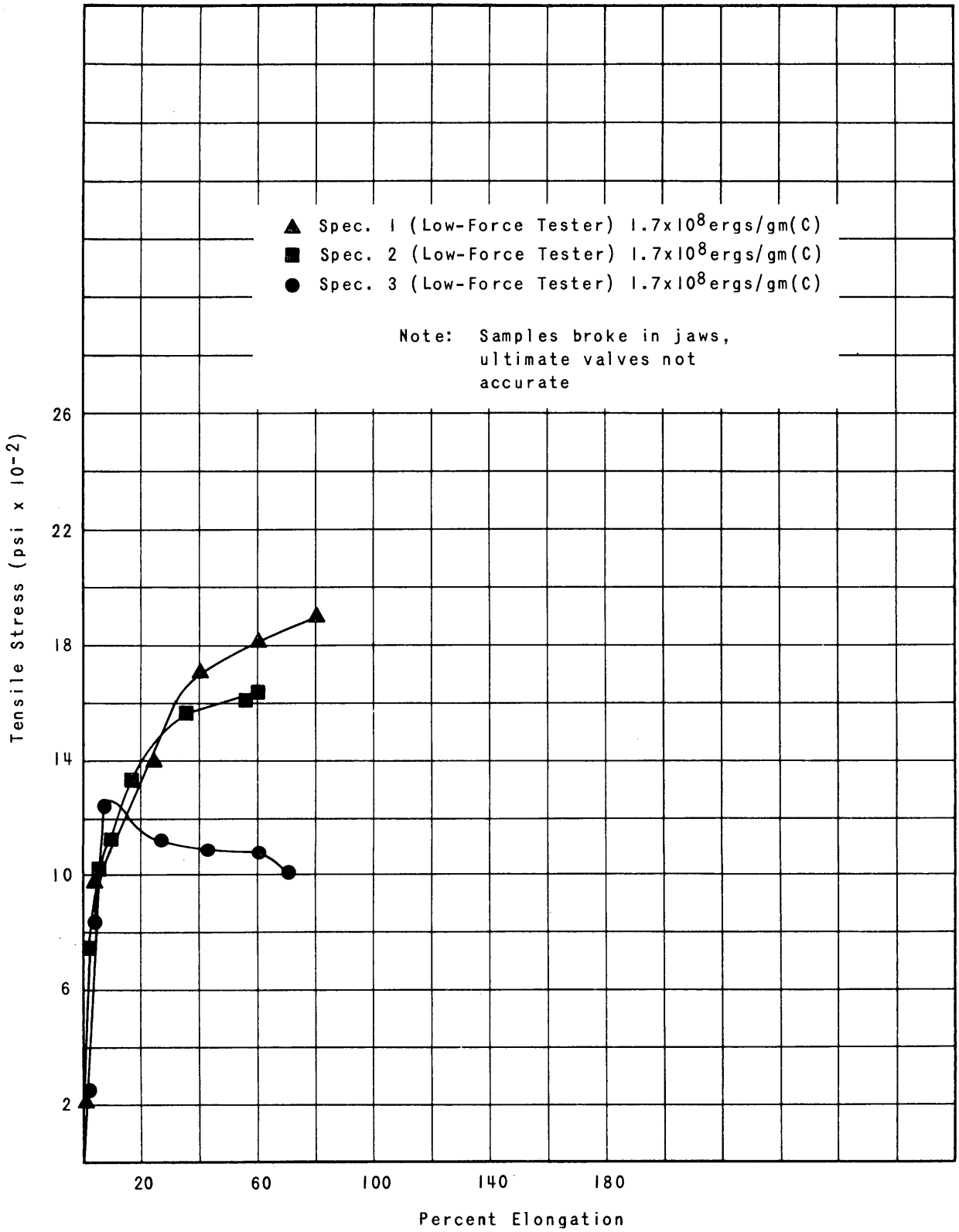


Figure 2.11 Stress-Strain Curves of Electrical Insulation Teflon TFE Film: Run I

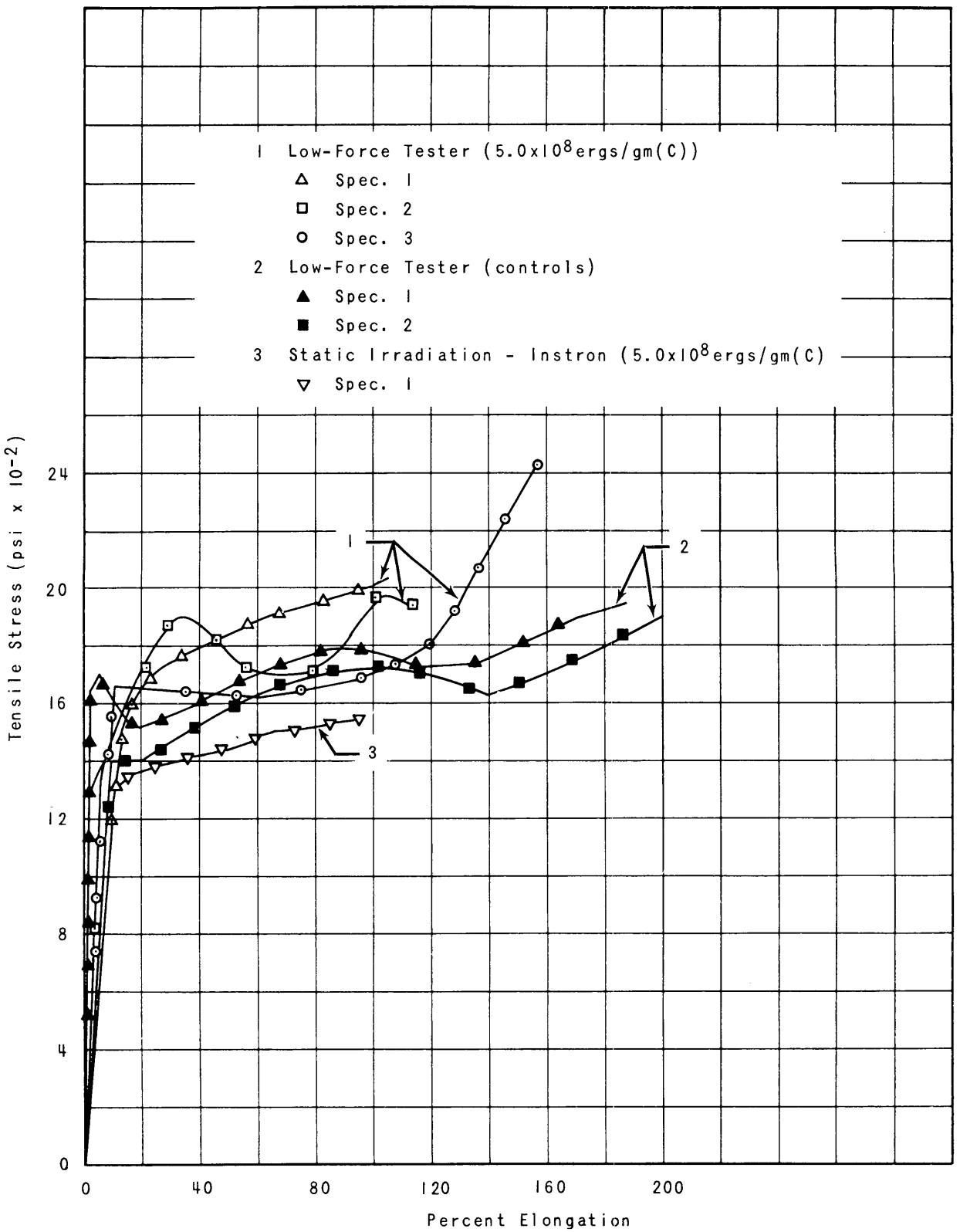


Figure 2.12 Stress-Strain Curves of Electrical Insulation Teflon TFE Film: Run II

## III. COMBINED EFFECTS OF RADIATION AND CRYOTEMPERATURES

### 3.1 Tensile-Specimen Preparation and Testing

All materials scheduled for testing under Modification 3 to the contract have been received at NARF from the sources of supply. All tensile specimens were prepared according to the original designs (Ref. 3), and irradiated during the second quarter of this year at the prescribed low and high doses in an ambient-air environment and at the prescribed low dose while submerged in $LN_2$. Postirradiation tensile tests for specimens from the ambient-air irradiation were then performed in the Irradiated Materials Laboratory with an Instron test machine. Postirradiation tensile tests for specimens irradiated while submerged in $LN_2$ were performed before removal of the specimens from $LN_2$. This operation was accomplished with use of an Instron machine, the cryogenic experimental assembly (see Fig. 3.1 in Ref. 3), and an interconnecting hydraulic servosystem.

Data accumulated on some materials in the tensile tests were good; on other materials data were questionable. Details concerning these data are discussed in Reference 4.

As a result of improper breaks during these initial tests, remaining specimens of materials D and H, which were scheduled for future testing at a high dose in $LN_2$ and at low and high doses in $LH_2$, were reduced in width in the narrow gage-length section from one-half inch to one-quarter inch. This modification was expected to result in a gage-length-section break for all specimens.

Such was not the case, however. Modified specimens of these two plastic materials, when tested at -320°F, continued to break both in the narrowed section and in the doubler section. No plausible explanation for this phenomenon has yet been found.

Teflon TFE was tested last year after irradiation in an ambient-air environment, but it was not tested in an $LN_2$ or $LH_2$ environment. Therefore, as an alternative to the possibility that no data will be generated on materials D and H this year, arrangements were made to test Teflon TFE again. Pull-rod spaces in the experimental assembly and ambient-air irradiation space were obtained. Specimens were fabricated according to the original design for specimens made from Materials D. A special etching process that resulted in a stronger bond between the Teflon and the aluminum doublers was used on the Teflon. The material will be tested after exposure to each of the nine possible combination environments associated with zero, low, and high doses of nuclear radiation and with ambient-air, $LN_2$ and $LH_2$ temperatures. And, of course, tensile tests at the two low temperatures will take place after irradiation while the specimens are still submerged in the cryogen fluids, without any intervening exposure to air.

T-peel specimens of Material O fell apart when submerged in $LN_2$. No tensile data were obtained after the low-dose $LN_2$ run, and the specimens will be excluded from future low-temperature tests. The pull-rod space will be used instead to test Teflon specimens.

## 3.2 Thermal-Conductivity Test Apparatus and Tests

The procedure for assembling the thermal conductivity tester is, first, to mount the test heaters, heater leads, Mycalex end pieces, thermocouples, and thermocouple leads in final position within the outer copper container (see Fig. 3.1). Following this, heater leads are carried out of the unit through the core of the Mycalex cylinder; thermocouple leads, through the foaming space. The properly mixed components of the test material are then poured into the bottom of the container and allowed to foam to the top.

Thermal-conductivity values for foam-type insulating materials are usually reported for minimum-density conditions. This minimum density will result from foaming the material in a container that is completely open in at least one direction. If the amount of liquid used is sufficient to free-foam a volume greater than the volume of a container that is even partially closed in all directions, then the final density will be greater than the free-foam value.

Such was the case with Stafoam AA-402 as foamed in the thermal conductivity tester. The top of the tester is, of necessity, closed except for six drilled holes in the top Mycalex end-piece, and the pre-foam liquid is injected into the unit through one of these holes. It is virtually impossible to inject the amount of liquid required to just fill the unit with foam. Instead, an amount is used which results in some foam being forced out of these holes at the top. This not only makes certain that the unit is completely filled but,

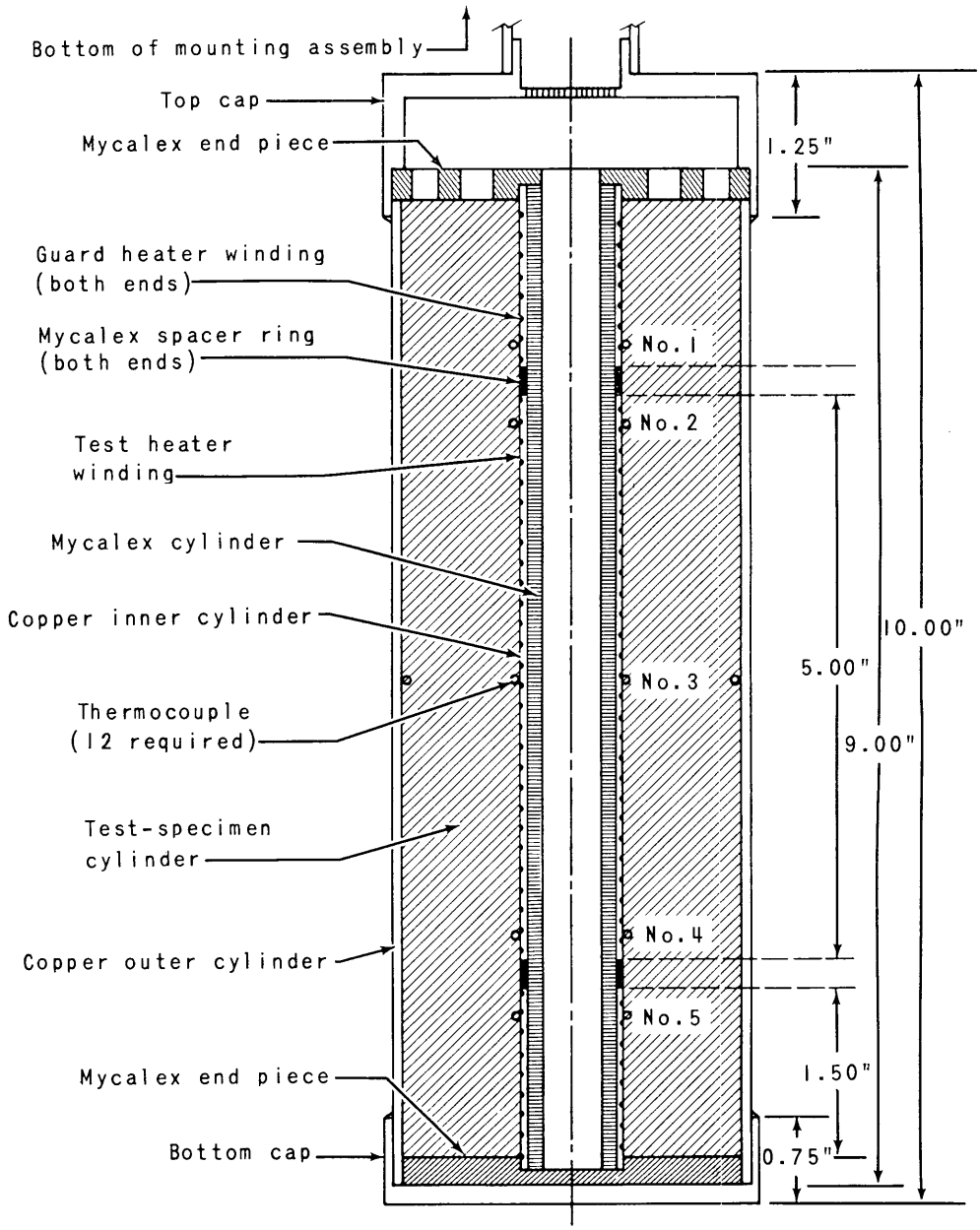


Figure 3.1 Thermal-Conductivity Tester

at the same time, causes an increase in the density of the foam over that which would result if the material were foamed in a completely free space. The density of Stafoam AA-402 foamed in a free space is about 2.00 $lb/ft^3$. The value in the thermal conductivity tester was 3.59 $lb/ft^3$.

The manufacturer's published value for the thermal conductivity of 2-lb-density Stafoam AA-402 (in units of Btu-in./$ft^2$-hr-$^oF$) is 0.145 at 70$^oF$ and 0.130 at -80$^oF$. Values obtained by Haskins and Hertz (Ref. 6) varied from 0.190 at 70$^oF$ to 0.10 at -80$^oF$ to 0.075 at 320$^oF$. (Some reasons for these differences at identical temperatures are suggested by Haskins and Hertz.) Preliminary values of 0.180 at 70$^oF$, 0.169 at -94$^oF$, and 0.153 at -320$^oF$ were obtained with one of five thermal conductivity testers which have, so far, been foamed with Stafoam AA-402 at GD/FW. Calculated values were obtained with use of generated test data and the equations shown in the Appendix of Reference 3.

Problems were encountered with all four units after they were foamed - problems that were amplified by the impossibility of making changes or repairs within the unit after the foam was in place. In the first tester, an open circuit that developed in one of the guard heaters after the foaming operation rendered the unit useless for thermal conductivity measurements. The unit was then sawed in half, longitudinally, to permit a check of the internal structure of the foam (see Fig. 3.2). Cellular structure and adherence of the foam to the container and other internal components were found to be both very good.

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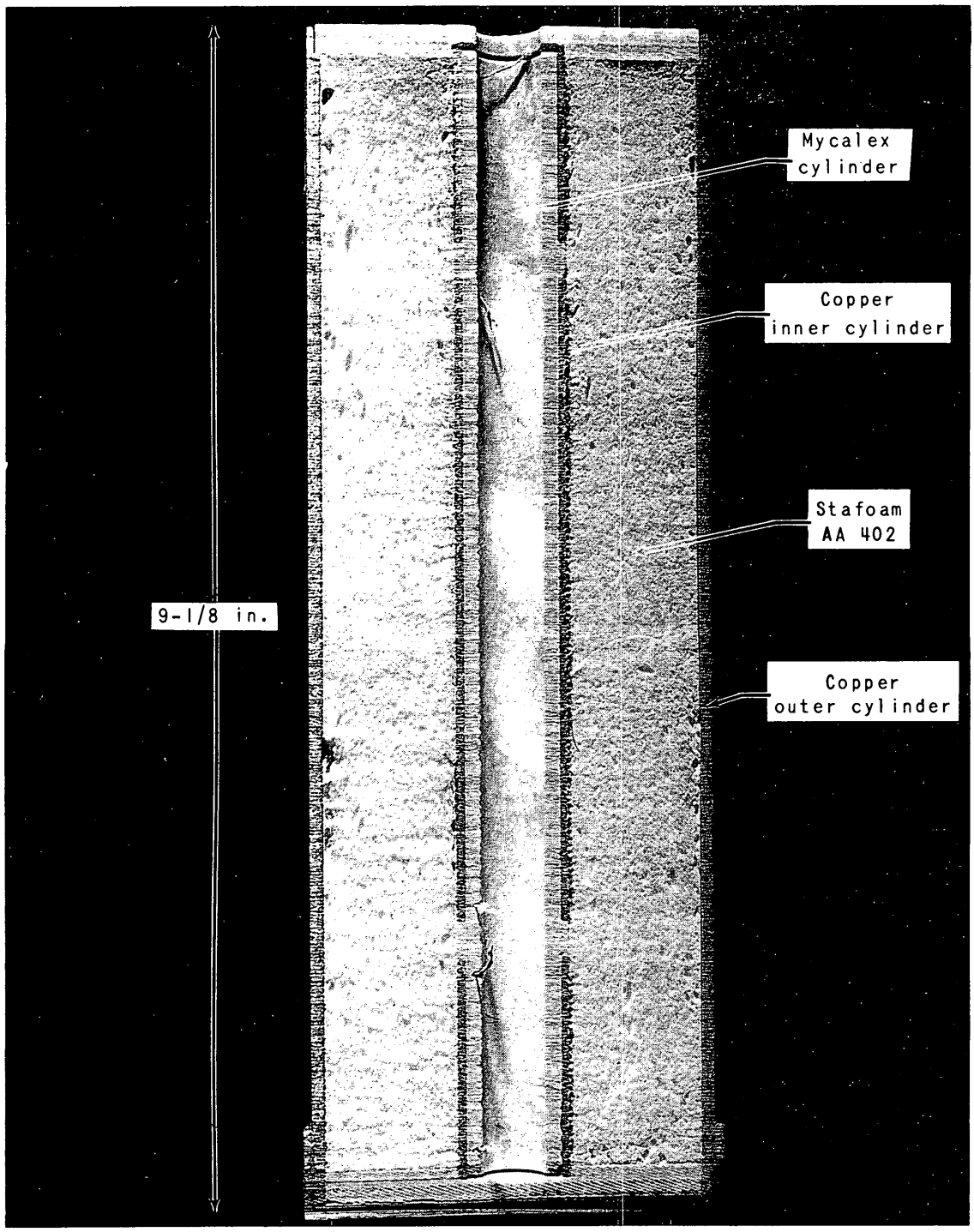


Figure 3.2 Cross-Section View of Thermal-Conductivity Tester

After completion of the foaming operation, open circuits were found in five of the twelve thermocouples in the second tester. Preliminary checkout measurements of thermal conductivity were made, but the data were considered to be unreliable. The third unit was assembled and foamed successfully, and preliminary data ( as reported above) seemed reliable. Attempts to reproduce these measured values at the three temperatures were, however, unsuccessful. The data varied widely, and current evidence indicates that leaks developed in the epoxy used to seal the top and bottom copper caps.

Furthermore, some thermocouples were lost during the second test run. Accumulated evidence suggested that successive thermal flexing of the foam within the tester was breaking the 3-mil thermocouple leads. A different epoxy was used in the fourth unit, but leaks and thermocouple open circuits continued to occur. The fifth unit was foamed with CPR 1021 instead of Stafoam AA-402. In addition, a new sealing compound was used for the top and bottom caps, and 10-mil thermocouple lead wire was used.

At this point in time, the next $LN_2$ irradiation run was scheduled to start, so that checkout work on these units had to cease in favor of shift work in the reactor area. Thus, completion of thermal-conductivity tester checkout work and irradiation tests were postponed until a later date.

## 3.3 Operational Checkout Test for Liquid-Nitrogen Dewar

### 3.3.1 Purpose

The main purpose for this test was to demonstrate the possibility of conducting safe, explosion-free tests which involve the irradiation of dewars containing large amounts of boiling liquid nitrogen, wherein the amount of liquid nitrogen that is boiled off during the test approaches hundreds or even thousands of gallons. The test was instigated at NARF as a result of the occurrence of several small detonations in $LN_2$ dewars during past irradiation tests at the facility.

### 3.3.2 Technical Considerations

Evidence has pointed out the fact that liquid-oxygen (LOX) impurities exist in commercially supplied liquid nitrogen ($LN_2$) in a concentration of up to 0.2 percent. Also, it is known that LOX, with a boiling point of $90^{\circ}K$, will, when mixed with boiling $LN_2$ at $77.4^{\circ}K$, remain in the liquid state. Therefore, it can be calculated that when from one to two thousand gallons of commercial $LN_2$ are boiled off in a large dewar, LOX in amounts approaching several gallons could be accumulated.

Two additional facts dovetail into the overall picture. First, molecular oxygen, under the influence of nuclear radiation, transforms into ozone. Whatever the mechanism is for the overall ozone yield, radiation initially produces ions, atoms, and excited molecules in the oxygen. These species may be produced by reactions such as the following:

$$O_2 \rightsquigarrow O_2^+ + e^- \qquad (1)$$

$$O_2 \rightarrow O_2^- \text{ or } O + O^- \qquad (2)$$

$$O_2 \rightsquigarrow O^+ = O = e^- \text{ or } O^+ + O^- \tag{3}$$

$$O_2 \rightsquigarrow O_2^* \text{ or } O + O. \tag{4}$$

Ozone may then be formed by many reactions, some of the more important of which are

$$\begin{aligned} O_2^+ + O_2^- &\rightarrow O_3 + O \\ &\rightarrow O_2^* + O_2 \\ &\rightarrow O_2 + O^* + O \\ &\rightarrow O_2 + O^* + O^* \end{aligned} \tag{5}$$

$$O + O_2 + M \rightarrow O_3 + M \tag{6}$$

$$O_2 + O_2^* \rightarrow O_3 + O. \tag{7}$$

Second, this radiation-produced ozone will then, under the influence of organic or other types of sensitizers and of catalysts (M), dissociate into molecular and atomic oxygen according to such reactions as

$$O_3 + M \rightarrow O_2 + O + M \tag{8}$$

$$O + O_3 \rightarrow 2\ O_2. \tag{9}$$

These dissociation reactions are highly exothermic and may, under proper conditions of confinement, be explosive.

A vivid enactment of this chain of events is believed to have taken place during a SNPO irradiation at GD/FW during the third week of May 1963. A dewar of 20-gallon capacity was filled with $LN_2$ and irradiated at various reactor power levels

for a period of 16 hours. During this time the $LN_2$ was boiling out of the dewar at a rate of from 20 to 40 gallons per hours, with the loss being continuously made up from an outside supply tank. The reported purity of $LN_2$ in the supply tank was 99.8 percent with the remaining 0.2 percent being mostly LOX.

At the end of the irradiation run, the dewar was positioned on the horizontal track of the escalator system and the $LN_2$ supply shut off. Approximately four hours later (this period of time being just about sufficient to boil off a subcooled dewar of $LN_2$) several loud detonations occurred in the dewar, and several witnesses noticed a distinct odor of ozone in the area.

On the basis of calculated (and measured) $LN_2$ boil-off rates during irradiation tests of existing dewars, it has been determined that anywhere from 1,000 to 3,000 gallons of $LN_2$ will be consumed in a 50-hour test. From this it can therefore be assumed that use of $LN_2$ with a purity of 99.8 percent or less in these dewars could result in ozone explosions during irradiation tests. On the other hand, it can also be assumed that if $LN_2$ with a guaranteed LOX content of less than 20 ppm is used, any ozone formed will be in insufficient quantities to produce detectable detonations. This test was an attempt to establish a high degree of reliability for the latter assumption.

### 3.3.3 Test Description

The test was conducted at NARF, using the GTR and the modified NASA dewars that were built at GD/FW under NASA Contract NAS8-2450. The dewar (Fig. 3.3) is a four-walled, all-aluminum vessel which was modified from the original

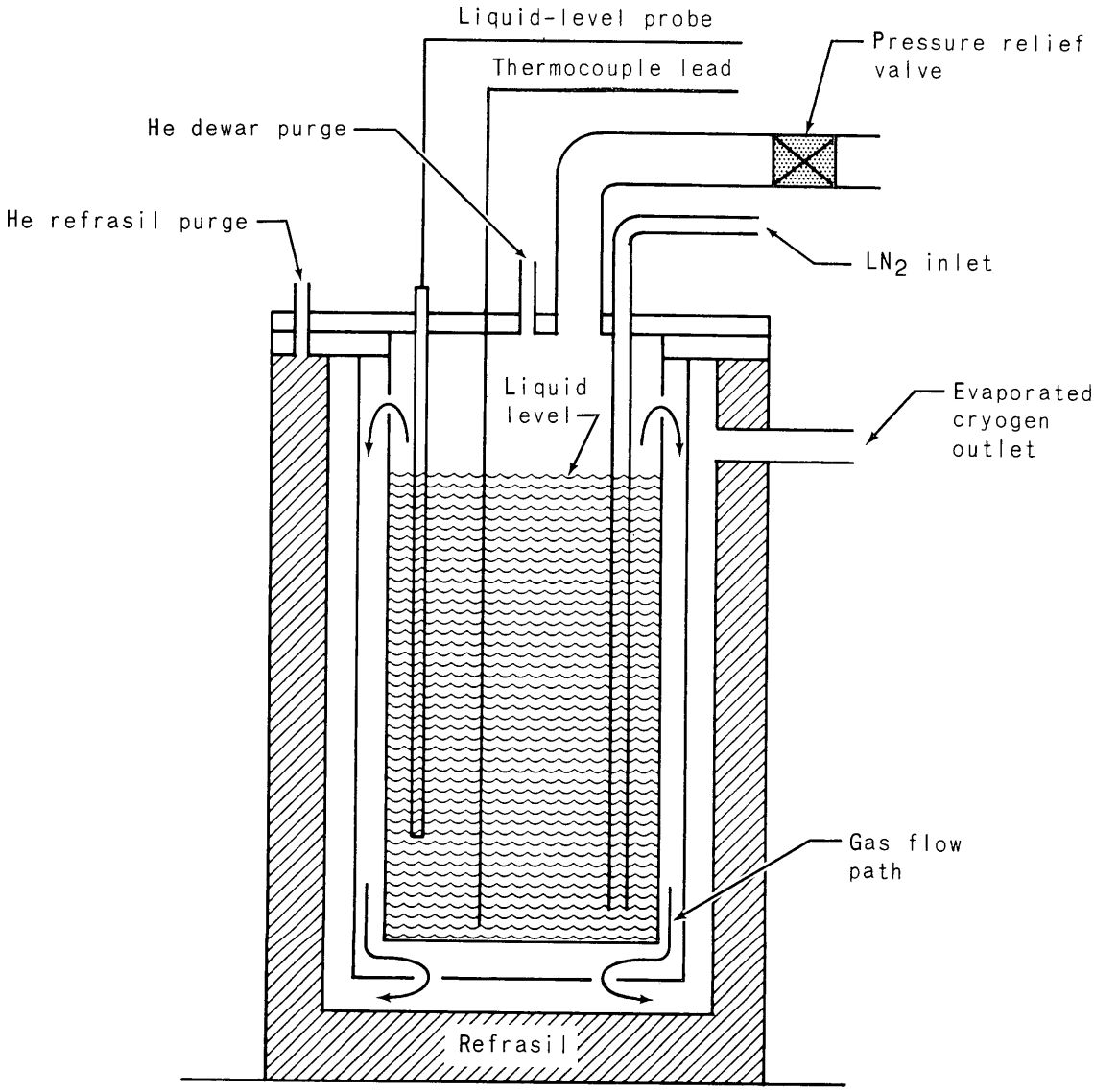


Figure 3.3 NASA Dewar

design to utilize, now, a double-reverse path for evaporated cryogen to act as thermal insulation for the central cryogen chamber. The outermost chamber contains the original Refrasil thermal insulation material.

The test consisted of irradiating the dewar for a 13-hour period, during which approximately 400 gallons of $LN_2$ (with a tested LOX content of less than 20 ppm) was boiled away in the cryogen chamber. During the run, temperature of the bottom of the cryogen chamber was monitored to detect any change from that of $LN_2$, since a different temperature is probably indicative of the presence of a significant amount of LOX or ozone.

At the end of the irradiation period, with the chamber still filled, a one-gallon sample of the contents of the bottom of the chamber was retrieved and allowed to boil away in a restricted area to check on the possible presence of LOX or ozone.

3.3.4 Experimental Equipment

The dewar as shown in Figure 3.3 was used. It was fastened to the underside of a standard NASA tensile assembly that served as a top cover for the cryogen chamber. The dewar contained 4000 cc of lead to provide an added source of gamma heating and thus increase the $LN_2$ boil-off rate. A 500-gallon portable $LN_2$ supply tank was used with an Armaflex-insulated, 1/2-inch soft-copper supply line. Temperature in the bottom of the cryogen chamber was monitored with a Brown recorder and a copper-constantan thermocouple. A liquid-level probe was attached to the underside of the dewar mounting plate. A pressure relief valve was mounted on the mating flange of the upper

tensile assembly and served to relieve any pressure in the cryogen chamber in excess of 7-1/2 psi. Helium, under low pressure, was fed into the dewar during the run from a He bottle and regulator.

Evaporated cryogen was bled out of the dewar through a one-inch gate valve. A cylinder of helium gas was used with a pressure regulator to purge the entire system prior to initiation of $LN_2$ flow. Sampling of the liquid in the bottom of the cryogen chamber at the end of the run was accomplished by pressurizing the dewar to 7 psi and forcing $LN_2$ back out the supply line and into a one-gallon open dewar.

3.3.5 Test Procedure and Results

The dewar, with attached tensile assembly, was positioned in the support framework, which then was attached to an escalator pallet on the horizontal tracks just north of the handling area in the reactor test area. Helium gas was then applied to the Refrasil packing in the dewar under 5 psi for a one-hour period. This thoroughly permeated the Refrasil fibers with helium. Thermocouple harness, liquid-level harness, $LN_2$ supply line, helium supply line, evaporated cryogen outlet line, and pressure relief valve were attached to the proper connections on the dewar cover plate. The entire assembly was then lowered into irradiation position.

With the $LN_2$ supply line disconnected at the supply tank, the entire system was purged with helium gas through a connection on top of the dewar. The helium supply was then shut off, the gate valve on the end of the evaporated-cryogen outlet opened wide, the $LN_2$ supply line connected to the tank, and

$LN_2$ flow started. The dewar filling operation proceeded normally and, when the liquid level reached the top resistor on the liquid-level probe, $LN_2$ flow was reduced to match the boil-off rate. The reactor was then started, brought to a 3-Mw power level, and operated for a 13-hour period. Boil-off rate during the test varied from a maximum of 35 gallons per hour at the beginning of the test, before the dewar had subcooled, to a minimum rate of 18 gallons per hour. The average rate was 20 gallons per hour. This was with the dewar located on the west irradiation pallet, with the reactor operating at 3-Mw and with 4000 cc of lead in the cryogen chamber.

After completion of the run, the reactor was retracted, the $LN_2$ supply shut off, and the assembly raised from irradiation position to the top edge of the pool. The $LN_2$ supply line was then disconnected from the supply tank and diverted to the open one-gallon dewar. The valve on the end of the evaporated-cryogen outlet line was slowly closed and pressure inside the dewar monitored with the pressure transducer. Pressure in the system rose gradually as a result of cryogen boil-off in the dewar and leveled off at 7 psi. This pressure then forced $LN_2$ out of the dewar and back through the $LN_2$ supply line. The supply line had warmed up in an interim period and most of the contents of the dewar flashed to gas before reaching the small open specimen-dewar. Liquid flow from the line began eventually, however, and a one-gallon specimen was obtained. During the initial flow of gas, a mild odor of ozone was detected, but it had disappeared by the time liquid was collected.

This liquid specimen was allowed to boil away and was observed during the boil-off period by personnel wearing protective clothing and face shields. During boil-off, the remaining liquid gradually turned dark blue in color - which could have implied the presence of ozone. No odor of ozone was detected, however, and no detonations occurred.

Nothing unusual was noticed by instrumentation for the test dewar during the 13-hour irradiation period, and no explosions were heard. No pressure or temperature changes were recorded and boil-off rates were normal. After completion of the purging operation at the end of the test, the dewar was opened and examined. Neither changes in the structure nor any other evidence of detonations were found.

Figure 3.4 is a flow diagram for the test equipment.

## 3.4 Future Operational Procedures for NASA Dewars

### 3.4.1 Structural Modifications

To comply with planned operational procedures, two structural modifications to the dewars were necessary. These were (1) installation of a 1-inch drain line from the inside bottom of the cryogen chamber, through the four walls of the structure, to the outside, and (2) reinforcement of the third wall out from the center of the dewar with 1/4-inch-thick aluminum plate on all four sides and bottom.

The drain line is installed flush with the location of the cryogen chamber to permit complete drainage of any liquid in the chamber. A two-way solenoid valve is installed at the outlet of this line. The 1/4-inch-thick plates are welded to the existing third wall out from the center of the dewar and

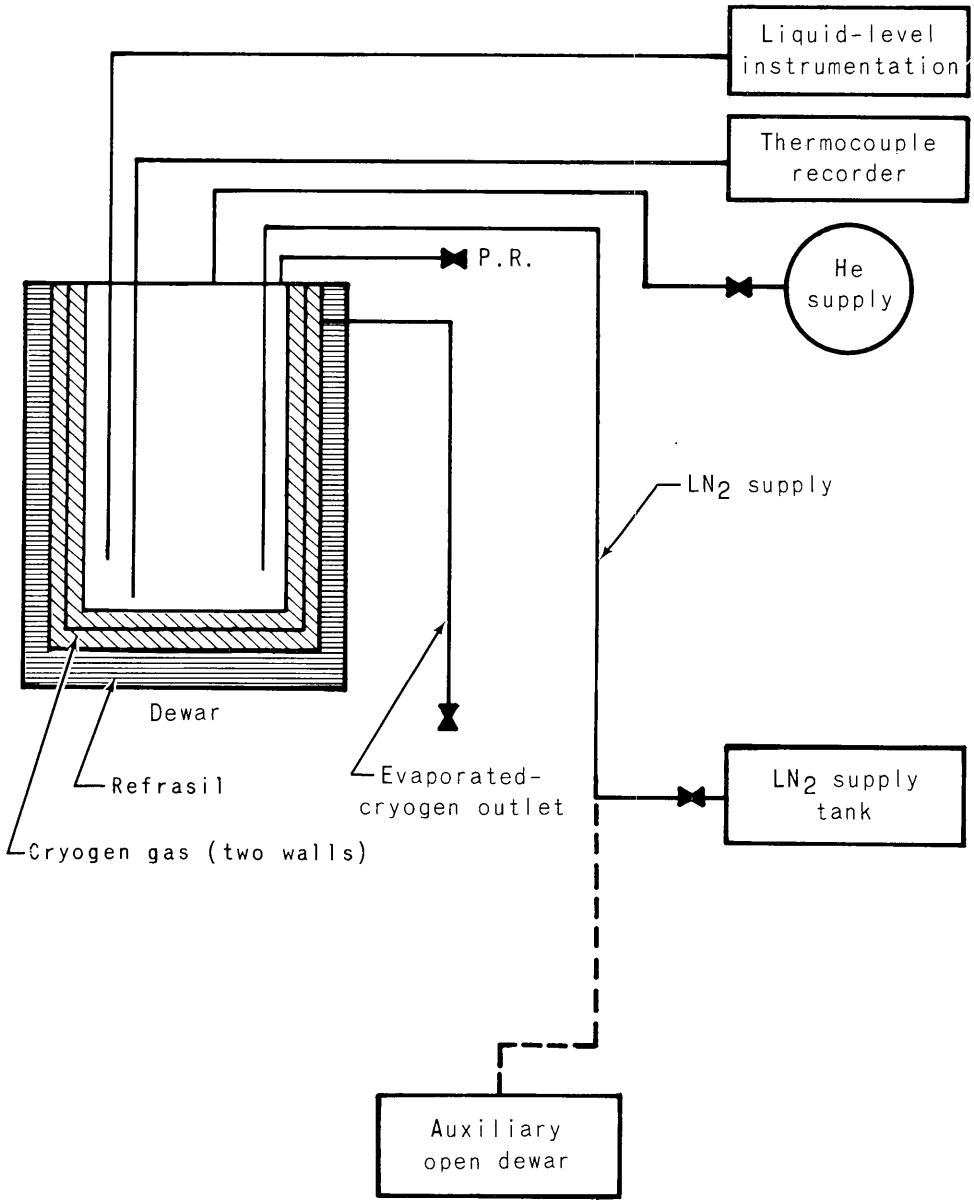


Figure 3.4 Flow Diagram

are, in addition, welded, plate-to-plate, at the edges. The next-to-outer chamber of the dewar (Fig. 3.3) was pressure-checked to 20 psi.

3.4.2 Operational Procedures

Future irradiation tests at NARF which involve the evaporation of large quantities of $LN_2$ will, according to present plans, utilize the NASA dewars as shown in Figure 3.3 except with modifications as described above. Standard procedure during operation will include use of a liquid-level sensor, a pressure transducer to monitor dewar pressure continuously, a pressure relief valve, a continuous helium purge in the cryogen chamber, and continuous temperature measurement. A preirradiation purge of the Refrasil insulation in the outer chamber will also be made.

The results of the test described in Section 3.3 go far toward establishing an explosion-free reliability for liquid-nitrogen irradiation tests that use only ultra-pure (20 ppm or less) $LN_2$. Modification to the dewar as described above makes possible the use of an added safety feature. Instead of merely boiling off the $LN_2$ in the dewar, the contents of the cryogen chamber can now be purged by either of two methods. First, the solenoid valve in the end of the 1-inch drain line at the bottom of the cryogen chamber can be opened remotely and the contents drained out by gravity flow. Second, the pressure relief valve can be set at 15 psi, the evaporated cryogen outline line valved off, the solenoid valve closed, the $LN_2$ supply line unhooked at the supply tank, and helium pressure

applied through the purge line to force liquid back out the $LN_2$ supply line. This purging operation could take place, say, every eight hours during an irradiation run to eliminate any possibility of an increase in LOX or ozone concentration.

# IV. COMBINED EFFECTS OF RADIATION, VACUUM, AND CRYOTEMPERATURES

A program has been initiated to evaluate the combined effects of radiation, vacuum, and cryotemperature on selected engineering materials. The determination of the required properties will be made after irradiation while the materials are maintained in the high-vacuum and cryotemperature environment. Two specially built testers will be used to perform these tests: an Electrical Tester to measure dielectric strength and dissipation factor, and a Mechanical Tester to measure stress-strain properties.

During this quarter the following major items have been completed for the Electrical Tester: (1) fabrication and leak-testing, (2) material selection and sample preparation, (3) control testing, (4) final preparation for the irradiation test. Also completed during this quarter, was the design of the Mechanical Tester, on which fabrication is approximately 40% complete.

## 4.1 Test-Material Selection

The materials selected for testing in the two dynamic testers are given in Table 4.1. The selection was based on the results from the vacuum-radiation tests and the cryotemperatures-radiation tests presented in the two-volume annual report (Refs. 1, 2) and from the tests performed during April and June. Another consideration given to the selection of the test materials is the use of these materials in current missiles and their probable use in future missiles.

Table 4.1

Materials for Vacuum-Cryogenic-Irradiation Experiment

| Dynamics Tester | Category | Chemical Class | Trade Name |
|---|---|---|---|
| Electrical Tester | Dielectric material | Fluoroethylene | Teflon TFE |
| | Electrical insulation | Polyvinyl chloride | Estane 5740 |
| | Potting compound | Epoxy resin<br>Silicone | Epon 828/Z<br>RTV-501 |
| Mechanical Tester | Dielectric material | Fluoroethylene<br>Polyimide<br>Polyester | Teflon TFE<br>SP Plastic<br>P-43 |
| | Electrical insulation | Polyvinyl chloride | Estane 5740 |

## 4.2 Test Equipment

The two cryogenic dynamic testers are designed to fit into the access opening of the Vacuum Irradiation Chambers (Fig. 2.1). One of the two vacuum chambers has been modified to provide safe operation in an explosive atmosphere to qualify for use with liquid-hydrogen cryogen. The standard motor, transformer, electrical contactor, and relays used with the original system that would contribute to an electrical spark have been removed and/or replaced. Also, all of the electrical lines and connectors have been enclosed with special conduit.

The Electrical Tester was designed and constructed by NASA at the George C. Marshall Space Flight Center under

the direction of R. L. Gause. Shown in Figure 4.1 are the major component parts of the tester. The cryogen enters through the vacuum system top plate and is contained in a shroud, which is a hollow cylinder one inch wide and 24 inches high. As can be seen from Figure 4.1, the shroud is attached to a top plate of the vacuum system and the test cells are attached to stainless-steel plates that are supported by a separate frame. For irradiation testing, the test cells and frame are inserted as a unit in the center of the hollow shroud and bolted in place. In this manner the gamma heat is transferred by radiant and conductive heat-transfer modes, since the test cells are not submerged in the cryogen.

Figure 4.2 shows the details of the test cells. These cells are designed in accordance with ASTM-D-150-54T ("A.C. Capacitance, Dielectric Constant, and Loss Characteristics of Electrical Insulation Material").

Operational checkout of the Electrical Tester was completed by NASA in late June. The control test at GD/FW was conducted with liquid nitrogen as the coolant. The unit was then prepared for the irradiation exposure scheduled for the first part of September.

The final design of the Mechanical Tester, completed in July, is shown in Figure 4.3. Fabrication, now approximately 40% complete is scheduled for completion by October 1. The tester was designed so that it would be closed enough to provide for the best heat-transfer possible from the samples and yet be open enough to allow easy access to

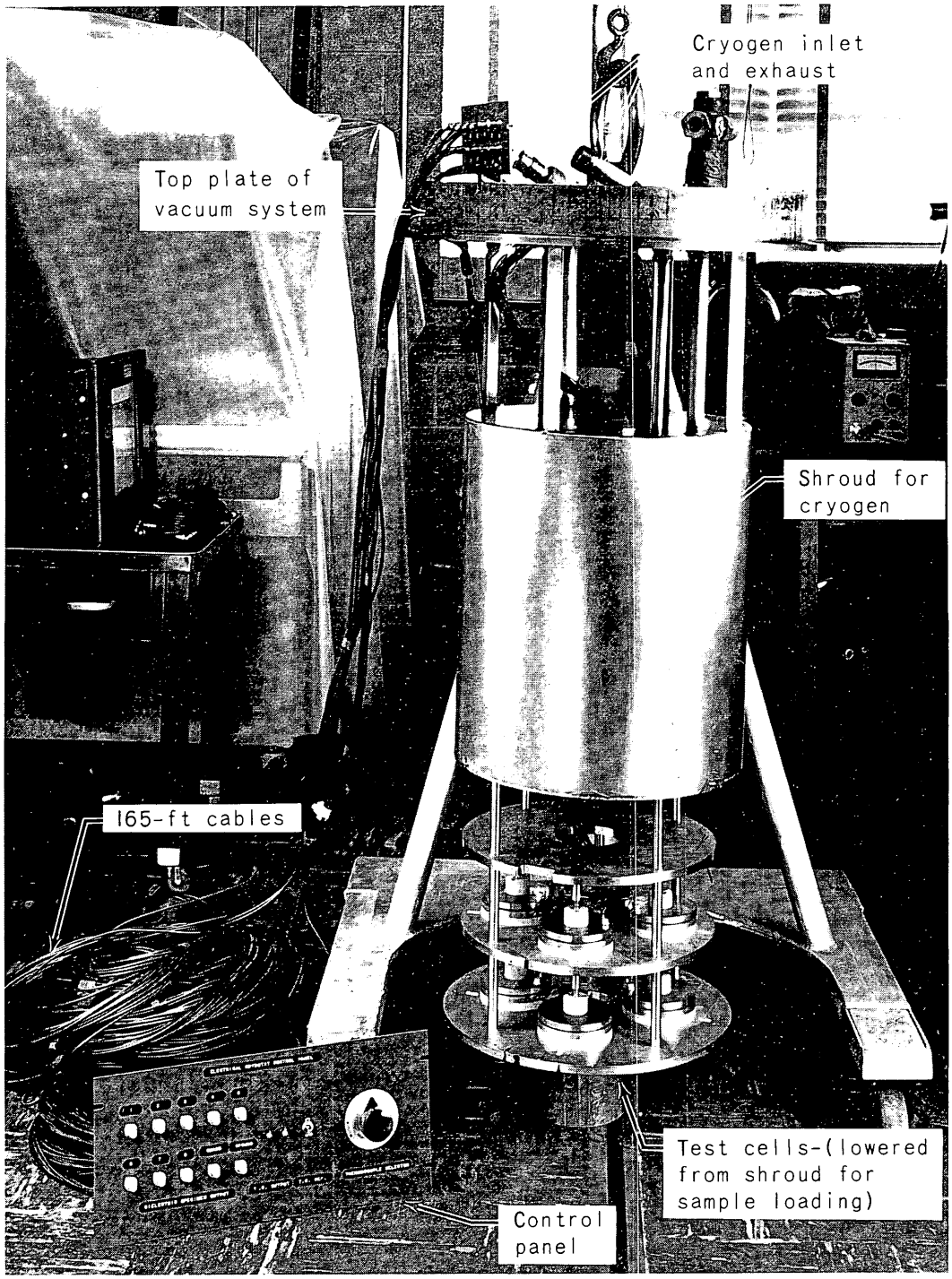


Figure 4.1 Electrical Tester Open for Sample Installation

NPC 19,354

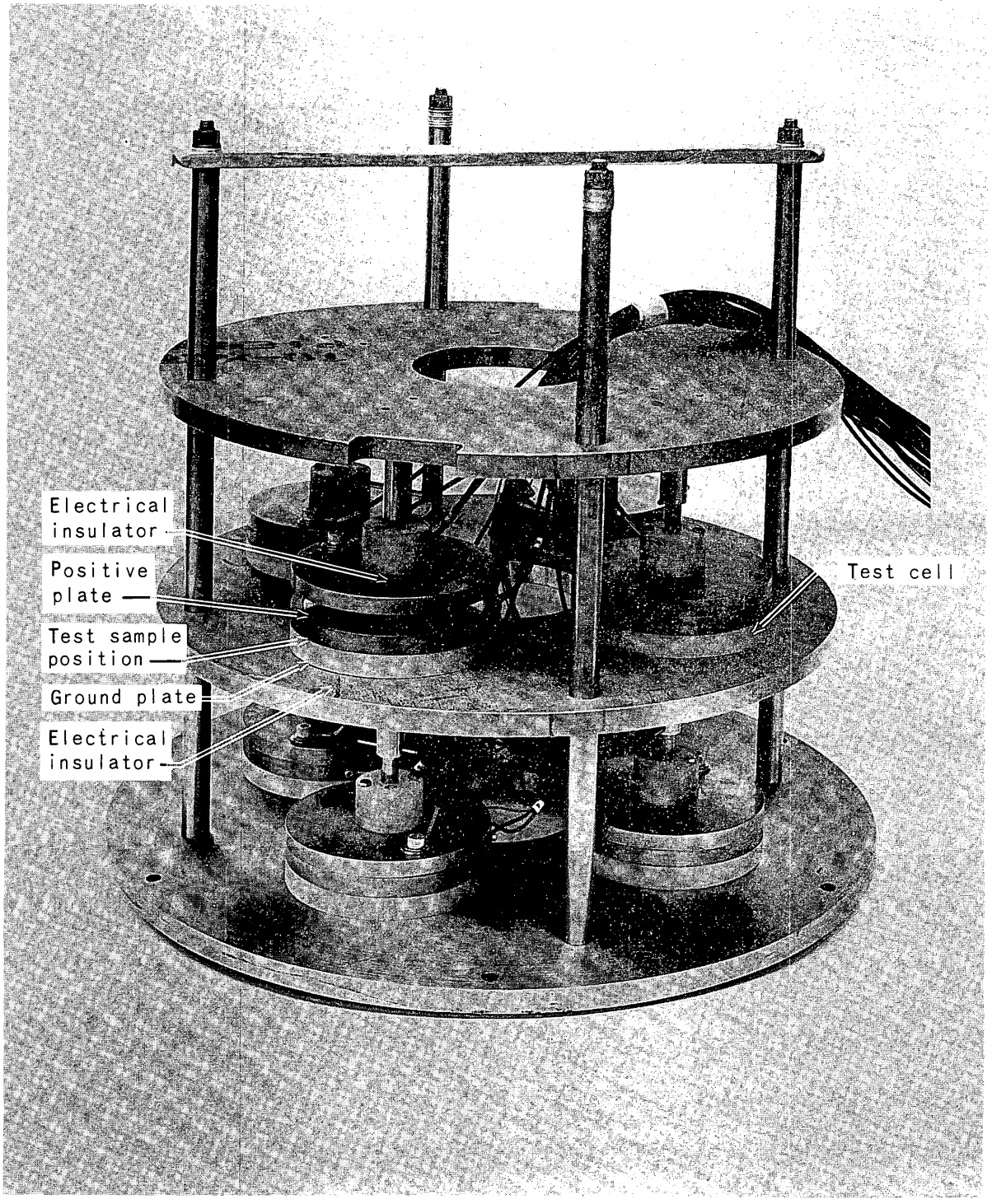


Figure 4.2 Test-Cell Arrangement of Electrical Tester

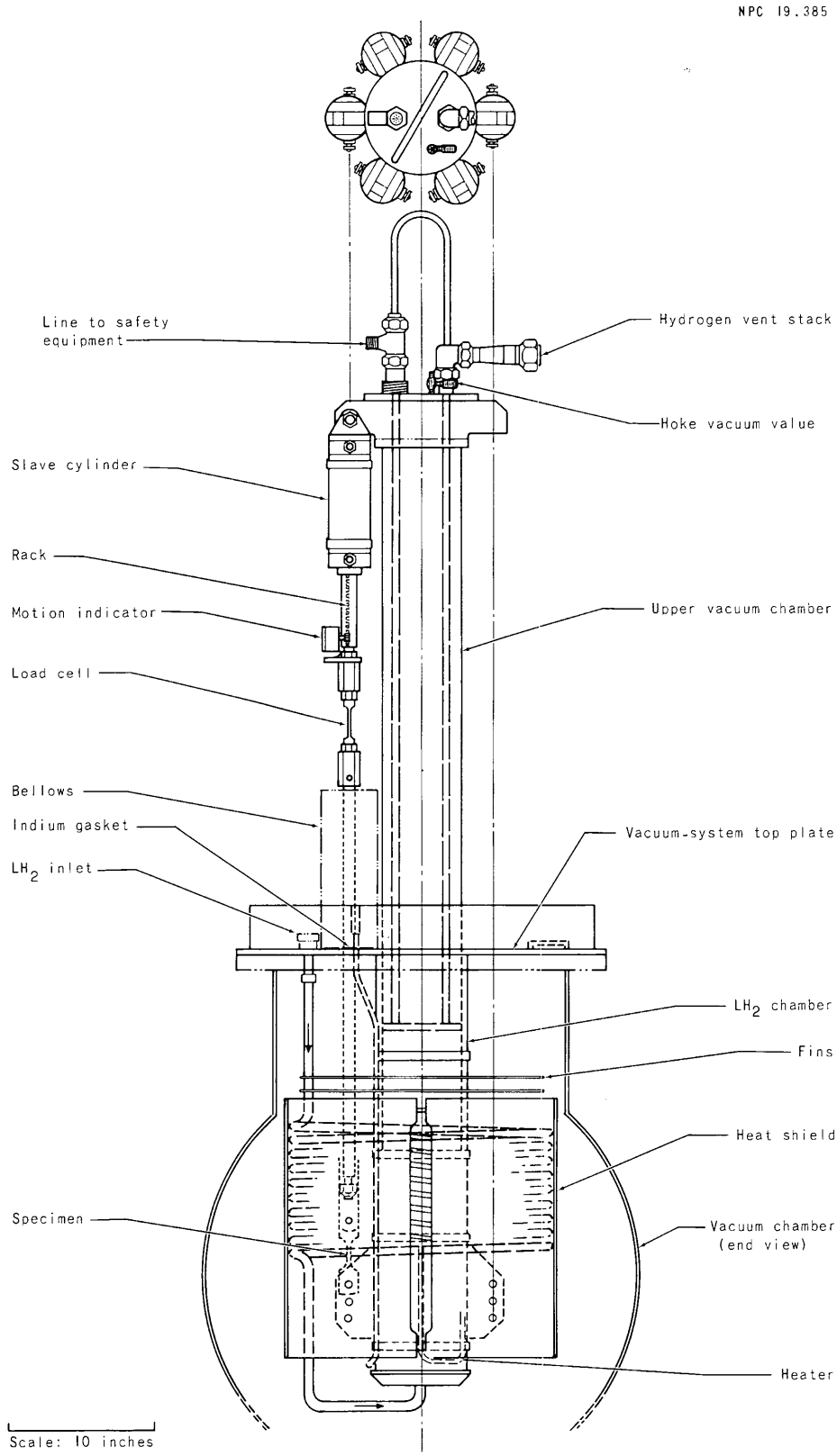


Figure 4.3 Mechanical Tester-Vacuum Chamber Arrangement

install samples and to allow adequate vacuum pumping. Since the test is being done in a vacuum, it is not possible to have the samples in contact with the cryogen; therefore, the sample must be cooled by radiant and conductive heat-transfer modes from the cryogen container.

In addition, the tester must be rigid enough to withstand a 5000-lb load with a minimum of flexure. This requirement necessitates the use of a considerable amount of structural material, and the nuclear-reactor-radiation-induced heating rate for steel of 0.35 watts/cc per Mw of reactor power (Ref. 7) will cause a considerable amount of heat to be generated in the tester that must be removed by the cryogen.

The final design of the tester provides for the cryogen to enter a top plate of the vacuum system and be conducted through a coil of tubing surrounding the samples before entering the bottom of a 6-inch ID tube. Sample pull rods are geometrically located around the 6-inch ID tube but inside of the coil of tubing. The bottom of the samples are attached with a clevis to the 6-inch ID tube. This tube is the main structural part of the tester. In this manner, the cryogen is in direct contact with the main mass of the tester, where the most gamma heating will be received. Since the main structure is cooled directly and the test samples are fastened to this structure through short clevises, the test samples should remain near the temperatures of the cryogen.

## 4.3 Test Plan

The test plan for the electrical tests includes three irradiations: one in air at ambient condition, one in vacuum and using liquid nitrogen as the cryogen, and one in vacuum using liquid hydrogen as the cryogen. The control test using liquid nitrogen was made during July; however, the data will be presented when all tests have been completed. The irradiation at liquid-nitrogen temperature and ambient temperature are scheduled for the first week of September; the liquid-hydrogen test, for the middle of October.

One irradiation is scheduled for the Mechanical Tester using liquid hydrogen as the cryogen. This test is scheduled for the middle of October.

# APPENDIX

## TABULATION OF DATA FOR MATERIALS IRRADIATED STATICALLY IN VACUUM AND AIR ENVIRONMENT

Table A-1

Test Environments and Results of Static Tests: Structural Adhesives

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Radiation Exposure: Neutron (n/cm$^2$) Thermal | Radiation Exposure: Neutron (n/cm$^2$) E > 2.9 Mev | Radiation Exposure: Neutron (n/cm$^2$) E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shell 929 | Air | 0 | 0 (control specimens) | 0 | 0 | - | 2312 | 95 | Lime Green | | | | |
| | | | | | | | 2458 | 95 | Lime Green | | | | |
| | | | | | | | 2676 | 95 | Lime Green | | | | |
| | | | | | | | 2856 | 95 | Lime Green | | | | |
| | | | | | | | 2212 | 95 | Lime Green | | | | |
| | | | | | | | 2772 | 95 | Lime Green | | | | |
| | | | | | | | 848 | 90 | Lime Green | | | | |
| | | | | | | | 2032 | 90 | Lime Green | | | | |
| | | | | | | | 2200 | 90 | Lime Green | | | | |
| | | | | | | | 2652 | 90 | Lime Green | | | | |
| | | | | | | | 1920 | 90 | Lime Green | | | | |
| | | | | | | | 2288 | 90 | Lime Green | | | | |
| | | | | | | | 2208 | 90 | Lime Green | | | | |
| | | | | | | | 2264/602 | 92/1 | | | | | |
| | Air | 6.0(9) | - (air irradiation) | 1.26(15) | - | 17 | 2522 | 95 | Light Brown | 100 | | ---- | |
| | | | | | | | 2448 | 95 | Light Brown | | | | |
| | | | | | | | 3000 | 95 | Light Brown | | | | |
| | | | | | | | 3208 | 95 | Light Brown | | | | |
| | | | | | | | 2876 | 95 | Light Brown | | | | |
| | | | | | | | 2968 | 95 | Light Brown | | | | |
| | | | | | | | 3130 | 95 | Light Brown | | | | |
| | | | | | | | 2879/281 | 95 | | | | | |
| | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 17 | 2460 | 95 | Light Brown | 100 | | ---- | |
| | | | | | | | 2484 | 95 | Light Brown | | | | |
| | | | | | | | 2812 | 95 | Light Brown | | | | |
| | | | | | | | 2300 | 95 | Light Brown | | | | |
| | | | | | | | 2810 | 95 | Light Brown | | | | |
| | | | | | | | 2568 | 95 | Light Brown | | | | |
| | | | | | | | 2774 | 95 | Light Brown | | | | |
| | | | | | | | 2601/189 | 95 | | | | | |
| | Air | 3.9(10) | 2.8(14) (air irradiation) | 6.1(15) | 2.6(14) | 17 | 2636 | 95 | Light Brown | 100 | | ---- | |
| | | | | | | | 2696 | 95 | Light Brown | | | | |
| | | | | | | | 2372 | 95 | Light Brown | | | | |
| | | | | | | | 2312 | 95 | Light Brown | | | | |
| | | | | | | | 2288 | 95 | Light Brown | | | | |
| | | | | | | | 2936 | 95 | Light Brown | | | | |
| | | | | | | | 2328 | 95 | Light Brown | | | | |
| | | | | | | | 2510/240 | 95 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shell 929 (continued) | Air | 5.9(9) | 1.18(14) (vacuum irradiation) | 6.55(14) | - | 10 | 1912 | 95 | Light Brown | 130 | | 1(-3) | |
| | | | | | | | 2268 | 95 | Light Brown | | | | |
| | | | | | | | 2120 | 95 | Light Brown | | | | |
| | | | | | | | 2160 | 95 | Light Brown | | | | |
| | | | | | | | 2568 | 95 | Light Brown | | | | |
| | | | | | | | 1892 | 95 | Light Brown | | | | |
| | | | | | | | 2016 | 95 | Light Brown | | | | |
| | | | | | | | 2134/250 | 95 | | | | | |
| | Air | 1.05(10) | 1.32(14) (vacuum irradiation) | 1.65(15) | 5.9(13) | 10 | 1688 | 95 | Light Brown | 150 | | 1(-3) | |
| | | | | | | | 2040 | 95 | Light Brown | | | | |
| | | | | | | | 2400 | 95 | Light Brown | | | | |
| | | | | | | | 2420 | 95 | Light Brown | | | | |
| | | | | | | | 2160 | 95 | Light Brown | | | | |
| | | | | | | | 1960 | 95 | Light Brown | | | | |
| | | | | | | | 2560 | 95 | Light Brown | | | | |
| | | | | | | | 2175/322 | 95 | | | | | |
| | Air | 2.85(10) | 3.88(14) (vacuum irradiation) | 6.62(15) | 2.09(14) | 9 | 2048 | 95 | | 200 | | 6(-7) | |
| | | | | | | | 2120 | 95 | | | | | |
| | | | | | | | 1760 | 95 | | | | | |
| | | | | | | | 2080 | 95 | | | | | |
| | | | | | | | 2000 | 95 | | | | | |
| | | | | | | | 2200 | 95 | | | | | |
| | | | | | | | 1600 | 95 | | | | | |
| | | | | | | | 1973/222 | 95 | | | | | |
| Shell 934 | Air | 0 | 0 (control specimens) | 0 | 0 | - | 2686 | 95 | Dark Gray | | | | |
| | | | | | | | 2932 | 95 | Dark Gray | | | | |
| | | | | | | | 3048 | 90 | Dark Gray | | | | |
| | | | | | | | 2652 | 95 | Dark Gray | | | | |
| | | | | | | | 2516 | 95 | Dark Gray | | | | |
| | | | | | | | 2700 | 95 | Dark Gray | | | | |
| | | | | | | | 2120 | 90 | Gray | | | | |
| | | | | | | | 2040 | 95 | Gray | | | | |
| | | | | | | | 2360 | 90 | Gray | | | | |
| | | | | | | | 2680 | 90 | Gray | | | | |
| | | | | | | | 2520 | 80 | Gray | | | | |
| | | | | | | | 2720 | 90 | Gray | | | | |
| | | | | | | | 2600 | 90 | Gray | | | | |
| | | | | | | | 2562/303 | 92/4 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shell 934 (continued) | Air | 6.0(9) | - (air irradiation) | 1.26(15) | - | 16 | 2440 | 70 | Dark Gray | 100 | | - | |
| | | | | | | | 3000 | 70 | Dark Gray | | | | |
| | | | | | | | 2848 | 70 | Dark Gray | | | | |
| | | | | | | | 2956 | 90 | Dark Gray | | | | |
| | | | | | | | 2786 | 95 | Dark Gray | | | | |
| | | | | | | | 3014 | 90 | Dark Gray | | | | |
| | | | | | | | 3064 | 90 | Dark Gray | | | | |
| | | | | | | | 2873/231 | 82/9 | | | | | |
| | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 16 | 2708 | 80 | Dark Gray | 100 | | - | |
| | | | | | | | 2274 | 90 | Dark Gray | | | | |
| | | | | | | | 2744 | 80 | Dark Gray | | | | |
| | | | | | | | 3114 | 90 | Dark Gray | | | | |
| | | | | | | | 3036 | 95 | Dark Gray | | | | |
| | | | | | | | 2732 | 80 | Dark Gray | | | | |
| | | | | | | | 3160 | 80 | Dark Gray | | | | |
| | | | | | | | 2824/328 | 85/6 | | | | | |
| | Air | 3.9(10) | 2.8(14) (air irradiation) | 6.1(15) | 2.6(14) | 16 | 2832 | 90 | Dark Gray | 100 | | - | |
| | | | | | | | 2892 | 90 | Dark Gray | | | | |
| | | | | | | | 3040 | 90 | Dark Gray | | | | |
| | | | | | | | 3092 | 90 | Dark Gray | | | | |
| | | | | | | | 3000 | 90 | Dark Gray | | | | |
| | | | | | | | 2600 | 90 | Dark Gray | | | | |
| | | | | | | | 2426 | 90 | Dark Gray | | | | |
| | | | | | | | 2840/246 | 90/0 | | | | | |
| | Air | 5.9(9) | 1.18(14) (vacuum irradiation) | 6.58(14) | - | 10 | 2320 | 90 | | 130 | | 1(-3) | |
| | | | | | | | 2640 | 90 | | | | | |
| | | | | | | | 2520 | 90 | | | | | |
| | | | | | | | 2320 | 90 | | | | | |
| | | | | | | | 2280 | 90 | | | | | |
| | | | | | | | 2360 | 90 | | | | | |
| | | | | | | | 2660 | 90 | | | | | |
| | | | | | | | 2443/141 | 90/0 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shell 934 (continued) | Air | 1.05(10) | 1.32(14) (vacuum irradiation) | 1.65(15) | 5.9(13) | 10 | 2440 | 90 | Gray | 150 | | 1(-3) | |
| | | | | | | | 1720 | 90 | Gray | | | | |
| | | | | | | | 2400 | 90 | Gray | | | | |
| | | | | | | | 2440 | 90 | Gray | | | | |
| | | | | | | | 2120 | 95 | Gray | | | | |
| | | | | | | | 2040 | 90 | Gray | | | | |
| | | | | | | | 2560 | 95 | Gray | | | | |
| | | | | | | | 2246/311 | 91/2 | | | | | |
| | Air | 2.85(10) | 3.88(14) (vacuum irradiation) | 6.62(15) | 2.09(14) | 9 | 2200 | 90 | Dark Brown | 200 | | 6(-7) | |
| | | | | | | | 2880 | 80 | Dark Brown | | | | |
| | | | | | | | 2680 | 85 | Dark Brown | | | | |
| | | | | | | | 2120 | 95 | Dark Brown | | | | |
| | | | | | | | 2080 | 95 | Dark Brown | | | | |
| | | | | | | | 2320 | 95 | Dark Brown | | | | |
| | | | | | | | 1960 | 90 | Dark Brown | | | | |
| | | | | | | | 2320/340 | 90/4 | | | | | |
| FM-1000 | Air | 0 | 0 (control specimens) | 0 | 0 | | 6460 | 30 | White | | | | |
| | | | | | | | 6340 | 25 | White | | | | |
| | | | | | | | 6380 | 20 | White | | | | |
| | | | | | | | 6370 | 10 | White | | | | |
| | | | | | | | 6000 | 10 | White | | | | |
| | | | | | | | 6200 | 15 | White | | | | |
| | | | | | | | 6360 | 20 | White | | | | |
| | | | | | | | 5770 | - | White | | | | |
| | | | | | | | 6460 | - | White | | | | |
| | | | | | | | 6340 | - | White | | | | |
| | | | | | | | 6400 | - | White | | | | |
| | | | | | | | 6430 | 30 | White | | | | |
| | | | | | | | 6200 | 30 | White | | | | |
| | | | | | | | 6250 | 50 | White | | | | |
| | | | | | | | 6283/203 | 24/13 | | | | | |
| | Air | 6.0(9) | - (air irradiation) | 1.26(15) | - | 17 | 6160 | 40 | Light Yellow | 100 | | - | |
| | | | | | | | 6120 | 40 | Light Yellow | | | | |
| | | | | | | | 6040 | 40 | Light Yellow | | | | |
| | | | | | | | 6196 | 40 | Light Yellow | | | | |
| | | | | | | | 6180 | 70 | Light Yellow | | | | |
| | | | | | | | 6220 | 40 | Light Yellow | | | | |
| | | | | | | | 6240 | 50 | Light Yellow | | | | |
| | | | | | | | 6165/74 | 46/11 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FM-1000 (continued) | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 17 | 6340 | 40 | Light Yellow | 100 | | - | |
| | | | | | | | 6420 | 50 | Light Yellow | | | | |
| | | | | | | | 6480 | 40 | Light Yellow | | | | |
| | | | | | | | 6130 | 40 | Light Yellow | | | | |
| | | | | | | | 6230 | 50 | Light Yellow | | | | |
| | | | | | | | 6460 | 60 | Light Yellow | | | | |
| | | | | | | | 6400 | 60 | Light Yellow | | | | |
| | | | | | | | 6351/129 | 49/7 | | | | | |
| | Air | 3.9(10) | 2.8(14) (air irradiation) | 6.1(15) | 2.6(14) | 17 | 6260 | 50 | Light Yellow | 100 | | - | |
| | | | | | | | 6160 | 40 | Light Yellow | | | | |
| | | | | | | | 4920 | 95 | Light Yellow | | | | |
| | | | | | | | 6260 | 60 | Light Yellow | | | | |
| | | | | | | | 6350 | 40 | Light Yellow | | | | |
| | | | | | | | 6400 | 60 | Light Yellow | | | | |
| | | | | | | | 6250 | 50 | Light Yellow | | | | |
| | | | | | | | 6086/547 | 56/20 | | | | | |
| | Air | 5.9(9) | 1.18(14) (vacuum irradiation) | 6.58(14) | - | 10 | 6500 | 25 | Orange | 130 | | 1(-3) | |
| | | | | | | | 5930 | 20 | Orange | | | | |
| | | | | | | | 6550 | 25 | Orange | | | | |
| | | | | | | | 5840 | 15 | Orange | | | | |
| | | | | | | | 6130 | 15 | Orange | | | | |
| | | | | | | | 7050 | 25 | Orange | | | | |
| | | | | | | | 6290 | 25 | Orange | | | | |
| | | | | | | | 6327/447 | 21/4 | | | | | |
| | Air | 1.05(10) | 1.32(14) (vacuum irradiation) | 1.65(15) | 5.9(13) | 10 | 6900 | 60 | Orange | 150 | | 1(-3) | |
| | | | | | | | 5300 | 95 | Orange | | | | |
| | | | | | | | 5560 | 95 | Orange | | | | |
| | | | | | | | 6980 | 60 | Orange | | | | |
| | | | | | | | 5900 | 95 | Orange | | | | |
| | | | | | | | 5000 | 95 | Orange | | | | |
| | | | | | | | 4380 | 95 | Orange | | | | |
| | | | | | | | 5717/932 | 85/11 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Radiation Exposure: Neutron (n/cm²) Thermal | Neutron E > 2.9 Mev | Neutron E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature Avg. (°F) | Temperature Figure No.[b] | Pressure Avg. (torr) | Pressure Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FM-1000 (continued) | Air | 2.85(10) | 3.88(14) (vacuum irradiation) | 6.62(15) | 2.09(14) | 9 | 6100 | 90 | Brown | 200 | | 6(-7) | |
| | | | | | | | 6200 | 20 | Brown | | | | |
| | | | | | | | 6690 | 80 | Brown | | | | |
| | | | | | | | 5600 | 20 | Brown | | | | |
| | | | | | | | 6330 | 20 | Brown | | | | |
| | | | | | | | 6000 | 95 | Brown | | | | |
| | | | | | | | 5900 | 95 | Brown | | | | |
| | | | | | | | 6117/403 | 60/28 | | | | | |
| HT-424 | Air | 0 | 0 (control specimens) | 0 | 0 | | 3716 | 15 | Gray Green or Drab Olive | | | | |
| | | | | | | | 3898 | 20 | | | | | |
| | | | | | | | 3588 | 18 | | | | | |
| | | | | | | | 3632 | 18 | | | | | |
| | | | | | | | 3890 | 20 | | | | | |
| | | | | | | | 3664 | 10 | | | | | |
| | | | | | | | 3416 | 10 | Gray Green | | | | |
| | | | | | | | 3412 | 15 | Gray Green | | | | |
| | | | | | | | 3756 | 15 | Gray Green | | | | |
| | | | | | | | 3504 | 15 | Gray Green | | | | |
| | | | | | | | 3308 | 20 | Gray Green | | | | |
| | | | | | | | 3620 | 20 | Gray Green | | | | |
| | | | | | | | 3464 | 15 | Gray Green | | | | |
| | | | | | | | 3605/177 | 16/3 | | | | | |
| | Air | 6.0(9) | - (air irradiation) | 1.26(15) | - | 14 | 3504 | 20 | Gray Green or Drab Olive | 100 | | - | |
| | | | | | | | 3604 | 20 | | | | | |
| | | | | | | | 3524 | 20 | | | | | |
| | | | | | | | 3728 | 22 | | | | | |
| | | | | | | | 3344 | 20 | | | | | |
| | | | | | | | 3478 | 20 | | | | | |
| | | | | | | | 3522 | 20 | | | | | |
| | | | | | | | 3529/142 | 20/1 | | | | | |
| | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 14 | 3548 | 20 | Gray Green or Drab Olive | 100 | | - | |
| | | | | | | | 3318 | 15 | | | | | |
| | | | | | | | 3444 | 15 | | | | | |
| | | | | | | | 3396 | 15 | | | | | |
| | | | | | | | 3256 | 20 | | | | | |
| | | | | | | | 3248 | 18 | | | | | |
| | | | | | | | 3328 | 15 | | | | | |
| | | | | | | | 3363/111 | 17/2 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HT-424 (continued) | Air | 3.9(10) | 2.8(14) (air irradiation) | 6.1(15) | 2.6(14) | 14 | 2662 | 15 | Gray Green or Drab Olive | 100 | | - | |
| | | | | | | | 2670 | 15 | | | | | |
| | | | | | | | 2540 | 10 | | | | | |
| | | | | | | | 2686 | 20 | | | | | |
| | | | | | | | 2728 | 5 | | | | | |
| | | | | | | | 2468 | 10 | | | | | |
| | | | | | | | 2442 | 10 | | | | | |
| | | | | | | | 2599/106 | 12/6 | | | | | |
| | Air | 5.9(9) | 1.18(14) (vacuum irradiation) | 6.58(14) | - | 9 | 3516 | 15 | Gray Green | 130 | | 1(-3) | |
| | | | | | | | 3524 | 10 | Gray Green | | | | |
| | | | | | | | 3532 | 15 | Gray Green | | | | |
| | | | | | | | 3478 | 25 | Gray Green | | | | |
| | | | | | | | 3416 | 20 | Gray Green | | | | |
| | | | | | | | 3480 | 20 | Gray Green | | | | |
| | | | | | | | 3440 | 20 | Gray Green | | | | |
| | | | | | | | 3484/43 | 18/4 | | | | | |
| | Air | 2.85(10) | 3.88(14) (vacuum irradiation) | 6.62(15) | 2.09(14) | 8 | 3528 | 20 | Gray Green | 200 | | 6(-7) | |
| | | | | | | | 3340 | 15 | Gray Green | | | | |
| | | | | | | | 3188 | 10 | Gray Green | | | | |
| | | | | | | | 3000 | 10 | Gray Green | | | | |
| | | | | | | | 3376 | 10 | Gray Green | | | | |
| | | | | | | | 3280 | 10 | Gray Green | | | | |
| | | | | | | | 3410 | 10 | Gray Green | | | | |
| | | | | | | | 3303/195 | 12/4 | | | | | |
| | Air | 1.05(10) | 1.32(14) | 1.65(15) | 5.9(13) | 9 | 3484 | 20 | Gray Green | 150 | | 1(-3) | |
| | | | | | | | 3456 | 20 | Gray Green | | | | |
| | | | | | | | 3224 | 25 | Gray Green | | | | |
| | | | | | | | 3224 | 25 | Gray Green | | | | |
| | | | | | | | 3328 | 25 | Gray Green | | | | |
| | | | | | | | 3352 | 10 | Gray Green | | | | |
| | | | | | | | 3544 | 15 | Gray Green | | | | |
| | | | | | | | 3373/118 | 20/6 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Radiation Exposure: Neutron (n/cm²) Thermal | Radiation Exposure: Neutron (n/cm²) E > 2.9 Mev | Radiation Exposure: Neutron (n/cm²) E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature Avg. (°F) | Temperature Figure No.[b] | Pressure Avg. (torr) | Pressure Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Narmco A | Air | 0 | 0 (control specimens) | 0 | 0 | | 3876 | 25 | Very light Green to Cream | | | | |
| | | | | | | | 4164 | 25 | | | | | |
| | | | | | | | 3892 | 25 | | | | | |
| | | | | | | | 3736 | 25 | | | | | |
| | | | | | | | 4212 | 40 | Gray | | | | |
| | | | | | | | 4268 | 40 | Light Gray | | | | |
| | | | | | | | 3816 | 60 | Gray | | | | |
| | | | | | | | 4452 | 20 | Very light Green | | | | |
| | | | | | | | 4680 | 25 | | | | | |
| | | | | | | | 4328 | 25 | | | | | |
| | | | | | | | 4032 | 35 | | | | | |
| | | | | | | | 4196 | 40 | | | | | |
| | | | | | | | 4392 | 40 | | | | | |
| | | | | | | | 4157/283 | 33/15 | | | | | |
| | Air | 6.0(9) | - (air irradiation) | 1.26(15) | - | 14 | 4388 | 75 | Light Yellowish Brown | 100 | | - | |
| | | | | | | | 4152 | 75 | | | | | |
| | | | | | | | 3956 | 80 | | | | | |
| | | | | | | | 4452 | 90 | | | | | |
| | | | | | | | 4160 | 90 | | | | | |
| | | | | | | | 4600 | 90 | | | | | |
| | | | | | | | 4472 | 70 | | | | | |
| | | | | | | | 4311/238 | 81/7 | | | | | |
| | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 14 | 4582 | 70 | Medium Yellowish Brown | 100 | | - | |
| | | | | | | | 4144 | 70 | | | | | |
| | | | | | | | 3864 | 70 | | | | | |
| | | | | | | | 4746 | 60 | | | | | |
| | | | | | | | 4456 | 90 | | | | | |
| | | | | | | | 4368 | 85 | | | | | |
| | | | | | | | 4308 | 90 | | | | | |
| | | | | | | | 4324/400 | 76/11 | | | | | |
| | Air | 3.9(10) | 2.8(14) (air irradiation) | 6.1(15) | 2.6(14) | 14 | 2640 | 95 | Medium Brown Between Metal-Dark Reddish Brown at Ends | 100 | | - | |
| | | | | | | | 2924 | 95 | | | | | |
| | | | | | | | 3810 | 90 | | | | | |
| | | | | | | | 4130 | 90 | | | | | |
| | | | | | | | 3668 | 98 | | | | | |
| | | | | | | | 3756 | 90 | | | | | |
| | | | | | | | 4508 | 90 | | | | | |
| | | | | | | | 3634/691 | 93/3 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Narmco A (cont'd) | Air | 5.9(9) | 1.18(14) (vacuum irradiation) | 6.58(14) | - | 10 | 4112<br>3992<br>3840<br>4300<br>4232<br>4348<br>4088<br>4130/188 | 50<br>80<br>80<br>80<br>90<br>80<br>70<br>76/15 | Light Yellowish Brown | 130 | | 1(-3) | |
| | Air | 1.05(10) | 1.32(14) (vacuum irradiation) | 1.65(15) | 5.9(13) | 10 | 4812<br>4460<br>3700<br>4720<br>4000<br>4500<br>4560<br>4394/411 | 90<br>90<br>90<br>75<br>90<br>70<br>90<br>85/7 | Reddish Brown | 150 | | 1(-3) | |
| | Air | 2.85(10) | 3.88(14) (vacuum irradiation) | 6.62(15) | 2.09(14) | 9 | 4940<br>4960<br>5212<br>5060<br>5340<br>4560<br>4640<br>4959/288 | 90<br>90<br>100<br>90<br>90<br>100<br>90<br>93/4 | Dark Reddish Brown | 200 | | 6(-7) | |
| FM-47 Lapshear | Air | 0 | 0 (control specimens) | 0 | 0 | | 4180<br>4550<br>4000<br>4160<br>4500<br>4500<br>4315/154 | 95<br>95<br>95<br>95<br>95<br>95<br>95 | Yellow<br>Yellow<br>Yellow<br>Yellow<br>Yellow<br>Yellow | | | | |
| | Air | 6.0(9) | - (air irradiation) | 1.26(15) | - | 9 | 4410<br>4550<br>4100<br>4490<br>4380<br>4000<br>4170<br>4300/203 | -<br>90<br>95<br>95<br>95<br>95<br>95<br>94 | Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown | 100 | | - | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FM-47 Lapshear (continued) | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 9 | 4200<br>4000<br>4080<br>4100<br>4050<br>3800<br>3100<br>3904/407 | 95<br>95<br>95<br>95<br>95<br>95<br>95 | Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown | 100 | | - | |
| | Air | 3.9(10) | 2.8(14) (air irradiation) | 6.1(15) | 2.6(14) | 9 | 4000<br>3770<br>3670<br>3800<br>3580<br>3540<br>3650<br>3716/170 | 95<br>95<br>95<br>95<br>95<br>95<br>95 | Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown | 100 | | - | |
| | Air | 5.9(9) | 1.18(14) (vacuum irradiation) | 6.58(14) | - | 9 | 3700<br>4200<br>3600<br>3500<br>4020<br>3300<br>3200<br>3646/370 | 95<br>95<br>95<br>95<br>95<br>95<br>95 | Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown | 130 | | 1(-3) | |
| | Air | 1.05(10) | 1.32(14) (vacuum irradiation) | 1.65(15) | 5.9(13) | 9 | 3500<br>3430<br>3020<br>3480<br>4000<br>3570<br>3380<br>3483/362 | 95<br>95<br>95<br>95<br>95<br>95<br>95 | Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown<br>Red Brown | 150 | | 1(-3) | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Radiation Exposure: Neutron (n/cm$^2$) Thermal | Radiation Exposure: Neutron (n/cm$^2$) E > 2.9 Mev | Radiation Exposure: Neutron (n/cm$^2$) E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FM-47 Lapshear (continued) | Air | 2.85(10) | 3.88(14) | 6.62(15) | 2.09(14) | 8 | 2360 | 95 | Dark Brown | 200 | | 5(-7) | |
| | | | (vacuum irradiation) | | | | 2900 | 95 | Dark Brown | | | | |
| | | | | | | | 2600 | 95 | Dark Brown | | | | |
| | | | | | | | 2230 | 95 | Dark Brown | | | | |
| | | | | | | | 2600 | 95 | Dark Brown | | | | |
| | | | | | | | 2900 | 95 | Dark Brown | | | | |
| | | | | | | | 2340 | 95 | Dark Brown | | | | |
| | | | | | | | 2561/248 | | | | | | |
| MB 4021 | Air | 0 | 0 | 0 | 0 | | 4548 | 30 | Reddish Brown at Ends - Yellow Brown between Metal | | | | |
| | | | (control specimens) | | | | 4364 | 95 | | | | | |
| | | | | | | | 4388 | 20 | | | | | |
| | | | | | | | 4240 | 40 | | | | | |
| | | | | | | | 4700 | 20 | | | | | |
| | | | | | | | 4720 | 20 | | | | | |
| | | | | | | | 4020 | 50 | Reddish Brown | | | | |
| | | | | | | | 4100 | 20 | | | | | |
| | | | | | | | 4120 | 20 | | | | | |
| | | | | | | | 3816 | 20 | | | | | |
| | | | | | | | 4580 | 20 | | | | | |
| | | | | | | | 4840 | 20 | | | | | |
| | | | | | | | 4370/314 | 31/28 | | | | | |
| | Air | 6.0(9) | - | 1.26(15) | - | 15 | 4140 | 50 | Dark Choc. Brown at Ends - Chocolate Brown between Metals | 100 | | - | |
| | | | | | | | 4200 | 50 | | | | | |
| | | | | | | | 4188 | 40 | | | | | |
| | | | | | | | 3680 | 50 | | | | | |
| | | | | | | | 4192 | 50 | | | | | |
| | | | | | | | 3372 | 30 | | | | | |
| | | | | | | | 3144 | 50 | | | | | |
| | | | | | | | 3845/391 | 46/7 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB 4021 (continued) | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 15 | 3832<br>3968<br>3860<br>3730<br>4228<br>3760<br>2834<br>3745/516 | 80<br>80<br>50<br>50<br>70<br>40<br>40<br>59/15 | Dark Brown<br>Dark Brown<br>Dark Brown<br>Dark Brown<br>Dark Brown<br>Dark Brown<br>Dark Brown | 100 | | - | |
| | Air | 3.9(10) | 2.8(14) (air irradiation) | 6.1(15) | 2.6(14) | 15 | 3338<br>3072<br>3274<br>3084<br>3194<br>3162<br>3512<br>3234/163 | 50<br>90<br>100<br>90<br>80<br>90<br>95<br>85/18 | Dark Brown<br>Dark Brown<br>Dark Brown<br>Dark Brown<br>Dark Brown<br>Dark Brown<br>Dark Brown | 100 | | - | |
| | Air | 5.9(9) | 1.18(14) (vacuum irradiation) | 6.58(14) | - | 10 | 4544<br>4620<br>4480<br>4616<br>----<br>3520<br>3240<br>4170/545 | 30<br>20<br>20<br>20<br>20<br>20<br>20<br>21/4 | Reddish Brown | 130 | | 1(-3) | |
| | Air | 1.05(10) | 1.32(14) (vacuum irradiation) | 1.65(15) | 5.9(13) | 10 | 4100<br>4590<br>3970<br>3700<br>4500<br>4200<br>4320<br>4197/329 | 75<br>25<br>50<br>20<br>25<br>50<br>30<br>43/20 | | 150 | | 1(-3) | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Radiation Exposure: Neutron (n/cm²) Thermal | Radiation Exposure: Neutron (n/cm²) E > 2.9 Mev | Radiation Exposure: Neutron (n/cm²) E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB 4021 (continued) | Air | 2.85(10) | 3.88(14) (vacuum irradiation) | 6.62(15) | 2.09(14) | 9 | 3040<br>3140<br>3100<br>3160<br>3180<br>3496<br>3636<br>3250/220 | 40<br>40<br>60<br>60<br>60<br>60<br>80<br>57/15 | Black<br>Black<br>Black<br>Black<br>Black<br>Black<br>Black | 200 | | 6(-7) | |
| APCO 1252 | Air | 0 | 0 (control specimens) | 0 | 0 | | 2622<br>3016<br>2682<br>2344<br>2728<br>2804<br>2896<br>2748<br>2700<br>2888<br>2743/218 | 50<br>30<br>25<br>25<br>25<br>35<br>40<br>20<br>30<br>40<br>32/11 | Clear with a Yellow Cast<br>Clear<br>Clear<br>Clear<br>Clear | 100 | | - | |
| | Air | 6.0(9) | - (air irradiation) | 1.26(15) | - | 15 | 3042<br>2876<br>3330<br>2942<br>2906<br>3086<br>3400<br>3082/194 | 50<br>40<br>40<br>40<br>40<br>50<br>50<br>44/4 | Clear with a Yellow Cast | 100 | | - | |
| | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 15 | 3542<br>3364<br>3788<br>3592<br>3164<br>3404<br>3060<br>3416/269 | 95<br>95<br>95<br>95<br>95<br>95<br>95<br>95 | Clear with a Yellow Cast | 100 | | - | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| APCO 1252 (continued) | Air | 3.9(10) | 2.8(14) (air irradiation) | 6.1(15) | 2.6(14) | 15 | 3446<br>3244<br>3072<br>3564<br>3033<br>3242<br>3228<br>3262/195 | 95<br>95<br>95<br>95<br>95<br>95<br>95<br>95 | Clear with a Yellow Cast | 100 | | | |
| | Air | 5.9(9) | 1.18(14) (vacuum irradiation) | 6.58(14) | - | 10 | 3116<br>3140<br>3740<br>3208<br>3168<br>3256<br>3396<br>3289/370 | 80<br>80<br>80<br>80<br>80<br>80<br>80<br>83/15 | Light Amber<br>Light Amber<br>Light Amber<br>Light Amber<br>Light Amber<br>Light Amber<br>Light Amber | 130 | | 1(-3) | |
| | Air | 1.05(10) | 1.32(14) (vacuum irradiation) | 1.65(15) | 5.9(13) | 10 | 3412<br>3264<br>3336<br>3632<br>3192<br>3368<br>3140<br>3335/182 | | | 150 | | 1(-3) | |
| | Air | 2.85(10) | 3.88(14) (vacuum irradiation) | 6.62(15) | 2.09(14) | 9 | 3112<br>3060<br>3160<br>3304<br>3116<br>3304<br>3208<br>3181/90 | 100<br>100<br>100<br>100<br>100<br>100<br>100<br>100 | Light Amber<br>Light Amber<br>Light Amber<br>Light Amber<br>Light Amber<br>Light Amber<br>Light Amber | 200 | | 5(-7) | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Radiation Exposure: Neutron (n/cm²) Thermal | Radiation Exposure: Neutron (n/cm²) E > 2.9 Mev | Radiation Exposure: Neutron (n/cm²) E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Narmco C | Air | 0 | 0 | 0 | 0 | | 904 | 100 | Light Cream | | | | |
| | | | (control specimens) | | | | 972 | 100 | Light Cream | | | | |
| | | | | | | | 858 | 100 | Light Cream | | | | |
| | | | | | | | 842 | 100 | Light Cream | | | | |
| | | | | | | | 900 | 100 | Light Cream | | | | |
| | | | | | | | 982 | 100 | Light Cream | | | | |
| | | | | | | | 674 | 100 | Very Light Tan | | | | |
| | | | | | | | 1008 | 100 | | | | | |
| | | | | | | | 812 | 100 | | | | | |
| | | | | | | | 1002 | 100 | | | | | |
| | | | | | | | 896 | 100 | | | | | |
| | | | | | | | 780 | 100 | | | | | |
| | | | | | | | 848 | 100 | | | | | |
| | | | | | | | 883/100 | | | | | | |
| | Air | 6.0(9) | - | 1.26(15) | - | 14 | 48.0 | 90 | Light Cream with some Green under Metal | 100 | | - | |
| | | | (air irradiation) | | | | 56.6 | 90 | | | | | |
| | | | | | | | 90.2 | 100 | | | | | |
| | | | | | | | 55.8 | 100 | | | | | |
| | | | | | | | 8.0 | 100 | | | | | |
| | | | | | | | 51.7/35.2 | 96/4 | | | | | |
| | Air | 1.07(10) | 1.9(14) | 2.3(15) | - | 14 | 21.0 | 100 | Very Dark Brown at Ends - Med. Brown between Metal | 100 | | - | |
| | | | (air irradiation) | | | | 95.2 | 100 | | | | | |
| | | | | | | | 58.8 | 100 | | | | | |
| | | | | | | | 31.6 | 100 | | | | | |
| | | | | | | | 51.7/36.0 | | | | | | |
| | Air | 3.9(10) | 2.8(14) | 6.1(15) | 2.6(14) | 14 | 50.4 | 100 | Very Dark Brown with Med. Greenish Brown Cast | 100 | | - | |
| | | | (air irradiation) | | | | 3.2 | 100 | | | | | |
| | | | | | | | 8.8 | 100 | | | | | |
| | | | | | | | 20.8/27.9 | | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-1 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Radiation Exposure: Neutron (n/cm$^2$) Thermal | Radiation Exposure: Neutron (n/cm$^2$) E > 2.9 Mev | Radiation Exposure: Neutron (n/cm$^2$) E > 8.1 Mev | Time Until Test (days) | Ultimate Shear Strength[a] (psi) | Percent Adhesive Failure | Specimen Color | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Narmco C (continued) | Air | 5.9(9) | 1.18(14) (vacuum irradiation) | 6.58(14) | - | 14 | 580<br>552<br>428<br>380<br>392<br>394<br>412<br>448/74 | 100<br>100<br>100<br>100<br>100<br>100<br>100 | Dark Brown Green | 130 | | 1(-3) | |
| | Air | 1.05(10) | 1.32(14) (vacuum irradiation) | 1.65(15) | 5.9(13) | 14 | 456<br>540<br>728<br>550<br>494<br>528<br>614<br>559/101 | 100<br>100<br>100<br>100<br>100<br>100<br>100 | Soft Dark Brown | 150 | | 1(-3) | |
| | Air | 2.85(10) | 3.88(14) (vacuum irradiation) | 6.62(15) | 2.09(14) | 13 | 450<br>242<br>106<br>488<br>584<br>610<br>698<br>454/219 | 100<br>100<br>100<br>100<br>100<br>100<br>100 | Soft Red Brown | 200 | | [illegible] | |

[a]Values given as: average value/standard deviation on an individual basis.
[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-2

Test Environments and Result of Static Tests: Structural Laminates

| Material Trade Name | Test Condition | Radiation exposure: Gamma (ergs/gm(C)) | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Ultimate Tensile Strength[a] (psi) | Ultimate Elongation[a] (%) | Specimen Color[b] | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mobiloy 81-AH7 | Air | 0 | 0 (control specimens) | 0 | 0 | - | | | 60,866<br>41,245<br>38,717<br>54,123<br>49,238/10,757 | 1.96<br>1.46<br>1.30<br>1.60<br>1.60/0.32 | | | | | |
| | Air | 6.0(9) | - (air irradiation) | 1.26(15) | - | 14 | | | 60,082<br>45,238<br>46,746<br>38,716<br>41,122<br>46,381/9186 | 1.75<br>1.44<br>1.37<br>1.75<br>1.30<br>1.52/0.19 | | 100 | | - | |
| | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 14 | | | 49,705<br>59,153<br>42,082<br>39,289<br>56,672<br>49,380/8540 | 1.53<br>1.86<br>1.36<br>1.18<br>1.75<br>1.54/0.29 | | 100 | | - | |
| | Air | 3.9(10) | 2.8(14) (air irradiation) | 6.1(15) | 2.6(14) | 14 | | | 47,199<br>54,313<br>50,329<br>50,385<br>34,615<br>47,368/8469 | 1.57<br>1.81<br>1.56<br>1.61<br>1.02<br>1.51/0.34 | | 100 | | - | |
| | Air | 4.1(9) | 6.4(13) (vacuum irradiation) | 3.7(14) | 1.6(13) | 6 | 15.1895<br>15.2567<br>14.8518<br>14.7022<br>14.9811 | -0.0300<br>-0.0261<br>-0.0206<br>-0.0231<br>-0.0275 | 47,750<br>58,373<br>55,652<br>60,949<br>56,568<br>55,838/5675 | 1.37<br>1.77<br>1.71<br>1.88<br>1.44<br>1.63/0.22 | | 160 | | 8(-7) | |
| | Air | 1.4(10) | 9.4(14) (vacuum irradiation) | 1.8(15) | 7.4(13) | 6 | 15.0600<br>14.8719<br>14.6645<br>14.6314<br>14.7718 | -0.0241<br>-0.0287<br>-0.0218<br>-0.0194<br>-0.0272 | 61,167<br>57,673<br>58.771<br>60,832<br>55,264<br>58,741/2538 | 1.50<br>1.63<br>1.29<br>1.61<br>1.54<br>1.51/0.15 | | 160 | | 8(-7) | |

(Table continued)

[a] Values given as: average value/standard deviation on an individual basis.

[b] Figures showing plotted data to be presented and listed in the annual report.

Table A-2 (continued)

| Material Trade Name | Test Condition | Radiation exposure: Gamma (ergs/gm(C)) | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Ultimate Tensile Strength[a] (psi) | Ultimate Elongation[a] (%) | Specimen Color[b] | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mobiloy 81-AH7 (cont'd) | Air | 3.1(10) | 2.87(14) | 7.87(15) | - | 13 | 15.2639 | -0.0151 | 39,535 | 1.05 | | 200 | | 6(-7) | |
| | | | (vacuum irradiation) | | | | 14.5430 | +0.0077 | 46,400 | 1.50 | | | | | |
| | | | | | | | 14.3558 | +0.0101 | ------ | ---- | | | | | |
| | | | | | | | 14.5942 | +0.0079 | ------ | ---- | | | | | |
| | | | | | | | 14.9385 | +0.0103 | 41,015 | 1.19 | | | | | |
| | | | | | | | | | 42,317/4055 | 1.25/0.27 | | | | | |
| Paraplex P-43 | Air | 0 | 0 | 0 | 0 | - | | | 37,925 | 1.61 | | | | | |
| | | | (control specimens) | | | | | | 35,042 | 1.78 | | | | | |
| | | | | | | | | | 38,738 | 1.78 | | | | | |
| | | | | | | | | | 38,529 | 1.94 | | | | | |
| | | | | | | | | | 37,638 | 2.02 | | | | | |
| | | | | | | | | | 43,650 | 2.15 | | | | | |
| | | | | | | | | | 41,117 | 1.75 | | | | | |
| | | | | | | | | | 40,140 | 2.17 | | | | | |
| | | | | | | | | | 40,815 | 1.75 | | | | | |
| | | | | | | | | | 38,131 | 1.88 | | | | | |
| | | | | | | | | | 39,173/2767 | 1.88/0.18 | | | | | |
| | Air | 6.0(9) | - | 1.26(15) | - | 15 | | | 36,322 | 1.77 | | 100 | | - | |
| | | | (air irradiation) | | | | | | 35,611 | 1.75 | | | | | |
| | | | | | | | | | 26,891 | 1.45 | | | | | |
| | | | | | | | | | 32,941/5571 | 1.66/0.19 | | | | | |
| | Air | 1.07(10) | 1.9(14) | 2.3(15) | 8.2(13) | 15 | | | 40,862 | 1.87 | | 100 | | - | |
| | | | (air irradiation) | | | | | | 39,299 | 1.95 | | | | | |
| | | | | | | | | | 25,249 | 1.10 | | | | | |
| | | | | | | | | | 36,370 | 1.61 | | | | | |
| | | | | | | | | | 35,445/7587 | 1.63/0.41 | | | | | |
| | Air | 3.9(10) | 2.8(14) | 6.1(15) | 2.6(14) | 15 | | | 36,103 | 1.89 | | 100 | | - | |
| | | | (air irradiation) | | | | | | 36,114 | 1.79 | | | | | |
| | | | | | | | | | 36,075 | 1.73 | | | | | |
| | | | | | | | | | 38,799 | 1.80 | | | | | |
| | | | | | | | | | 36,773/1324 | 1.80/0.08 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-2 (continued)

| Material Trade Name | Test Condition | Radiation exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E> 2.9 Mev | Neutron (n/cm²): E> 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Ultimate Tensile Strength[a] (psi) | Ultimate Elongation[a] (%) | Specimen Color[b] | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paraplex P-43 (cont'd) | Air | 4.1(9) | 6.4(13) (vacuum irradiation) | 3.7(14) | 1.6(13) | 6 | 14.6953<br>14.5378<br>14.5011<br>13.7559 | -0.0119<br>-0.0143<br>-0.0172<br>-0.0142 | 40,348<br>40,898<br>40,126<br>49,698<br>42,768/4652 | 1.88<br>1.92<br>2.00<br>1.94<br>1.94/0.06 | | 160 | | 8(-7) | |
| | Air | 1.4(10) | 9.4(14) (vacuum irradiation) | 1.8(15) | 7.4(13) | 6 | 14.0466<br>13.5526<br>14.7077<br>14.8699 | -0.0278<br>-0.0252<br>-0.0401<br>-0.0368 | 40,523<br>43,224<br>39,366<br>38,311<br>40,356/2388 | 1.65<br>2.06<br>1.96<br>1.86<br>1.88/0.17 | | 160 | | 8(-7) | |
| | Air | 3.1(10) | 2.87(14) (vacuum irradiation) | 7.87(15) | - | 12 | 14.8013<br>12.9719<br>14.8986<br>13.7477 | -0.1001<br>-0.0735<br>-0.1199<br>-0.1060 | 31.250<br>35,871<br>28,908<br>31,603<br>31,908/3384 | 1.52<br>1.54<br>1.44<br>1.62<br>1.53/0.09 | | 200 | | 8(-7) | |
| DC-2104 | Air | 0 | 0 (control specimens) | 0 | 0 | | | | 16,359<br>21,626<br>23,210<br>17,848<br>17,989<br>19,406/2945 | 0.94<br>1.17<br>1.11<br>1 10<br>0.93<br>1.05/0.10 | | | | | |
| | Air | 6.0(9) | - (air irradiation) | 1.26(15) | - | 14 | | | 17,562<br>17,594<br>21,192<br>20,131<br>26,094<br>20,515/3668 | 0.95<br>0.89<br>1.09<br>1.07<br>1.23<br>1.05/0.15 | | 100 | | - | |
| | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 14 | | | 19,352<br>20,645<br>19,789<br>18,707<br>18,622<br>19,423/870 | 1.02<br>1.07<br>1.04<br>1.05<br>0.91<br>1.02/0.07 | | 100 | | - | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-2 (continued)

| Material Trade Name | Test Condition | Radiation exposure: Gamma (ergs/gm(C)) | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Ultimate Tensile Strength[a] (psi) | Ultimate Elongation[a] (%) | Specimen Color[b] | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC-2104 (cont'd) | Air | 3.9(10) | 2.8(14) | 6.1(15) | - | 14 | | | 19,737<br>22,795<br>21,080<br>19,768<br>20,290<br>20,734/1315 | 1.16<br>1.19<br>1.23<br>1.15<br>1.12<br>1.17/0.05 | | 100 | | - | |
| | | | (air irradiation) | | | | | | | | | | | | |
| | Air | 3.8(9) | - | 3.6(14) | 1.5(13) | 6 | 19.8010<br>13.4341<br>13.8041<br>20.3603<br>20.1233 | -0.0691<br>-0.0460<br>-0.0459<br>-0.0416<br>-0.0658 | 22,243<br>19,512<br>19,073<br>23,438<br>21,229<br>21,099/1877 | 1.19<br>1.50<br>1.34<br>1.25<br>1.14<br>1.28/0.15 | | 160 | | 8(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | |
| | Air | 1.4(10) | 9.4(14) | 1.8(15) | 7.4(13) | 6 | 20.0366<br>20.3746<br>20.3654<br>20.3454<br>19,9027 | -0.0720<br>-0.1400<br>-0.1305<br>-0.0711<br>-0.1136 | 23,946<br>19,199<br>20.392<br>23,198<br>22,365<br>21,820/2041 | 1.17<br>1.21<br>1.21<br>1.17<br>1.25<br>1.20/0.03 | | 160 | | 8(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | |
| | Air | 2.85(10) | 3.88(14) | 6.62(15) | 2.09(14) | 12 | 20.3202<br>19.4871<br>20.4845<br>20.1397<br>20.3301 | -0.2352<br>-0.2159<br>-0.2492<br>-0.2480<br>-0.2487 | 16,022<br>16,346<br>17,755<br>14,991<br>16,887<br>16,400/1188 | 0.98<br>1.10<br>1.14<br>0.97<br>1.11<br>1.06/0.07 | | 200 | | 6(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | |
| Selectron 5003 | Air | 0 | 0 | 0 | 0 | - | | | 45,524<br>45,768<br>50,593<br>42,829<br>45,429/3800 | 1.93<br>1.62<br>2.13<br>2.28<br>1.99/0.32 | | | | | |
| | | | (control specimens) | | | | | | | | | | | | |
| | Air | 6.0(9) | - | 1.26(15) | - | 14 | | | 50,444<br>51,102<br>48,217<br>46,902<br>42,661<br>47,805/3629 | 1.94<br>2.04<br>1.63<br>1.84<br>1.84<br>1.86/0.18 | | 100 | | - | |
| | | | (air irradiation) | | | | | | | | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-2 (continued)

| Material Trade Name | Test Condition | Radiation exposure: Gamma (ergs/gm(C)) | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Ultimate Tensile Strength[a] (psi) | Ultimate Elongation[a] (%) | Specimen Color[b] | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Selectron 5003 (cont'd) | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 14 | | | 35,878<br>41,609<br>48,819<br>40,637<br>42,452<br>41,879/5564 | 1.43<br>1.64<br>2.00<br>1.78<br>1.60<br>1.69/0.25 | | 100 | | - | |
| | Air | 3.9(10) | 2.8(14) (air irradiation) | 6.1(15) | 2.6(14) | 14 | | | 41,767<br>50,020<br>43,998<br>48,033<br>45,256<br>45,815/3548 | 1.86<br>1.90<br>1.84<br>1.62<br>1.71<br>1.79/0.12 | | 100 | | - | |
| | Air | 7.2(9) | 1.29(14) (vacuum irradiation) | 6.55(14) | 2.45(13) | 15 | | | 52,038<br>55,585<br>56,102<br>47,905<br>51,655<br>52,657/3524 | 2.02<br>2.13<br>2.19<br>1.62<br>2.29<br>2.05/0.29 | | 130 | | 1(-3) | |
| | Air | 1.05(10) | 1.32(14) (vacuum irradiation) | 1.65(15) | 5.90(13) | 13 | | | 51,918<br>46,924<br>42,609<br>44,120<br>44,830<br>46,080/4002 | 2.36<br>1.45<br>2.03<br>2.09<br>1.94<br>1.97/0.39 | | 150 | | 1(-3) | |
| | Air | 2.85(10) | 3.88(14) (vacuum irradiation) | 6.62(15) | 2.09(14) | 12 | | | 45,782<br>50,814<br>40,864<br>42,293<br>44,176<br>44,786/4278 | 1.83<br>2.03<br>1.96<br>1.96<br>1.81<br>1.92/0.09 | | 200 | | 5(-7) | |

[a] Values given as: average value/standard deviation on an individual basis.

[b] Figures showing plotted data to be presented and listed in the annual report.

Table A-2 (continued)

| Material Trade Name | Test Condition | Radiation exposure: Gamma (ergs/gm(C)) | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Compressive Strength[a] (psi) @25% Elong | Compressive Elongation[a] (%) | Specimen Color[b] | Temperature: Avg. (°F) | Temperature: Figure No.[b] | Pressure: Avg. (torr) | Pressure: Figure No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HRP Honeycomb | Air | 0 | 0 (control specimens) | 0 | 0 | - | | | 303<br>302<br>276<br>330<br>303/26 | 422<br>428<br>418<br>441<br>427/16 | | | | | |
| | Air | 6.0(9) | - (air irradiation) | 1.26(15) | - | 23 | | | | 431<br>494<br>456<br>460/37 | | 100 | | - | |
| | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 23 | | | | 606<br>567<br>606<br>531<br>578/36 | | 100 | | - | |
| | Air | 3.9(10) | 2.8(14) (air irradiation) | 6.1(15) | 2.6(14) | 23 | | | | 582<br>625<br>544<br>462<br>468<br>536/27 | | 100 | | - | |
| | Air | 5.9(9) | 1.18(14) (vacuum irradiation) | 6.56(14) | - | 23 | | | 280<br>352<br>282<br>305/43 | 424<br>447<br>422<br>431/15 | | 150 | | 1(-3) | |
| | Air | 1.05(10) | 1.32(14) (vacuum irradiation) | 1.65(15) | 5.9(13) | 23 | | | | 458<br>433<br>446/22 | | 150 | | 1(-3) | |
| | Air | 2.85(10) | 3.88(14) (vacuum irradiation) | 6.62(15) | 2.09(14) | 22 | | | | 483<br>410<br>482<br>458/43 | | 200 | | 6(-7) | |

[a] Values given as: average value/standard deviation on an individual basis.

[b] Figures showing plotted data to be presented and listed in the annual report.

Table A-3

Test Environment and Results of Static Tests: Potting Compounds (Compression Buttons)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E> 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Compression Yield (psi) | Crushing Load (lb) | Compression Strength (psi) | Ultimate Compression Strength (psi) | Strength at 25% Compression (psi) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Scotchcast 212 | Air | 0 | 0 | 0 | 0 | - | | | 8,505<br>10,441<br>10,415<br>9787/1144 | 2,740<br>2,220<br>2,950<br>2637/431 | 13,955<br>11,306<br>15,024<br>13,428/2196 | | | | | | | |
| | | | (control specimens) | | | | | | | | | | | | | | | |
| | Air | 6.8(8) | 2.4(13) | 1.2(14) | 4.9(12) | 9 | | | 9,091<br>-----<br>9,091/x | 2,450<br>3,250<br>2850/709 | 12,478<br>16,552<br>14,515/3612 | | | | 32 | | - | |
| | | | (air irradiation) | | | | | | | | | | | | | | | |
| | Air | 1.36(9) | 1.8(13) | 2.5(14) | 9.5(12) | 9 | | | 9,473<br>9,829<br>10,033<br>9,778/331 | 2,500<br>2,435<br>2,350<br>2,428/89 | 12,732<br>12,401<br>11,968<br>12,367/451 | | | | 82 | | - | |
| | | | (air irradiation) | | | | | | | | | | | | | | | |
| | Air | 3.9(10) | 2.8(14) | 6.1(15) | 5.90(13) | 16 | | | -----<br>-----<br>8,938<br>-----<br>8,938/x | 3,010<br>1,550<br>3,555<br>3,000<br>2,779/974 | 15,330<br>11,968<br>18,105<br>15,279<br>15,171/2981 | | | | 100 | | - | |
| | | | (air irradiation) | | | | | | | | | | | | | | | |
| | Air | 4.7(8) | 2.0(13) | 6.4(13) | 2.4(12) | 9 | | | 8,607<br>8,938<br>8,913<br>9,244<br>9,167<br>8,974/274 | 2,490<br>3,050<br>2,350<br>2,290<br>2,480<br>2,532/327 | 12,681<br>15,533<br>11,968<br>11,663<br>12,631<br>12,895/1664 | | | | 90 | | -(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |
| | Air | 9.4(8) | 2.8(13) | 1.5(14) | 5.6(12) | 9 | | | 9,422<br>9,677<br>9,575<br>9,473<br>9,537/124 | 2,070<br>2,750<br>2,760<br>2,175<br>2,439/335 | 10,542<br>14,006<br>14,057<br>11,077<br>12,421/1707 | | | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |
| | Air | 2.85(10) | 3.88(14) | 6.62(15) | 2.09(14) | 22 | | | 17,851<br>17,545<br>17,698<br>17,698<br>17,698/149 | 3,120<br>3,250<br>3,180<br>3,850<br>3,348/350 | 17,851<br>17,545<br>17,698<br>19,557<br>18,163/977 | | | | 200 | | 6(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-3 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Compression Yield (psi) | Crushing Load (psi) | Compression Strength (psi) | Ultimate Compression Strength (psi) | Strength at 25% Compression (psi) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Durock D-133 | Air | 0 | 0 | 0 | 0 | - | | | | | | | 21,380<br>5,808*<br>26,852<br>24,119/3232 | | | | | |
| | | | (control specimens) | | | | | | | | | | | | | | | |
| | Air | 3.9(10) | 2.8(14) | 6.1(15) | 2.6(14) | 25 | | | | | | | 30,429<br>34,722<br>33,499<br>32,870/2035 | | 100 | | - | |
| | | | (air irradiation) | | | | | | | | | | | | | | | |
| | Air | 3.43(10) | 4.07(14) | 7.56(15) | 2.70(14) | 24 | 21.1843<br>21.0721<br>21.1106 | -0.0004<br>-0.0015<br>-0.0011 | | | | | 6,313*<br>17,677<br>16,624<br>17,151/822 | | 200 | | [illegible] | |
| | | | (vacuum irradiations) | | | | | | | | | | | | | | | |
| RTV-501 | Air | 0 | 0 | 0 | 0 | - | | | | | | | 134<br>128<br>139<br>133/8 | | | | | |
| | | | (control specimens) | | | | | | | | | | | | | | | |
| | Air | 1.5(8) | 3.3(12) | 3.0(13) | 1.1(12) | 15 | | | | | | | 124<br>119<br>117<br>125<br>121/4 | | 80 | | - | |
| | | | (air irradiation) | | | | | | | | | | | | | | | |
| | Air | 1.36(9) | 1.8(13) | 2.5(14) | 9.5(12) | 15 | | | | | | | 197.5<br>185<br>200<br>180.5<br>186/19 | | 82 | | - | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |
| | Air | 1.8(8) | 8.4(12) | 1.85(13) | 7.6(11) | 8 | 9.0681<br>8.9501<br>9.0108<br>8.9517 | -0.0562<br>-0.0604<br>-0.0591<br>-0.0568 | | | | | 148<br>144<br>147<br>146<br>146/2 | | 80 | | 1.7(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |
| | Air | 4.7(8) | 2.0(13) | 6.4(13) | 2.4(12) | 9 | 9.0269<br>9.0227<br>9.0087<br>8.9402 | -0.0521<br>-0.0525<br>-0.0557<br>-0.0556 | | | | | 164<br>159.5<br>154.5<br>157<br>159/5 | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

*Values not included in calculating average and standard deviation.

Table A-3 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Compression Yield (psi) | Crushing Load (lb) | Compression Strength (psi) | Ultimate Compression Strength (psi) | Strength at 25% Compression (psi) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RTV-501 (cont'd) | Air | 9.4(8) | 2.8(13) | 1.5(14) | 5.6(12) | 12 | 9.0601<br>8.9891<br>8.9849<br>8.9633 | -0.0553<br>-0.0553<br>-0.0545<br>-0.0561 | | | | | 181.5<br>170<br>170<br>175<br>174/6 | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |
| EC2273 | Air | 0 | 0 | 0 | 0 | - | | | | | | | 457<br>457<br>430<br>419<br>441/18 | | | | | |
| | | | (control specimens) | | | | | | | | | | | | | | | |
| | Air | 1.5(8) | 3.3(12) | 3.0(13) | 1.1(12) | 15 | | | | | | | 452<br>463<br>442<br>450<br>452/10 | | 80 | | - | |
| | | | (air irradiation) | | | | | | | | | | | | | | | |
| | Air | 1.36(9) | 1.8(13) | 2.5(14) | 9.5(12) | 15 | | | | | | | 453<br>460<br>418<br>427<br>440/20 | | 32 | | - | |
| | | | (air irradiation) | | | | | | | | | | | | | | | |
| | Air | 6.0(9) | - | 1.26(15) | - | 15 | | | | | | | 537<br>557<br>540<br>569<br>551/16 | | 100 | | - | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |
| | Air | 1.8(8) | 8.4(12) | 1.85(13) | 7.6(11) | 8 | 10.3397<br>10.3520<br>10.3657<br>10.3376 | +0.0154<br>+0.0172<br>+0.0162<br>+0.0175 | | | | | ---<br>470<br>445<br>430<br>448/24 | | 80 | | 1.7(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |
| | Air | 9.4(8) | 2.8(13) | 1.5(14) | 5.6(12) | 12 | 10.3455<br>10.4134<br>10.2124<br>10.0138 | +0.0094<br>+0.0099<br>+0.0082<br>+0.0081 | | | | | 445<br>629<br>625<br>570<br>567/89 | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-3 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Compression Yield (psi) | Crushing Load (lb) | Compression Strength (psi) | Ultimate Compression Strength (psi) | Strength at 25% Compression (psi) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EC2273 (cont'd) | Air | 5.9(9) | 1.18(14) | 6.58(14) | - | 12 | 10.4031<br>10.3362<br>10.3043<br>10.0224 | -0.0223<br>-0.0242<br>-0.0146<br>-0.0211 | | | | | 532<br>548<br>521<br>521<br>531/13 | | 160 | | 37-73 | - |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-4

Test Environments and Results of Static Tests: Electrical Insulations

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | Tensile Strength[a] (psi): at 50% Elongation | Tensile Strength[a] (psi): at 100% Elongation | Tensile Strength[a] (psi): Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC-7-170 | Air | 0 | 0 (control specimens) | 0 | 0 | - | | | 271 | 483 | --- | 847 | 80 | | | | | |
| | | | | | | | | | 275 | 420 | 833 | 833 | 100 | | | | | |
| | | | | | | | | | 193 | 355 | 678 | 678 | 100 | | | | | |
| | | | | | | | | | 247 | 414 | --- | 661 | -- | | | | | |
| | | | | | | | | | 327 | 584 | --- | 726 | 60 | | | | | |
| | | | | | | | | | 200 | 386 | --- | 707 | 90 | | | | | |
| | | | | | | | | | 264 | --- | --- | 762 | 90 | | | | | |
| | | | | | | | | | 254/50 | 441/90 | 756/x | 745/69 | 87/16 | | | | | |
| | Air | 1.5(8) | 3.3(12) (air irradiation) | 3.0(13) | 1.1(12) | 13 | | | 305 | 595 | --- | 837 | 75 | | 80 | | ----- | |
| | | | | | | | | | 266 | --- | --- | 757 | 125 | | | | | |
| | | | | | | | | | --- | --- | --- | 649 | 30 | | | | | |
| | | | | | | | | | 284 | 498 | --- | 591 | 65 | | | | | |
| | | | | | | | | | 352 | 684 | --- | 684 | 50 | | | | | |
| | | | | | | | | | 302/42 | 592/110 | --- | 704/106 | 69/41 | | | | | |
| | Air | 1.36(9) | 1.8(13) (air irradiation) | 2.5(14) | 9.5(12) | 13 | | | 426 | --- | --- | 584 | 45 | | 32 | | ----- | |
| | | | | | | | | | 395 | 659 | --- | 725 | 65 | | | | | |
| | | | | | | | | | 460 | --- | --- | 460 | 25 | | | | | |
| | | | | | | | | | 390 | 732 | --- | 732 | 50 | | | | | |
| | | | | | | | | | 471 | 722 | --- | 803 | 60 | | | | | |
| | | | | | | | | | 428/35 | 704/43 | --- | 661/117 | 49/17 | | | | | |
| | Air | 9.1(7) | 7.8(12) (vacuum irradiation) | 1.7(13) | 7.0(11) | 8 | 3.5327 | +0.0035 | 365 | --- | --- | 928 | 70 | | 80 | | [illegible] | |
| | | | | | | | 3.6987 | +0.0063 | 284 | --- | --- | 797 | 85 | | | | | |
| | | | | | | | 3.7714 | +0.0064 | 336 | --- | --- | 546 | 45 | | | | | |
| | | | | | | | 3.7630 | +0.0072 | 266 | --- | --- | 630 | 70 | | | | | |
| | | | | | | | 3.7063 | +0.0102 | 334 | --- | --- | 904 | 65 | | | | | |
| | | | | | | | | | 317/43 | --- | --- | 761/164 | 67/17 | | | | | |
| | Air | 3.9(8) | 2.0(13) (vacuum irradiation) | 5.8(13) | 2.4(12) | 7 | 3.7296 | +0.0062 | 404 | 732 | --- | 934 | 60 | | 90 | | [illegible] | |
| | | | | | | | 3.3929 | +0.0050 | 317 | 523 | --- | 888 | 75 | | | | | |
| | | | | | | | 3.9351 | +0.0061 | 360 | 633 | --- | 773 | 55 | | | | | |
| | | | | | | | 3.9861 | +0.0040 | 275 | 492 | --- | 492 | 62 | | | | | |
| | | | | | | | 3.6277 | +0.0076 | 508 | 855 | --- | 1010 | 57 | | | | | |
| | | | | | | | | | 373/100 | 647/143 | --- | 819/223 | 62/ 9 | | | | | |

(Table continued)

[a] Values given as: average value/standard deviation on an individual basis.

[b] Figures showing plotted data to be presented and listed in the annual report.

Table A-4 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC-7-170 | Air | 8.8(8) | 2.8(13) (vacuum irradiation) | 1.7(14) | 6.4(12) | 7 | 3.7915 | +0.0049 | 476 | 826 | --- | 966 | 55 | | 90 | | 4(-7) | |
| | | | | | | | 3.4506 | +0.0001 | 511 | 821 | --- | 1023 | 55 | | | | | |
| | | | | | | | 3.8441 | +0.0044 | 461 | --- | --- | 644 | 45 | | | | | |
| | | | | | | | 3.6816 | +0.0046 | 463 | 826 | --- | 898 | 52 | | | | | |
| | | | | | | | 3.8052 | +0.0029 | --- | --- | --- | 1058 | 60 | | | | | |
| | | | | | | | | | 477/24 | 824/ 3 | --- | 918/178 | 53/ 6 | | | | | |
| Kel-F-81 | Air | 0 | 0 (control specimen) | 0 | 0 | - | | | 4622 | 4622 | 4558 | 5897 | 176 | | | | | |
| | | | | | | | | | 4495 | 4551 | 4462 | 5619 | 180 | | | | | |
| | | | | | | | | | ---- | 4286 | 4242 | 5081 | 200 | | | | | |
| | | | | | | | | | 4221 | 4221 | 4347 | 5513 | 180 | | | | | |
| | | | | | | | | | 4171 | 4234 | 4265 | 6070 | 185 | | | | | |
| | | | | | | | | | 4377/219 | 4385/26 | 4375/136 | 5636/425 | 184/10 | | | | | |
| | Air | 6.5(7) | 3.5(12) (air irradiation) | 1.4(13) | 6.0(11) | 14 | | | ---- | ---- | ---- | 5377 | 15* | | 80 | | ----- | |
| | | | | | | | | | 4178 | 4211 | 4275 | 5409 | 205 | | | | | |
| | | | | | | | | | 4022 | 4106 | 4149 | 5080 | 150 | | | | | |
| | | | | | | | | | 4204 | 4016 | 4141 | 5239 | 205 | | | | | |
| | | | | | | | | | 4135/108 | 4111/115 | 4188/79 | 5276/140 | 187/32 | | | | | |
| | Air | 1.5(8) | 3.3(12) (air irradiation) | 3.0(13) | 1.1(12) | 14 | | | 4166 | 4099 | 4165 | 5477 | 180 | | 80 | | ----- | |
| | | | | | | | | | 4275 | 4312 | 4344 | 5431 | 200 | | | | | |
| | | | | | | | | | 4137 | 4269 | 4225 | 5325 | 185 | | | | | |
| | | | | | | | | | 4313 | 4357 | 4313 | 5237 | 190 | | | | | |
| | | | | | | | | | 4204 | 4204 | 4141 | 5334 | 180 | | | | | |
| | | | | | | | | | 4219/76 | 4248/111 | 4238/87 | 5361/103 | 187/ 9 | | | | | |
| | Air | 6.8(8) | 2.4(13) (air irradiation) | 1.2(14) | 4.9(12) | 14 | | | 3876 | ---- | ---- | 5276 | 40* | | 82 | | ----- | |
| | | | | | | | | | 3888 | 3920 | 3984 | 5227 | 190 | | | | | |
| | | | | | | | | | 4016 | 3984 | 4016 | 5173 | 210 | | | | | |
| | | | | | | | | | 3941 | 4027 | 4071 | 5110 | 215 | | | | | |
| | | | | | | | | | 4142 | 3984 | 3953 | 5249 | 200 | | | | | |
| | | | | | | | | | 3973/114 | 3979/52 | 4006/57 | 5207/71 | 204/12 | | | | | |
| | Air | 7.5(7) | 4.6(12) (vacuum irradiation) | 5.2(12) | 2.35(11) | 8 | 22.2416 | -0.0037 | 4458 | 4458 | 4392 | 5605 | 104 | | 80 | | 1.7(-7) | |
| | | | | | | | 22.5782 | -0.0034 | 4590 | 4526 | 4717 | 5610 | 150 | | | | | |
| | | | | | | | 22.1467 | +0.0002 | 4376 | 4408 | 4637 | 4474 | 170 | | | | | |
| | | | | | | | 16.6356 | -0.0019 | 4434 | 4304 | 4521 | 5521 | 145 | | | | | |
| | | | | | | | 23.5746 | -0.0015 | 4514 | 4358 | 4483 | 5821 | 182 | | | | | |
| | | | | | | | | | 4474/92 | 4411/95 | 4550/140 | 5406/579 | 150/34 | | | | | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

*Data point not used in average

Table A-4 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E> 2.9 Mev | Neutron (n/cm²): E> 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | Tensile Strength[a] (psi): at 50% Elongation | Tensile Strength[a] (psi): at 100% Elongation | Tensile Strength[a] (psi): Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kel-F-81 | Air | 9.1(7) | 7.8(12) (vacuum irradiation) | 1.7(13) | 7.0(11) | 8 | 22.2692 | -0.0006 | 4405 | 4340 | 4405 | 5636 | 202 | | 80 | | 1.7(-7) | |
| | | | | | | | 22.4512 | -0.0007 | 3841 | 3777 | 3809 | 5633 | 168 | | | | | |
| | | | | | | | 21.9510 | -0.0040 | 4487 | 4520 | ---- | 5626 | 55* | | | | | |
| | | | | | | | 16.6468 | -0.0010 | 4539 | 4628 | 4494 | 5384 | 157 | | | | | |
| | | | | | | | 23.5801 | +0.0002 | 4328 | 4268 | 4328 | 5440 | 172 | | | | | |
| | | | | | | | | | 4320/300 | 4307/366 | 4259/333 | 5544/108 | 175/22 | | | | | |
| | Air | 4.45(8) | 7.95(13) (vacuum irradiation) | 5.45(13) | 2.1(12) | 10 | 22.6049 | -0.0008 | 4437 | 4405 | 4373 | 5733 | 165 | | 90 | | 4 (-7) | |
| | | | | | | | 22.0014 | -0.0068 | 4599 | 4632 | 4567 | 5798 | 185 | | | | | |
| | | | | | | | 16.7075 | +0.0007 | 4379 | 4207 | 4379 | 5367 | 175 | | | | | |
| | | | | | | | 16.7023 | -0.0007 | 4296 | 4252 | 4296 | 5436 | 180 | | | | | |
| | | | | | | | 23.1123 | -0.0001 | 4486 | 4330 | 4267 | 5616 | 200 | | | | | |
| | | | | | | | | | 4439/130 | 4365/183 | 4376/129 | 5590/185 | 181/15 | | | | | |
| Mylar A | Air | 0 | 0 (control specimens) | 0 | 0 | - | | | 16,300 | 17,000 | 19,000 | 20,500 | 119 | | | | | |
| | | | | | | | | | 16,600 | 17,600 | 19,700 | 22,000 | 132 | | | | | |
| | | | | | | | | | 16,900 | 17,800 | 19,800 | 19,800 | 100 | | | | | |
| | | | | | | | | | 16,600 | 17,500 | 19,500 | ------ | --- | | | | | |
| | | | | | | | | | 17,000 | 17,500 | 19,400 | 20,200 | 110 | | | | | |
| | | | | | | | | | 16,680/301 | 17,480/344 | 19,480/344 | 20,625/946 | 115/14 | | | | | |
| | Air | 6.8(8) | 2.4(13) (air irradiation) | 1.2(14) | 4.9(12) | 16 | | | 16,500 | 17,200 | 18,600 | 21,800 | 140 | | 82 | | ----- | |
| | | | | | | | | | 16,500 | 17,200 | 18,800 | 22,000 | 130 | | | | | |
| | | | | | | | | | 16,800 | 17,500 | 19,200 | 21,300 | 125 | | | | | |
| | | | | | | | | | 16,600 | 17,500 | 18,800 | 21,400 | 150 | | | | | |
| | | | | | | | | | 16,350/389 | 17,350/146 | 18,850/291 | 21,625/340 | 136/12 | | | | | |
| | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 16 | | | 15,400 | 15,700 | ------ | 16,000 | 80 | | 100 | | ----- | |
| | | | | | | | | | 15,600 | 15,800 | ------ | 16,300 | --- | | | | | |
| | | | | | | | | | 15,500 | 15,900 | ------ | 16,500 | 75 | | | | | |
| | | | | | | | | | 15,500 | 15,900 | 16,200 | 16,200 | 100 | | | | | |
| | | | | | | | | | 15,500 | 16,800 | ------ | 16,800 | 60 | | | | | |
| | | | | | | | | | 15,500/86 | 16,020/473 | ------ | 16,360/344 | 79/19 | | | | | |
| | Air | 4.45(8) | 1.95(13) (vacuum irradiation) | 5.45(13) | 2.1(12) | 9 | 1.4195 | +0.0003 | 16,500 | 17,500 | 19,200 | 21,500 | 131 | | 90 | | 4 (-7) | |
| | | | | | | | 1.4059 | +0.0001 | 16,500 | 17,300 | 19,000 | 19,500 | 105 | | | | | |
| | | | | | | | 1.4067 | +0.0005 | 16,500 | 17,200 | 19,200 | 21,500 | 132 | | | | | |
| | | | | | | | 1.4190 | 0.0000 | 16,500 | 17,300 | 19,500 | 22,000 | 135 | | | | | |
| | | | | | | | 1.4184 | +0.0019 | 16.500 | 17,300 | 19,300 | 19,700 | 110 | | | | | |
| | | | | | | | | | 16,500/0 | 17,320/125 | 19,240/215 | 20,840/1075 | 123/13 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

*Data point not used in average

Table A-4 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | Tensile Strength[a] (psi): at 50% Elongation | Tensile Strength[a] (psi): at 100% Elongation | Tensile Strength[a] (psi): Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mylar A | Air | 5.9(9) | 1.18(14) (vacuum irradiation) | 6.58(14) | - | 7 | 1.4112 | -0.0016 | 15,300 | 16,700 | ------ | 17,800 | 110 | | 100 | | 3 (-7) | |
| | | | | | | | 1.3924 | 0.0000 | 16,300 | 16,800 | ------ | 17,500 | 95 | | | | | |
| | | | | | | | 1.3972 | -0.0002 | 16,500 | 16,800 | ------ | 18,300 | 105 | | | | | |
| | | | | | | | 1.3993 | -0.0005 | 16,200 | 16,700 | ------ | 17,300 | 75 | | | | | |
| | | | | | | | 1.4003 | +0.0001 | 16,000 | 16,500 | 17,300 | 17,300 | 100 | | | | | |
| | | | | | | | | | 16,060/516 | 16,700/129 | ------ | 17,640/430 | 97/15 | | | | | |
| | Air | 1.05(10) | 1.32(14) (vacuum irradiation) | 1.65(15) | 5.9(13) | 7 | 1.4154 | -0.0010 | ------ | ------ | ------ | 19,200 | --- | | 100 | | 3 (-7) | |
| | | | | | | | 1.4196 | -0.0011 | ------ | ------ | ------ | 16,780 | 80 | | | | | |
| | | | | | | | 1.4013 | -0.0014 | ------ | ------ | ------ | 17,500 | 20 | | | | | |
| | | | | | | | 1.3976 | +0.0001 | 15,300 | 15,800 | ------ | 15,300 | 50 | | | | | |
| | | | | | | | 1.3982 | -0.0021 | ------ | ------ | ------ | 16,000 | 15 | | | | | |
| | | | | | | | | | ------ | ------ | ------ | 17,056/1462 | 41/32 | | | | | |
| Mylar C | Air | 0 | 0 (control specimens) | 0 | 0 | - | | | 16,300 | 19,200 | ------ | 21,300 | 60 | | | | | |
| | | | | | | | | | 16,000 | 18,700 | ------ | ------ | --- | | | | | |
| | | | | | | | | | 16,200 | 18,700 | 24,500 | 24,500 | 100 | | | | | |
| | | | | | | | | | 16,200 | 17,500 | 24,000 | 28,500 | 121 | | | | | |
| | | | | | | | | | 16,300 | 18,500 | 24,500 | 28,500 | 130 | | | | | |
| | | | | | | | | | 16,200/129 | 18,520/731 | 24,333/295 | 25,700/3497 | 103/34 | | | | | |
| | Air | 6.8(8) | 2.4(13) (air irradiation) | 1.2(14) | 4.9(12) | 13 | | | 15,500 | 17,500 | 21,000 | 23,700 | 110 | | 32 | | ----- | |
| | | | | | | | | | 15,200 | 17,500 | 19,300 | 24,000 | 110 | | | | | |
| | | | | | | | | | 14,800 | 16,500 | ------ | 16,500 | 50 | | | | | |
| | | | | | | | | | 15,500 | 17,500 | 22,500 | 26,300 | 110 | | | | | |
| | | | | | | | | | 15,000 | 17,000 | 20,500 | 22,500 | 105 | | | | | |
| | | | | | | | | | 15,200/301 | 17,200/430 | 20,825/1554 | 22,600/4213 | 97/26 | | | | | |
| | Air | 1.36(9) | 1.8(13) (air irradiation) | 2.5(14) | 9.5(12) | 13 | | | 15,500 | 18,300 | 21,500 | 23,700 | 105 | | 32 | | ----- | |
| | | | | | | | | | 15,200 | 17,500 | 21,500 | 24,300 | 125 | | | | | |
| | | | | | | | | | 15,700 | 18,000 | 22,500 | 24,400 | 105 | | | | | |
| | | | | | | | | | 15,000 | 17,000 | ------ | 19,300 | 70 | | | | | |
| | | | | | | | | | 15,200 | 17,000 | 21,000 | 22,500 | 105 | | | | | |
| | | | | | | | | | 15,320/301 | 17,560/559 | 21,625/729 | 22,840/2193 | 102/24 | | | | | |
| | Air | 6.0(9) | - (air irradiation) | 1.26(15) | - | 16 | | | 16,000 | ------ | ------ | 16,700 | 35 | | 100 | | ----- | |
| | | | | | | | | | ------ | ------ | ------ | 18,800 | 60 | | | | | |
| | | | | | | | | | ------ | ------ | ------ | 20.000 | 70 | | | | | |
| | | | | | | | | | ------ | ------ | ------ | ------ | --- | | | | | |
| | | | | | | | | | ------ | ------ | ------ | 18,500/1949 | 55/21 | | | | | |

(Table continued)

[a] Values given as: average value/standard deviation on an individual basis.

[b] Figures showing plotted data to be presented and listed in the annual report.

Table A-4 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mylar C | Air | 4.45(8) | 1.95(13) (vacuum irradiation) | 5.45(13) | 2.1(12) | 9 | 0.1470 | -0.0014 | 16,300 | 18,600 | ------ | 24,000 | 90 | | 90 | | 4 (-7) | |
| | | | | | | | 0.1498 | -0.0027 | ------ | ------ | ------ | ------ | 110 | | | | | |
| | | | | | | | 0.1503 | -0.0007 | 16,500 | 19,000 | ------ | 21,300 | 70 | | | | | |
| | | | | | | | 0.1462 | -0.0012 | 16,500 | 18,500 | 22,000 | 27,300 | 120 | | | | | |
| | | | | | | | 0.1494 | -0.0002 | 16,500 | 20,000 | 26,000 | 28,700 | 108 | | | | | |
| | | | | | | | | | 16,450/97 | 19,250/729 | 24,000/x | 25,325/2283 | 100/21 | | | | | |
| | Air | 9.1(8) | 2.8(13) (vacuum irradiation) | 1.6(14) | 6.0(13) | 9 | 0.1475 | -0.0016 | 16,300 | 18,500 | 24,500 | 24,500 | 100 | | 90 | | 4 (-7) | |
| | | | | | | | 0.1485 | +0.0011 | 16,800 | 19,000 | ------ | 23,700 | 90 | | | | | |
| | | | | | | | ------ | ------ | ------ | ------ | ------ | ------ | --- | | | | | |
| | | | | | | | 0.1422 | 0.0000 | 16,700 | 19,000 | ------ | 20,700 | 96 | | | | | |
| | | | | | | | 0.1433 | -0.0006 | 16,200 | 19,000 | ------ | 26,000 | 98 | | | | | |
| | | | | | | | | | 16,500/291 | 18,875/243 | ------ | 23,725/2574 | 96/5 | | | | | |
| Geon 2046 Elastomer Die C Specimen | Air | 0 | 0 (control specimens) | 0 | 0 | | | | 477 | 1171 | 1866 | 2934 | 295 | | | | | |
| | | | | | | | | | 898 | 1498 | 1948 | 3123 | 190 | | | | | |
| | | | | | | | | | 849 | 1255 | 1771 | 2951 | 340 | | | | | |
| | | | | | | | | | 644 | 1146 | 1508 | 2580 | 360 | | | | | |
| | | | | | | | | | 1080 | 1451 | ---- | 2722 | 265 | | | | | |
| | | | | | | | | | 647 | 1171 | 1515 | 2617 | 350 | | | | | |
| | | | | | | | | | 766/238 | 1282/139 | 1722/186 | 2821/214 | 300/67 | | | | | |
| | Air | 6.8(8) | 2.4(13) (air irradiation) | 1.2(14) | 4.9(12) | 16 | | | 665 | 1138 | 1541 | 2539 | --- | | 82 | | ----- | |
| | | | | | | | | | 575 | 1165 | 1475 | 2593 | 330 | | | | | |
| | | | | | | | | | 516 | 1158 | 1535 | 2554 | 330 | | | | | |
| | | | | | | | | | 669 | 1138 | 1539 | 2570 | 320 | | | | | |
| | | | | | | | | | 600 | 1117 | 1493 | 2540 | 300 | | | | | |
| | | | | | | | | | 605/66 | 1143/21 | 1517/28 | 2559/23 | 320/15 | | | | | |
| | Air | 6.0(9) | - (air irradiation) | 1.26(15) | - | 16 | | | 855 | 1244 | 1904 | 2561 | 170 | | 100 | | ----- | |
| | | | | | | | | | 864 | 1254 | 2028 | 2556 | 172 | | | | | |
| | | | | | | | | | 824 | 1286 | 1812 | 2405 | 175 | | | | | |
| | | | | | | | | | 714 | 1178 | 1810 | 2394 | 182 | | | | | |
| | | | | | | | | | 736 | 919 | 1815 | 2375 | 170 | | | | | |
| | | | | | | | | | 730 | 1192 | 1745 | 2445 | 185 | | | | | |
| | | | | | | | | | 787/59 | 1179/145 | 1852/112 | 2456/71 | 175/16 | | | | | |

(Table continued)

[a] Values given as: average value/standard deviation on an individual basis.

[b] Figures showing plotted data to be presented and listed in the annual report.

Table A-4 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Geon 2046 Elastomer Die C Specimen (cont'd) | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 16 | | | 875 | 1488 | 2082 | 2695 | 130 | | 100 | | ----- | |
| | | | | | | | | | 870 | 1425 | 2041 | 2690 | 135 | | | | | |
| | | | | | | | | | 744 | 1281 | 2110 | 2621 | 135 | | | | | |
| | | | | | | | | | 692 | 1175 | 2078 | 2579 | 130 | | | | | |
| | | | | | | | | | 872 | 1345 | 2075 | 2659 | 135 | | | | | |
| | | | | | | | | | 712 | 1222 | 1960 | 2709 | 139 | | | | | |
| | | | | | | | | | 794/72 | 1323/124 | 2058/59 | 2659/51 | 134/4 | | | | | |
| | Air | 3.9(8) | 2.0(13) (vacuum irradiation) | 5.8(13) | 2.4(12) | 13 | 2.9826 | -0.0076 | 1008 | 1411 | 1875 | 2941 | 315 | | 90 | | [illegible] (-7) | |
| | | | | | | | 3.3903 | -0.0085 | 800 | 1192 | 1685 | 2900 | 346 | | | | | |
| | | | | | | | 3.0741 | -0.0120 | 890 | 1295 | 1771 | 2850 | 345 | | | | | |
| | | | | | | | 3.6627 | -0.0069 | 860 | 1273 | 1872 | 2922 | 300 | | | | | |
| | | | | | | | 3.5968 | -0.0079 | 767 | 1220 | 1815 | 2870 | 325 | | | | | |
| | | | | | | | | | 865/104 | 1258/94 | 1804/82 | 2899/35 | 326/20 | | | | | |
| | Air | 1.3(10) | 1.2(15) (vacuum irradiation) | 2.0(15) | 9.8(13) | 6 | 3.1583 | -0.1556 | 1174 | ---- | ---- | 2126 | 80 | | 100 | | 9 (-7) | |
| | | | | | | | 3.2555 | -0.2141 | 1334 | ---- | ---- | 2230 | 60 | | | | | |
| | | | | | | | 3.2338 | -0.2116 | 1539 | 2078 | ---- | ---- | -- | | | | | |
| | | | | | | | 3.1203 | -0.1557 | 1117 | ---- | ---- | 2422 | 70 | | | | | |
| | | | | | | | 3.0895 | -0.1984 | 1288 | 1989 | ---- | 2260 | 55 | | | | | |
| | | | | | | | | | 1290/181 | 2034/x | ---- | 2260/144 | 66/12 | | | | | |
| Geon 8800 Elastomer Die C Specimen | Air | 0 | 0 (control specimens) | 0 | 0 | - | | | 1071 | 1714 | 2161 | 3289 | 270 | | | | | |
| | | | | | | | | | 1746 | 2077 | 2536 | 2830 | --- | | | | | |
| | | | | | | | | | 1641 | 2089 | 2492 | 2966 | 315 | | | | | |
| | | | | | | | | | 1552 | 1985 | 2346 | 2851 | 300 | | | | | |
| | | | | | | | | | 1849 | 2169 | ---- | 2924 | 300 | | | | | |
| | | | | | | | | | 1629 | 2018 | 2425 | 2874 | 300 | | | | | |
| | | | | | | | | | 1581/307 | 2009/180 | 2392/153.3 | 2956/173.0 | 297/15.7 | | | | | |
| | Air | 6.8(8) | 2.40(13) (air irradiation) | 1.2(14) | 4.9(12) | 15 | | | 1541 | 1917 | 2199 | 2650 | 350 | | 82 | | ----- | |
| | | | | | | | | | 1611 | 2014 | 2307 | 2637 | 300 | | | | | |
| | | | | | | | | | 1859 | 2166 | 2400 | 2689 | 260 | | | | | |
| | | | | | | | | | 1481 | 1851 | 2185 | 2555 | 390 | | | | | |
| | | | | | | | | | 1723 | 2007 | 2291 | 2613 | 290 | | | | | |
| | | | | | | | | | 1643/163 | 1991/135 | 2276/92 | 2629/58 | 318/56 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-4 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E> 2.9 Mev | Neutron (n/cm²): E> 8.1Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | Tensile Strength[a] (psi): at 50% Elongation | Tensile Strength[a] (psi): at 100% Elongation | Tensile Strength[a] (psi): Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Geon 8800 Elastomer Die C Specimen (cont'd) | Air | 6.0(9) | - (air irradiation) | 1.26(14) | - | 16 | | | ----<br>1928<br>1778<br>1832<br>1846/89 | ----<br>2401<br>2224<br>2309<br>2311/105 | ----<br>2930<br>2795<br>3005<br>2910/124 | ----<br>3292<br>3164<br>3219<br>3225/76 | 110<br>130<br>128<br>125<br>123/10 | | 100 | | ----- | |
| | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(13) | 16 | | | 2230<br>----<br>----<br>2142<br>2255<br>2209/67 | ----<br>----<br>----<br>2928<br>3062<br>2995/x | ----<br>----<br>----<br>----<br>----<br>---- | 2602<br>3395<br>3692<br>3678<br>3495<br>3372/469 | 45<br>70<br>82<br>75<br>65<br>67/16 | | 100 | | ----- | |
| | Air | 3.9(8) | 2.0(13) (vacuum irradiation) | 5.8(13) | 2.4(12) | 7 | 7.3523<br>7.2144<br>7.3627<br>7.2065<br>7.1097 | +0.0043<br>+0.0037<br>+0.0058<br>+0.0055<br>+0.0067 | ----<br>1641<br>1722<br>1591<br>1148<br>1526/279 | 2051<br>2089<br>2093<br>1895<br>1611<br>1948/207 | ----<br>2492<br>2407<br>2323<br>2166<br>2347/158 | 2835<br>2966<br>2833<br>2743<br>3177<br>2911/187 | 290<br>315<br>290<br>280<br>265<br>284/24 | | 90 | | [illegible] | |
| | Air | 1.3(10) | 1.2(15) (vacuum irradiation) | 2.0(15) | 9.8(13) | 6 | 7.1623<br>7.4593<br>7.4964<br>7.1806<br>7.1872 | -0.3404<br>-0.3121<br>-0.3163<br>-0.3518<br>-0.3094 | ----<br>3259<br>----<br>----<br>----<br>---- | ----<br>----<br>----<br>4417<br>4132<br>4225/x | ----<br>----<br>----<br>----<br>----<br>---- | ----<br>3259<br>4178<br>4417<br>4132<br>3996.5/507.0 | ---<br>25<br>45<br>60<br>50<br>45/14.7 | | 160 | | [illegible] | |
| Estane 5740X1 Elastomer Die C, Specimen | Air | 0 | 0 (control | 0 specimens) | 0 | - | | | 748<br>637<br>741<br>748<br>723<br>723<br>842<br>780<br>743/72 | 884<br>892<br>865<br>884<br>855<br>907<br>956<br>900<br>893/35 | 1033<br>1084<br>988<br>952<br>960<br>1052<br>1084<br>1020<br>1022/46 | 5346<br>----<br>----<br>4829<br>2855<br>6012<br>5745<br>5049<br>4973/1246 | 535<br>---<br>---<br>660<br>615<br>540<br>---<br>585<br>587/34 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-4 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | Tensile Strength[a] (psi): at 50% Elongation | Tensile Strength[a] (psi): at 100% Elongation | Tensile Strength[a] (psi): Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Estane 5740X1 Elastomer Die C, Specimen (cont'd) | Air | 1.36(9) | 1.8(13) (air irradiation) | 2.5(14) | 9.5(12) | 13 | | | 680<br>684<br>657<br>638<br>702<br>672/28 | 884<br>881<br>855<br>829<br>829<br>856/24 | 952<br>986<br>920<br>956<br>958<br>954/28 | 4149<br>3350<br>3815<br>4080<br>3765<br>3832/344 | 590<br>510<br>630<br>650<br>560<br>588/60 | | 32 | | ----- | |
| | Air | 1.07(10) | 1.9(14) (air irradiation) | 2.3(15) | 8.2(14) | 16 | | | 844<br>789<br>753<br>735<br>765<br>777/47 | 993<br>1020<br>982<br>944<br>982<br>984/33 | 1183<br>1291<br>1188<br>1188<br>1225<br>1215/46 | 2625<br>2720<br>2540<br>2621<br>2835<br>2668/127 | 300<br>292<br>292<br>298<br>310<br>298/8 | | 100 | | ----- | |
| | Air | 3.9(10) | 2.8(14) (air irradiation) | 6.1(15) | 2.6(14) | 16 | | | 868<br>1027<br>829<br>885<br>855<br>893/85 | 1237<br>1449<br>1184<br>1170<br>1185<br>1245/120 | 1907<br>----<br>1842<br>1770<br>1709<br>1807/96 | 2475<br>2435<br>2565<br>2380<br>2410<br>2453/80 | 120<br>115<br>135<br>128<br>130<br>125/9 | | 100 | | ----- | |
| | Air | 9.1(8) | 2.8(13) (vacuum irradiation) | 1.6(14) | 6.0(12) | 7 | 1.6393<br>1.8330<br>1.7473<br>1.8386<br>1.7363 | +0.0024<br>+0.0006<br>+0.0020<br>+0.0020<br>+0.0016 | 731<br>815<br>789<br>780<br>749<br>773/36 | 914<br>976<br>894<br>900<br>920<br>921/35 | 1111<br>1161<br>1092<br>1080<br>1105<br>1110/35 | 5499<br>4796<br>5591<br>5253<br>5460<br>5321/342 | 552<br>555<br>520<br>550<br>572<br>550/22 | | 80 | | 4 (-7) | |
| | Air | 1.3(10) | 1.2(15) (vacuum irradiation) | 2.0(15) | 9.8(13) | 6 | 1.7587<br>1.8095<br>1.7596<br>1.7231<br>1.7884 | -0.0112<br>-0.0166<br>-0.0113<br>-0.0130<br>-0.0103 | 657<br>556<br>723<br>573<br>701<br>642/72 | 960<br>927<br>1118<br>956<br>1058<br>1004/82 | 1644<br>1483<br>1710<br>1594<br>1696<br>1625/98 | 3420<br>3770<br>4012<br>3571<br>3762<br>3707/255 | 205<br>245<br>250<br>230<br>225<br>231/19 | | 120 | | 3 (-7) | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-4 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E> 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Estane 5740X1 Elastomer Die C, Specimen (cont'd) | Air | 2.6(10) | 4.88(14) (vacuum irradiation) | 5.36(15) | 2.09(14) | 10 | 1.7709<br>1.8673<br>1.7740<br>1.7387<br>1.7511 | -0.0509<br>-0.0512<br>-0.0472<br>-0.0421<br>-0.0515 | 565<br>667<br>855<br>1091<br>592<br>754/226 | 1418<br>1359<br>1841<br>2369<br>1500<br>1697/434 | ----<br>----<br>----<br>----<br>----<br>---- | 2525<br>2842<br>3025<br>3195<br>3319<br>2981/341 | 85<br>80<br>80<br>70<br>90<br>81/9 | | 200 | | [illegible] (-7) | |
| Duroid 5600 | Air | 0 | 0 (control specimens) | 0 | 0 | - | | | | | | 2219<br>2492<br>2262<br>2167<br>2316<br>2291/140 | 0.82<br>0.91<br>0.79<br>0.69<br>0.94<br>0.83/.11 | | | | | |
| | Air | 1.5(8) | 3.3(12) (air irradiation) | 3.0(13) | 1.1(12) | 10 | | | | | | 2193<br>1596<br>1800<br>1972<br>1890<br>1890/257 | 0.48<br>0.47<br>0.41<br>0.64<br>0.53<br>0.51/.10 | | 80 | | ----- | |
| | Air | 6.8(8) | 2.4(13) (air irradiation) | 1.2(14) | 4.9(12) | 10 | | | | | | 1609<br>1666<br>1542<br>1359<br>1818<br>1599/197 | 0.42<br>0.38<br>0.34<br>0.27<br>0.47<br>0.38/.09 | | 82 | | ----- | |
| | Air | 1.36(9) | 1.8(13) (air irradiation) | 2.5(14) | 9.5(12) | 10 | | | | | | 1542<br>1646<br>1492<br>1560/91 | 0.34<br>0.37<br>0.45<br>0.39/.06 | | 82 | | ----- | |
| | Air | 1.8(8) | 8.4(12) (vacuum irradiation) | 1.85(13) | 7.6(11) | 8 | 23.3102<br>23.8341<br>23.0300<br>23.8446<br>23.8812 | +0.0153<br>+0.0127<br>+0.0137<br>+0.0105<br>+0.0090 | | | | 2001<br>2208<br>1976<br>2066<br>2115<br>2073/100 | 0.58<br>0.74<br>0.57<br>0.63<br>0.60<br>0.62/.07 | | 80 | | 1.7(-7) | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-4 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Duroid 5600 (cont'd) | Air | 4.2(8) | 1.9(13) | 4.5(13) | 1.8(12) | 8 | 22.9615<br>22.8704<br>23.8973<br>22.9133<br>23.7812 | -0.0033<br>-0.0036<br>-0.0088<br>-0.0038<br>-0.0038 | | | | 2243<br>2220<br>1930<br>2323<br>2375<br>2218/191 | 0.65<br>0.75<br>0.86<br>0.77<br>0.74<br>0.75/.09 | | 90 | | 4 (-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |
| | Air | 8.8(8) | 2.8(13) | 1.7(14) | 6.4(12) | 8 | 23.0349<br>22.9674<br>23.5230<br>23.7765<br>22.8814 | -0.0060<br>-0.0048<br>-0.0077<br>-0.0056<br>-0.0043 | | | | 2148<br>2368<br>2151<br>2351<br>2234<br>2250/95 | 0.66<br>0.50<br>0.72<br>0.73<br>0.91<br>0.70/.18 | | 90 | | 4 (-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |
| Kynar | Air | 0 | 0 | 0 | 0 | - | | | | | | 4000<br>5133<br>4883<br>6167<br>5500<br>7000<br>6500<br>5598/1109 | ----<br>----<br>----<br>10<br>5<br>10<br>10<br>8.75/2.42 | | | | | |
| | | | (control specimens) | | | | | | | | | | | | | | | |
| | Air | 0 | 0 | 0 | 0 | - | | | | | | 7000 | 300 | | | | | |
| | | | (vendor data) | | | | | | | | | | | | | | | |
| | Air | 6.5(7) | 3.5(12) | 1.4(13) | 6.0(11) | 13 | | | | | | 5167<br>6000<br>6167<br>7467<br>5033<br>5967/975 | 10<br>10<br>5<br>10<br>25<br>12/7.6 | | 80 | | ----- | |
| | | | (air irradiation) | | | | | | | | | | | | | | | |
| | Air | 1.5(8) | 3.3(12) | 3.0(13) | 1.1(12) | 13 | | | | | | 5850<br>6117<br>5833<br>6367<br>5950<br>6023/226 | 10<br>10<br>10<br>5<br>10<br>9/2.24 | | 80 | | ----- | |
| | | | (air irradiation) | | | | | | | | | | | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-4 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kynar (cont'd) | Air | 1.36(9) | 1.8(12) (air irradiation) | 2.5(14) | 9.5(12) | 13 | | | | | | 6367<br>6200<br>8233<br>7333<br>5833<br>6793/982 | 10<br>10<br>5<br>5<br>10<br>8/2.74 | | 82 | | ----- | |
| | Air | 6.2(7) | 4.5(12) (vacuum irradiation) | 6.3(12) | 2.8(12) | 9 | 1.7303<br>1.5895<br>1.6308<br>1.4761<br>1.5520 | 0.0000<br>-0.0009<br>-0.0015<br>+0.0009<br>+0.0006 | | | | 6550<br>5383<br>5417<br>5417<br>5167<br>5587/548 | 5<br>20<br>15<br>10<br>15<br>16.25/6.77 | | 80 | | 1.7(-7) | |
| | Air | 1.8(8) | 8.4(12) (vacuum irradiation) | 1.85(13) | 7.6(11) | 8 | 1.5288<br>1.5462<br>1.5446<br>1.6016<br>1.5072 | +0.0019<br>+0.0091<br>+0.0024<br>+0.0020<br>+0.0025 | | | | 5283<br>4583<br>5667<br>6000<br>5283<br>5363/529 | 15<br>5<br>5<br>-<br>10<br>8.75/4.80 | | 80 | | 1.7(-7) | |
| | Air | 9.4(8) | 2.8(13) (vacuum irradiation) | 1.5(14) | 5.6(12) | 10 | | | | | | 5667<br>5333<br>5250<br>6117<br>5800<br>5633/359 | 10<br>-<br>10<br>10<br>-<br>10/0 | | 90 | | 4 (-7) | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-5

Test Environments and Results of Static Tests: Dielectric Materials

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Marlex 6002 (14 mil) | Air | 0 | 0 | 0 | 0 | - | | | 3000<br>3286<br>3643<br>3507<br>3700<br>3414<br>3714 | 2714<br>2571<br>3014<br>2943<br>3107<br>2921<br>3014 | 2714<br>2357<br>2571<br>2507<br>2643<br>2864<br>2943 | 4071<br>3343<br>3464<br>4086<br>3229<br>3521 | 785<br>1100<br>775<br>960<br>960<br>840<br>910 | | | | | |
| | | | (control specimens) | | | | | | 3466/264 | 2898/198 | 2657/217 | 3497/380 | 907/120 | | | | | |
| | Air | 1.5(8) | 3.3(12) | 3.0(13) | 1.1(12) | 14 | | | ----<br>----<br>----<br>3571 | ----<br>----<br>----<br>3071 | ----<br>----<br>----<br>2571 | 4286<br>4071<br>3893<br>3964 | ---<br>---<br>---<br>~800 | | 80 | | - | |
| | | | (air irradiation) | | | | | | 3571 | 3071 | 2571 | 4054/191 | ~800 | | | | | |
| | Air | 1.36(9) | 1.8(13) | 2.5(14) | 9.5(12) | 14 | | | ----<br>----<br>----<br>----<br>---- | ----<br>----<br>----<br>----<br>---- | ----<br>----<br>----<br>----<br>---- | 4307<br>4079<br>4057<br>3993<br>4000 | 20<br>15<br>20<br>5<br>10 | | 82 | | - | |
| | | | (air irradiation) | | | | | | ---- | ---- | ---- | 4087/135 | 14/6 | | | | | |
| | Air | 1.8(8) | 8.4(12) | 1.85(13) | 7.6(11) | 8 | 1.3798<br>1.3510<br>1.2338<br>1.2232<br>1.3605 | +0.0002<br>+0.0007<br>+0.0001<br>+0.0004<br>-0.0002 | 4214<br>2929<br>3929<br>3857<br>4107 | 3464<br>----<br>----<br>2714<br>---- | ----<br>----<br>----<br>----<br>---- | 4357<br>4286<br>4107<br>3964<br>4250 | 720<br>975<br>1030<br>690<br>825 | | 80 | | 1.71(-7) | |
| | | | (vacuum irradiation) | | | | | | 3807/552 | 3098/--- | ---- | 4193/169 | 848/146 | | | | | |
| | Air | 4.5(8) | 1.95(13) | 5.45(13) | 2.1(12) | 10 | 1.3427<br>1.3553<br>1.3485<br>1.3441<br>1.3169 | +0.0005<br>-0.0005<br>-0.0003<br>-0.0004<br>-0.0003 | 3571<br>4071<br>3786<br>4143<br>3786 | 3000<br>----<br>3071<br>3286<br>2857 | ----<br>----<br>----<br>----<br>---- | 4429<br>4500<br>4464<br>4393<br>4212 | 800<br>---<br>430<br>837<br>775 | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | | | 3871/246 | 3054/184 | ---- | 4400/123 | 711/198 | | | | | |
| | Air | 9.4(8) | 2.8(13) | 1.6(14) | 6.0(12) | 10 | 1.2526<br>1.2871<br>1.2490<br>1.3087<br>1.3116 | +0.0012<br>+0.0012<br>+0.0007<br>+0.0008<br>+0.0010 | 3714<br>----<br>4071<br>----<br>4214 | 3071<br>----<br>3143<br>----<br>2857 | ----<br>----<br>2643<br>----<br>---- | 3679<br>----<br>4214<br>----<br>4429 | 725<br>---<br>640<br>---<br>660 | | 90 | | [illegible] | |
| | | | (vacuum irradiation) | | | | | | 4000/295 | 3024/169 | 2643 | 4107/443 | 675/50 | | | | | |

[a] Values given as: average value/standard deviation on an individual basis.

[b] Figures showing plotted data to be presented and listed in the annual report.

Table A-5 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Teflon TFE (10 mil) | Air | 0 | 0 | 0 | 0 | - | | | 1863 | 2109 | 2209 | 3572 | 255 | | | | | |
| | | | (control specimens) | | | | | | 1909 | 2318 | 2590 | 3845 | 260 | | | | | |
| | | | | | | | | | 1745 | 2036 | 2263 | 3418 | 240 | | | | | |
| | | | | | | | | | 1681 | 2136 | ---- | 5363 | 330 | | | | | |
| | | | | | | | | | 1800/111 | 2150/137 | 2381/181.4 | 4049/894.0 | 271/42.5 | | | | | |
| | Air | 6.5(7) | 3.5(12) | 1.4(13) | 6.0(11) | 11 | | | ---- | ---- | ---- | 1772 | 30 | | 80 | | | |
| | | | (air irradiation) | | | | | | ---- | ---- | ---- | 1663 | 70 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 1709 | 65 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 1700 | 70 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 1772 | 65 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 1723/51.1 | 60/17.0 | | | | | |
| | Air | 1.5(8) | 3.3(12) | 3.0(13) | 1.1(12) | 11 | | | ---- | ---- | ---- | 1690 | 40 | | 80 | | | |
| | | | (air irradiation) | | | | | | ---- | ---- | ---- | 1645 | 35 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 1709 | 45 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 1700 | 30 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 1672 | 30 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 1683/27.0 | 36/6.5 | | | | | |
| | Air | 6.8(8) | 2.4(13) | 1.2(14) | 4.9(12) | x | | | TOO BRITTLE TO TEST | | | | | | | | | |
| | Air | 7.5(7) | 4.6(12) | 5.2(12) | 2.35(11) | 9 | 2.2295 | -0.0012 | 1772 | 1999 | 2181 | 3272 | 235 | | 80 | | 1.7(-7) | |
| | | | (vacuum irradiation) | | | | 2.2193 | -0.0005 | 1590 | 1863 | 2136 | 3363 | 260 | | | | | |
| | | | | | | | 2.3813 | -0.0003 | 1727 | 1909 | 2136 | 3272 | 260 | | | | | |
| | | | | | | | 2.2462 | -0.0009 | 1727 | 1954 | 2181 | 3227 | 230 | | | | | |
| | | | | | | | 2.2907 | -0.0003 | 1681 | 1954 | 2227 | 2318 | 210 | | | | | |
| | | | | | | | | | 1699/70 | 1936/58 | 2172/34.6 | 3090/440 | 239/21.4 | | | | | |
| | Air | 9.1(7) | 7.8(12) | 1.7(13) | 7.0(11) | 9 | 2.2188 | +0.0003 | 1636 | 1909 | 2090 | 2863 | 200 | | 80 | | 1.7(-7) | |
| | | | (vacuum irradiation) | | | | 2.1787 | +0.0003 | 1636 | 1863 | 2090 | 2363 | 150 | | | | | |
| | | | | | | | 2.2885 | -0.0001 | 1545 | 1772 | 2045 | 2818 | 200 | | | | | |
| | | | | | | | 2.1411 | +0.0008 | 1681 | 1909 | 2136 | 2636 | 190 | | | | | |
| | | | | | | | 2.3858 | 0.0000 | 1545 | 1818 | 2090 | 2727 | 180 | | | | | |
| | | | | | | | | | 1609/58 | 1854/59 | 2090/32.1 | 2681/175 | 184/20.8 | | | | | |
| | Air | 1.68(8) | 1.7(12) | 1.9(13) | - | 10 | | | 1590 | 1890 | 2136 | 3863 | 190 | | 85 | | 2.3(-7) | |
| | | | (vacuum irradiation) | | | | | | 1772 | 2136 | 2363 | 2909 | 180 | | | | | |
| | | | | | | | | | 1545 | 1881 | 2118 | 2227 | 120 | | | | | |
| | | | | | | | | | 1636/134 | 1969/151 | 2206/142 | 3000/822 | 163/39.4 | | | | | |

[a] Values given as: average value/standard deviation on an individual basis.

[b] Figures showing plotted data to be presented and listed in the annual report.

Table A-5 (contnnued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Teflon TFE (10 mil) (cont'd) | Air | 4.45(8) | 1.95(13) | 5.45(13) | 2.1(12) | 10 | 2.2441 | -0.0009 | 1590 | 1654 | ---- | 1772 | 60 | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | 2.3956 | -0.0005 | 1681 | 1790 | ---- | 2136 | 125 | | | | | |
| | | | | | | | 2.2721 | -0.0006 | 1727 | 1818 | 2054 | 2409 | 140 | | | | | |
| | | | | | | | 2.3678 | -0.0002 | 1727 | 1818 | 2027 | 2209 | 134 | | | | | |
| | | | | | | | 2.3278 | -0.0003 | 1681 | 1745 | 1900 | 2136 | 143 | | | | | |
| | | | | | | | | | 1681/59 | 1764/71 | 1997/77.2 | 2132/228 | 120/34.5 | | | | | |
| | Air | 5.08(8) | 8.31(12) | 6.98(13) | 2.77(12) | 9 | | | 1264 | 1291 | ---- | 1409 | 98 | | 87 | | 2.5(-7) | |
| | | | (vacuum irradiation) | | | | | | 1336 | 1336 | ---- | 1373 | 80 | | | | | |
| | | | | | | | | | 1345 | 1364 | ---- | 1418 | 95 | | | | | |
| | | | | | | | | | 1315/48 | 1330/43 | ---- | 1400/23.8 | 91/9.65 | | | | | |
| Teflon TFE (40 mil) Die A Specimen | Air | 0 | 0 | 0 | 0 | - | | | 2014 | 2108 | 2249 | 2905 | 400 | | | | | |
| | | | (control specimens) | | | | | | 1848 | 1971 | 2061 | 2786 | 275 | | | | | |
| | | | | | | | | | 1988 | 2120 | 2308 | 2833 | 275 | | | | | |
| | | | | | | | | | 1864 | 1978 | 2091 | 2796 | 300 | | | | | |
| | | | | | | | | | 1929/81 | 2044/72 | 2177/120 | 2830/58 | 313/61 | | | | | |
| | Air | 1.5(8) | 3.3(12) | 3.0(13) | 1.1(12) | 13 | | | ---- | ---- | ---- | 2000 | 1 | | 80 | | | |
| | | | (air irradiation) | | | | | | ---- | ---- | ---- | 1701 | 1 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 1847 | 1 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 1694 | 1 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 1770 | 1 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 1802/129 | 1/0 | | | | | |
| | Air | 6.8(8) | 2.40(13) | 1.2(14) | 4.9(12) | 13 | | | ---- | ---- | ---- | 364 | 1 | | 82 | | | |
| | | | (air irradiation) | | | | | | ---- | ---- | ---- | 381 | 1 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 402 | 1 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 742 | 1 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 704 | 1 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 519/163 | 1/0 | | | | | |
| | Air | 9.1(7) | 7.8(12) | 1.7(13) | 7.0(11) | 6 | 5.8602 | -0.0001 | 1762 | ---- | ---- | 1762 | 65 | | 80 | | 1.7(-7) | |
| | | | (vacuum irradiation) | | | | 5.8667 | -0.0003 | 1772 | ---- | ---- | 1772 | 25 | | | | | |
| | | | | | | | 5.8600 | -0.0004 | ---- | ---- | ---- | 1493 | 45 | | | | | |
| | | | | | | | 5.8583 | -0.0004 | 1607 | 1539 | ---- | 1539 | 50 | | | | | |
| | | | | | | | | | 1714/97 | ---- | ---- | 1642/136 | 46/19 | | | | | |

(Table continued)

[a] Values given as: average value/standard deviation on an individual basis.

[b] Figures showing plotted data to be presented and listed in the annual report.

Table A-5 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron ($n/cm^2$): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Teflon TFE (40 mil) Die A Specimen (cont'd) | Air | 3.9(8) | 1.9(13) (vacuum irradiation) | 4.4(13) | 1.7(12) | 10 | 5.8218 | +0.0003 | ---- | ---- | ---- | 1773 | 15 | | 80 | | 4(-7) | |
| | | | | | | | 5.8271 | -0.0006 | ---- | ---- | ---- | 1772 | 22 | | | | | |
| | | | | | | | 5.7846 | -0.0007 | ---- | ---- | ---- | 1830 | 45 | | | | | |
| | | | | | | | 5.8157 | -0.0003 | ---- | ---- | ---- | 1816 | 20 | | | | | |
| | | | | | | | 5.7941 | -0.0007 | 1742 | ---- | ---- | 1798 | 25 | | | | | |
| | | | | | | | | | 1742 | ---- | ---- | 1798/25 | 25/13 | | | | | |
| Teflon FEP (10 mil) | Air | 0 | 0 (control specimens) | 0 | 0 | | | | 1970 | 2040 | 2080 | ---- | --- | | | | | |
| | | | | | | | | | 2040 | 2120 | 2150 | ---- | --- | | | | | |
| | | | | | | | | | 2000 | 2050 | 2140 | ---- | --- | | | | | |
| | | | | | | | | | 2180 | 2280 | 2340 | 3480 | 310 | | | | | |
| | | | | | | | | | 2000 | 2070 | 2120 | ---- | --- | | | | | |
| | | | | | | | | | 1910 | 2050 | 2100 | 3830 | 367 | | | | | |
| | | | | | | | | | 2000 | 2060 | 2120 | 3580 | 325 | | | | | |
| | | | | | | | | | 1970 | 2060 | 2100 | 3800 | 363 | | | | | |
| | | | | | | | | | 2010 | 2090 | 2140 | 3700 | 323 | | | | | |
| | | | | | | | | | 2000 | 2050 | 2110 | 4100 | 381 | | | | | |
| | | | | | | | | | 2000 | 2070 | ---- | 3680 | 350 | | | | | |
| | | | | | | | | | 2000 | 2070 | 2120 | 3860 | 369 | | | | | |
| | | | | | | | | | 2020 | 2110 | 2150 | 3760 | 360 | | | | | |
| | | | | | | | | | 2040 | 2100 | 2150 | 3910 | 372 | | | | | |
| | | | | | | | | | 2010/79 | 2087/38 | 2140/78 | 3770/201 | 352/23 | | | | | |
| | Air | 6.5(7) | 3.5(12) (air irradiation) | 1.4(13) | 6.0(11) | 16 | | | 2000 | 2080 | 2130 | 2420 | 250 | | 80 | | - | |
| | | | | | | | | | 2000 | 2100 | 2130 | 3550 | 370 | | | | | |
| | | | | | | | | | 2000 | 2070 | 2130 | 2800 | 300 | | | | | |
| | | | | | | | | | 2050 | 2100 | 2150 | 2300 | 240 | | | | | |
| | | | | | | | | | 2013/24 | 2088/15 | 2135/10 | 2768/607 | 290/53 | | | | | |
| | Air | 6.8(8) | 2.4(13) (air irradiation) | 1.2(14) | 4.9(12) | 16 | | | 2000 | 2040 | 2030 | 2300 | 140 | | 82 | | - | |
| | | | | | | | | | 1950 | 2000 | 2000 | 2250 | 220 | | | | | |
| | | | | | | | | | 1950 | 2000 | 1970 | 2250 | 140 | | | | | |
| | | | | | | | | | 1900 | 1950 | 1940 | 2130 | 210 | | | | | |
| | | | | | | | | | 1950/49 | 1998/44 | 1985/38.4 | 2245/49.4 | 177.5/43.3 | | | | | |
| | Air | 7.5(7) | 4.6(12) (vacuum irradiation) | 5.2(12) | 2.35(11) | 9 | 2.1568 | -0.0104 | 2050 | 2100 | 2160 | 3800 | 365 | | 80 | | 1.7(-7) | |
| | | | | | | | 2.1449 | -0.0001 | 2050 | 2100 | 2160 | 4020 | 430 | | | | | |
| | | | | | | | 2.1317 | -0.0037 | 2030 | 2100 | 2150 | 3780 | 380 | | | | | |
| | | | | | | | 2.1663 | +0.0003 | 2050 | 2100 | 2150 | 3830 | 365 | | | | | |
| | | | | | | | 2.1632 | -0.0009 | 2070 | 2150 | 2200 | 3670 | 345 | | | | | |
| | | | | | | | | | 2050/17 | 2110/21 | 2160/21.1 | 3820/127.5 | 377/30.0 | | | | | |

(Table continued)

[a] Values given as: average value/standard deviation on an individual basis.

[b] Figures showing plotted data to be presented and listed in the annual report.

Table A-5 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E> 2.9 Mev | E> 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Teflon FEP (10 mil) (cont'd) | Air | 1.8(8) | 8.4(12) | 1.85(13) | 7.6(11) | 9 | 2.1591 | 0.0000 | 2000 | 2100 | ---- | 3600 | 360 | | 80 | | 1.7(-7) | |
| | | | (vacuum irradiation) | | | | 2.1834 | -0.0083 | 2000 | 2070 | 2150 | 3050 | 320 | | | | | |
| | | | | | | | 2.1576 | -0.0032 | 2100 | 2150 | ---- | 3830 | 395 | | | | | |
| | | | | | | | 2.1908 | -0.0017 | 1800 | 1870 | 1950 | 3300 | 330 | | | | | |
| | | | | | | | 2.1562 | -0.0081 | 1800 | 1850 | 1950 | ---- | ---- | | | | | |
| | | | | | | | | | 1940/129 | 2008/129 | 2017/117.0 | 3445/336.2 | 349.5/34.2 | | | | | |
| | Air | 4.45(8) | 1.95(13) | 5.45(13) | 2.1(12) | 10 | 2.1542 | +0.0021 | 1960 | 2010 | 2070 | 2230 | 270 | | 80 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | 2.1530 | +0.0015 | 1950 | 1990 | 2060 | 2400 | 280 | | | | | |
| | | | | | | | 2.1480 | +0.0013 | 1960 | 2030 | 2060 | 3000 | ---- | | | | | |
| | | | | | | | 2.2139 | -0.0023 | 2000 | 2050 | 2120 | 2320 | 275 | | | | | |
| | | | | | | | 2.1410 | -0.0108 | 1940 | 1970 | ---- | 2260 | 275 | | | | | |
| | | | | | | | | | 1962/26 | 2010/34 | 2077.5/29.0 | 2442/322.0 | 275/4.1 | | | | | |
| Teflon FEP (40 mil) Die A Specimen | Air | 0 | 0 | 0 | 0 | - | | | 1860 | 1906 | 1930 | 2950 | 385 | | | | | |
| | | | (control specimens) | | | | | | 1985 | 2009 | 2009 | 2583 | 325 | | | | | |
| | | | | | | | | | 1886 | 1910 | 1933 | 2641 | 345 | | | | | |
| | | | | | | | | | 1983 | 1932 | 1932 | 2704 | 350 | | | | | |
| | | | | | | | | | 1915 | 1943 | 1971 | 2728 | 330 | | | | | |
| | | | | | | | | | 1906/58 | 1940/44 | 1955/34 | 2717/149 | 347/26 | | | | | |
| | Air | 1.5(8) | 3.3(12) | 3.0(13) | 1.1(12) | 16 | | | 1822 | 1869 | 1845 | 2102 | 300 | | 80 | | - | |
| | | | (air irradiation) | | | | | | 1714 | 1835 | 1835 | 2202 | 320 | | | | | |
| | | | | | | | | | 1886 | 1910 | 1886 | 2311 | 320 | | | | | |
| | | | | | | | | | 1768 | 1816 | 1792 | 2122 | 300 | | | | | |
| | | | | | | | | | 1792 | 1839 | 1874 | 2216 | 325 | | | | | |
| | | | | | | | | | 1796/74 | 1854/40 | 1808/91 | 2191/90 | 313/11 | | | | | |
| | Air | 6.8(8) | 2.4(13) | 1.2(14) | 4.9(12) | 16 | | | 2065 | 2089 | 2065 | 2276 | 120 | | 82 | | - | |
| | | | (air irradiation) | | | | | | 1904 | 1928 | 1857 | 1928 | 100 | | | | | |
| | | | | | | | | | 1913 | 1913 | ---- | 1913 | 55 | | | | | |
| | | | | | | | | | 2105 | 2105 | 1913 | 2009 | 110 | | | | | |
| | | | | | | | | | 1913 | 1937 | 1889 | 2081 | 110 | | | | | |
| | | | | | | | | | 1980/86 | 1994/83 | 1931/101 | 2041/156 | 99/28 | | | | | |

(Table continued)

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-5 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E> 2.9 Mev | E> 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Teflon FEP (40 mil) Die A Specimen (cont'd) | Air | 9.1(7) | 7.8(12) | 1.7(13) | 7.0(11) | 8 | 5.4292 | +0.0007 | 1886 | 1933 | 1933 | 2452 | 320 | | 80 | | 1.7(-7) | |
| | | | (vacuum irradiation) | | | | 5.4134 | +0.0014 | 1941 | 1966 | 1975 | 2524 | 315 | | | | | |
| | | | | | | | 5.4191 | +0.0031 | 1908 | 1956 | 1956 | 2318 | 305 | | | | | |
| | | | | | | | 5.3982 | +0.0022 | 1908 | 1932 | 1956 | 2294 | 310 | | | | | |
| | | | | | | | 5.4775 | -0.0030 | 1886 | 1933 | 1933 | 2523 | 330 | | | | | |
| | | | | | | | | | 1906/24 | 1944/15 | 1951/18 | 2422/99 | 316/11 | | | | | |
| | Air | 3.9(8) | 1.9(13) | 4.4(13) | 1.7(12) | 7 | 5.3818 | -0.0007 | 1849 | 1867 | 1887 | 2231 | 330 | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | 5.3837 | +0.0004 | 1893 | 1922 | 1922 | 2246 | 315 | | | | | |
| | | | | | | | 5.4215 | 0.0000 | 1917 | 1941 | 1941 | 2427 | 355 | | | | | |
| | | | | | | | 5.4641 | -0.0005 | 1893 | 1893 | 1932 | 2294 | 336 | | | | | |
| | | | | | | | 5.4252 | -0.0006 | 1870 | 1899 | 1889 | 1889 | 100 | | | | | |
| | | | | | | | | | 1884/29 | 1904/32 | 1914/23 | 2217/231 | 287/110 | | | | | |
| Tedlar (2 mil) | Air | 0 | 0 | 0 | 0 | - | | | 5900 | 6150 | ---- | 9900 | 245 | | | | | |
| | | | (control specimens) | | | | | | 5750 | 5750 | ---- | 9250 | 227 | | | | | |
| | | | | | | | | | 5750 | 5750 | ---- | 9650 | 278 | | | | | |
| | | | | | | | | | 6000 | 6000 | ---- | 9350 | 255 | | | | | |
| | | | | | | | | | 5750 | 5900 | ---- | 9150 | 230 | | | | | |
| | | | | | | | | | 5830/107 | 5910/172 | ---- | 9460/322 | 247/23 | | | | | |
| | Air | 1.5(8) | 3.3(12) | 3.0(13) | 1.1(12) | 12 | | | 5250 | 5400 | 5750 | 8350 | 255 | | 80 | | - | |
| | | | (air irradiation) | | | | | | 5500 | 5350 | 5500 | 8350 | 280 | | | | | |
| | | | | | | | | | 5500 | 5400 | 5400 | 9400 | 260 | | | | | |
| | | | | | | | | | 5650 | 5650 | 5650 | 8650 | 250 | | | | | |
| | | | | | | | | | 5475/172 | 5450/129 | 5575/150 | 8688/451 | 261/13 | | | | | |
| | Air | 1.36(9) | 1.8(13) | 2.5(14) | 9.5(14) | 12 | | | 5350 | 5350 | 5400 | 7250 | 190 | | 82 | | - | |
| | | | (air irradiation) | | | | | | 5650 | 5750 | 5750 | 7750 | 225 | | | | | |
| | | | | | | | | | 5750 | 5750 | 5850 | 8700 | 260 | | | | | |
| | | | | | | | | | 5250 | 5350 | 5500 | 8400 | 230 | | | | | |
| | | | | | | | | | 5400 | 5400 | 5500 | 8000 | 260 | | | | | |
| | | | | | | | | | 5470/215 | 5520/172 | 5600/193 | 8020/623 | 233/30 | | | | | |
| | Air | 9.1(7) | 7.8(12) | 1.7(13) | 7.0(11) | 9 | 0.3186 | +0.0004 | 6000 | 6250 | 6500 | 10,000 | 260 | | 80 | | 1.7(-7) | |
| | | | (vacuum irradiation) | | | | 0.3178 | 0.0000 | 6250 | ---- | ---- | 7 500 | ---- | | | | | |
| | | | | | | | 0.3175 | -0.0099 | 6100 | 5750 | ---- | 10,400 | 285 | | | | | |
| | | | | | | | 0.3182 | +0.0002 | 6250 | ---- | ---- | 9 650 | 220 | | | | | |
| | | | | | | | 0.3168 | +0.0004 | 5900 | 6000 | 6150 | 10,250 | 320 | | | | | |
| | | | | | | | | | 6100/150 | 6000/295 | 6325/x | 9560/1247 | 271/49 | | | | | |

(Table continued)

[a] Values given as: average value/standard deviation on an individual basis.

[b] Figures showing plotted data to be presented and listed in the annual report.

Table A-5 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tedlar (2 mil) (cont'd) | Air | 4.45(8) | 1.95(13) | 5.45(13) | 2.1(12) | 8 | 0.3218 | -0.0008 | ---- | ---- | ---- | ---- | 225 | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | 0.3162 | +0.0003 | 5800 | 5800 | ---- | 9100 | 218 | | | | | |
| | | | | | | | 0.3250 | +0.0001 | 6100 | 6150 | ---- | 9650 | 240 | | | | | |
| | | | | | | | 0.3179 | +0.0003 | 6150 | 6150 | ---- | 9300 | 240 | | | | | |
| | | | | | | | 0.3132 | +0.0002 | 6350 | 6000 | 6250 | 9650 | 250 | | | | | |
| | | | | | | | | | 6100/267 | 6025/170 | ---- | 9425/267 | 235/14 | | | | | |
| | Air | 9.4(8) | 2.8(13) | 1.5(14) | 5.6(12) | 8 | 0.3126 | -0.0001 | ---- | 5750 | 5900 | 9000 | 235 | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | 0.3135 | -0.0009 | 5900 | 5900 | ---- | 8850 | 220 | | | | | |
| | | | | | | | 0.3249 | +0.0003 | 6150 | 6150 | 6250 | 8850 | 225 | | | | | |
| | | | | | | | 0.3225 | +0.0003 | 6000 | 6100 | 6150 | 8650 | 220 | | | | | |
| | | | | | | | 0.3242 | -0.0002 | 6250 | 6400 | ---- | 9600 | 240 | | | | | |
| | | | | | | | | | 6075/170 | 6060/279 | 6100/207 | 8990/408 | 228/9 | | | | | |
| H-Film (2 mil) | Air | 0 | 0 | 0 | 0 | - | | | 14,661 | 15,593 | 18,475 | 20,678 | 140 | | | | | |
| | | | (control specimens) | | | | | | 14,237 | 15,339 | 17,627 | 19,068 | 120 | | | | | |
| | | | | | | | | | 14,407 | 15,678 | 18,305 | 19,407 | 125 | | | | | |
| | | | | | | | | | 15,678 | 16,610 | 19,322 | 20,508 | 140 | | | | | |
| | | | | | | | | | 14,492 | 15,254 | 17,542 | 18,644 | 140 | | | | | |
| | | | | | | | | | 15,339 | 16,186 | 19,068 | 20,339 | 130 | | | | | |
| | | | | | | | | | ------ | 15,085 | 17,966 | 17,966 | 100 | | | | | |
| | | | | | | | | | ------ | 15,085 | 15,847 | 19,153 | 128 | | | | | |
| | | | | | | | | | 14,802/569 | 15,604/536 | 18,019/1221 | 19,470/953 | 128/14 | | | | | |
| | Air | 6.0(9) | - | 1.26(15) | - | 16 | | | 15,169 | 15,678 | ------ | 16,356 | --- | | 100 | | - | |
| | | | (air irradiation) | | | | | | 14,831 | 15,254 | ------ | 17,797 | 110 | | | | | |
| | | | | | | | | | 14,661 | 15,678 | ------ | 18,729 | 115 | | | | | |
| | | | | | | | | | 15,254 | 16,102 | ------ | 20,508 | 135 | | | | | |
| | | | | | | | | | 15,424 | 16,102 | ------ | 20,508 | 130 | | | | | |
| | | | | | | | | | 15,068/328 | 15,763/365 | ------ | 18,780/1785 | 123,12 | | | | | |
| | Air | 3.9(10) | 2.8(14) | 6.1(15) | 2.6(14) | 16 | | | 15,678 | 16,610 | ------ | 17,458 | 65 | | 100 | | - | |
| | | | (air irradiation) | | | | | | 15,678 | 16,525 | ------ | 17,288 | 60 | | | | | |
| | | | | | | | | | 15,085 | 15,932 | ------ | 18,136 | 105 | | | | | |
| | | | | | | | | | 15,424 | 16,441 | 18,729 | 18,729 | 100 | | | | | |
| | | | | | | | | | 15,466/288 | 16,377/329 | 18,729 | 17,903/700 | 83/22 | | | | | |
| | Air | 1.05(10) | 1.32(14) | 1.65(15) | 5.90(13) | 11 | | | 14,831 | 16,017 | ------ | 16,949 | 90 | | 150 | | 1(-3) | |
| | | | (vacuum irradiation) | | | | | | 14,831 | 15,847 | ------ | 20,339 | 135 | | | | | |
| | | | | | | | | | 14,831 | 15,593 | ------ | 19,492 | 125 | | | | | |
| | | | | | | | | | 14,254 | 16,102 | ------ | 21,102 | 138 | | | | | |
| | | | | | | | | | 14,937/205 | 15,890/247 | ------ | 19,871/2017 | 122/23 | | | | | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-5 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H-Film (2 mil) (cont'd) | Air | 2.85(10) | 3.88(14) | 6.62(15) | 2.09(14) | 10 | 0.1352 | 0.0000 | 15,169 | 15,932 | ------ | 15,932 | 50 | | 200 | | 8(-7) | |
| | | | (vacuum irradiation) | | | | 0.1464 | -0.0015 | ------ | ------ | ------ | ------ | --- | | | | | |
| | | | | | | | 0.1420 | -0.0003 | ------ | ------ | ------ | 19,492 | 120 | | | | | |
| | | | | | | | 0.1401 | -0.0009 | 15,000 | 16,016 | ------ | 18,898 | 105 | | | | | |
| | | | | | | | 0.1373 | -0.0001 | 14,576 | 16,355 | ------ | 21,186 | 135 | | | | | |
| | | | | | | | | | 14,915/350 | 16,101/250 | ------ | 18,877/2552 | 103/41 | | | | | |
| Thermofit | Air | 0 | 0 | 0 | 0 | - | | | 1768 | 1768 | 1632 | 2755 | 400 | | | | | |
| | | | (control specimens) | | | | | | 1430 | 1470 | 1403 | 2510 | 390 | | | | | |
| | | | | | | | | | 1531 | 1531 | 1497 | 2039 | --- | | | | | |
| | | | | | | | | | 1571 | 1598 | 1543 | 2811 | 395 | | | | | |
| | | | | | | | | | 1724 | 1724 | 1594 | 2700 | 395 | | | | | |
| | | | | | | | | | 1720 | 1720 | 1633 | 2867 | 425 | | | | | |
| | | | | | | | | | 1624/133 | 1635/118 | 1550/91 | 2613/327 | 401/15 | | | | | |
| | Air | 1.5(8) | 3.3(12) | 3.0(13) | 1.1(12) | 13 | | | 1515 | 1534 | 1469 | 2482 | 410 | | 80 | | - | |
| | | | (air irradiation) | | | | | | 1422 | 1476 | 1388 | 2493 | 360 | | | | | |
| | | | | | | | | | 1593 | 1593 | 1472 | 2630 | 390 | | | | | |
| | | | | | | | | | 1562 | 1562 | 1477 | 2463 | 400 | | | | | |
| | | | | | | | | | 1510 | 1530 | 1428 | 2707 | 410 | | | | | |
| | | | | | | | | | 1520/74 | 1539/50 | 1447/38 | 2555/105 | 394/21 | | | | | |
| | Air | 1.36(9) | 1.8(13) | 2.5(14) | 9.5(12) | 13 | | | 1658 | 1711 | 1579 | 2139 | 270 | | 82 | | - | |
| | | | (air irradiation) | | | | | | 1606 | 1626 | 1540 | 3770 | 230 | | | | | |
| | | | | | | | | | 1626 | 1626 | 1558 | 1944 | 250 | | | | | |
| | | | | | | | | | 1652 | 1704 | 1573 | 2327 | 290 | | | | | |
| | | | | | | | | | 1633 | 1685 | 1587 | 2624 | 290 | | | | | |
| | | | | | | | | | 1639/22 | 1670/37 | 1567/20 | 2561/785 | 266/26 | | | | | |
| | Air | 1.07(10) | 1.9(14) | 2.3(15) | 8.2(13) | 16 | | | 2100 | ---- | ---- | 2100 | 25 | | 100 | | - | |
| | | | | | | | | | ---- | ---- | ---- | 2114 | 30 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 1970 | 20 | | | | | |
| | | | | | | | | | 2054 | ---- | ---- | 2054 | 25 | | | | | |
| | | | | | | | | | ---- | ---- | ---- | 2080 | 35 | | | | | |
| | | | | | | | | | 2077/27 | ---- | ---- | 2064/62 | 27/6 | | | | | |

(Table continued)

[a] Values given as: average value/standard deviation on an individual basis.

[b] Figures showing plotted data to be presented and listed in the annual report.

Table A-5 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E> 2.9 Mev | Neutron (n/cm²): E> 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | Tensile Strength[a] (psi): at 50% Elongation | Tensile Strength[a] (psi): at 100% Elongation | Tensile Strength[a] (psi): Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Thermofit (cont'd) | Air | 1.8(8) | 8.4(12) | 1.85(13) | 7.6(11) | 8 | 3.2179 | +0.0012 | 1673 | 1673 | 1572 | 2744 | 400 | | 80 | | 1.7(-7) | |
| | | | (vacuum irradiation) | | | | 3.2633 | +0.0019 | 1673 | 1693 | 1572 | 2844 | 400 | | | | | |
| | | | | | | | 3.2278 | +0.0018 | 1700 | 1700 | 1666 | 2496 | 370 | | | | | |
| | | | | | | | 3.1546 | +0.0019 | 1583 | 1618 | 1548 | 2885 | 400 | | | | | |
| | | | | | | | 3.3521 | +0.0017 | ---- | ---- | ---- | 2763 | 395 | | | | | |
| | | | | | | | | | 1657/50 | 1671/35 | 1590/51 | 2746/167 | 393/13 | | | | | |
| | Air | 8.8(9) | 2.8(13) | 1.7(14) | 6.4(12) | 7 | 3.1783 | +0.0006 | 1722 | 1736 | 1681 | 2646 | 325 | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | 3.2308 | +0.0007 | 1646 | 1680 | 1653 | 2413 | 315 | | | | | |
| | | | | | | | 3.0910 | +0.0007 | 1716 | 1743 | 1702 | 2802 | 322 | | | | | |
| | | | | | | | 3.1378 | +0.0002 | 1626 | 1654 | 1640 | 2853 | 322 | | | | | |
| | | | | | | | 3.3332 | +0.0001 | 1683 | 1683 | 1645 | 2784 | 335 | | | | | |
| | | | | | | | | | 1679/41 | 1699/38 | 1664/27 | 2700/189 | 324/9 | | | | | |
| | Air | 1.3(10) | 1.2(15) | 2.0(15) | 9.8(13) | 6 | 3.2961 | -0.1191 | 1807 | ---- | ---- | 2115 | 35 | | 160 | | 8(-7) | |
| | | | (vacuum irradiation) | | | | 3.1984 | -0.0792 | ---- | ---- | ---- | 2106 | 65 | | | | | |
| | | | | | | | 3.2143 | -0.1025 | 1800 | ---- | ---- | 2053 | 50 | | | | | |
| | | | | | | | 3.2038 | -0.0954 | ---- | ---- | ---- | 2101 | 45 | | | | | |
| | | | | | | | 3.3051 | -0.1472 | 1800 | ---- | ---- | 2120 | 45 | | | | | |
| | | | | | | | | | 1802/4 | ---- | ---- | 2099/29 | 48/13 | | | | | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-6

Test Environment and Results of Static Tests: Thermal Insulation

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron ($n/cm^2$): Thermal | Neutron ($n/cm^2$): E> 2.9 Mev | Neutron ($n/cm^2$): E>8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Compressive Strength (psi) at 25% Deflection | Specimen Color | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPR-20-Compression Buttons | Air | 0 | 0 (control specimens) | 0 | 0 | - | | | 126<br>105<br>89<br>84<br>96<br>100/18 | | | | | |
| | Air | 6.5(7) | 3.5(12) (air irradiaton) | 1.4(13) | 6.0(11) | 16 | | | 123.5<br>86<br>99<br>85<br>98/21 | | 80 | | - | |
| | Air | 1.5(8) | 3.3(12) (air irradiation) | 3.0(13) | 1.1(12) | 16 | | | 117<br>86<br>89<br>126<br>105/19 | | 80 | | - | |
| | Air | 1.36(9) | 1.8(13) (air irradiation) | 2.5(14) | 9.5(12) | 16 | | | 89<br>91<br>91.5<br>124<br>99/17 | | 82 | | - | |
| | Air | 7.5(7) | 4.6(12) (vacuum irradiation) | 5.2(12) | 2.35(11) | 7 | 0.6354<br>0.4578<br>0.4738<br>0.4554 | -0.0013<br>-0.0010<br>-0.0006<br>-0.0006 | 111<br>82.5<br>85<br>87.5<br>92/14 | | 80 | | 1.7(-7) | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-6 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E> 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Compressive Strength (psi) at 25% Deflection | Specimen Color | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPR-20 Compression Buttons (cont'd) | Air | 1.8(8) | 8.4(12) | 1.85(13) | 7.6(11) | 7 | 0.4754<br>0.4724<br>0.4651<br>0.626 | -0.0011<br>-0.0012<br>-0.0009<br>-0.0005 | 91.5<br>86<br>103<br>114<br>99/14 | | 80 | | 1.7(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | |
| | Air | 9.1(8) | 2.8(13) | 1.6(14) | 6.0(12) | 7 | 0.6451<br>0.4722<br>0.4663<br>0.4768 | -0.0026<br>-0.0020<br>-0.0025<br>-0.0019 | 116<br>79.5<br>85<br>80<br>90/18 | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | |
| CPR-1021-2 Compression Buttons | | 0 | 0 | 0 | 0 | - | | | 29.8<br>30.8<br>31.1<br>35.5<br>31.5<br>39.5<br>33.0/3.8 | | | | | |
| | | | (control specimens) | | | | | | | | | | | |
| | | 5.08(8) | 8.31(12) | 6.98(13) | 2.77(12) | | | | 29.8<br>31.7<br>27.8<br>29.8/2.3 | | 87 | | 2.5(-7) | |
| | | | (vacuum irradiaton)<br>(low force static) | | | | | | | | | | | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-7

Test Environment and Results Static Tests: Seals

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Rubber O-rings RA33860 | Air | 0 | 0 (control specimens) | 0 | 0 | - | | | 91<br>91<br>91<br>85<br>85<br>91<br>91<br>91<br>91<br>90/2 | 152<br>139<br>139<br>130<br>133<br>136<br>136<br>139<br>145<br>139/7 | 258<br>236<br>249<br>218<br>230<br>230<br>236<br>245<br>249<br>239/13 | 1965<br>1803<br>1963<br>1645<br>1741<br>1730<br>1728<br>1758<br>1832<br>1796/108 | 477<br>478<br>498<br>470<br>471<br>472<br>468<br>478<br>458<br>474/13 | | | | | |
| | Air | 6.8(8) | 2.4(13) (air irradiation) | 1.2(14) | 4.9(12) | 11 | | | 100<br>91<br>91<br>97<br>97<br>95/4 | 167<br>152<br>152<br>152<br>152<br>155/6 | 261<br>258<br>258<br>258<br>258<br>259/1 | 1760<br>1721<br>1893<br>1910<br>1565<br>1770/148 | 445<br>431<br>455<br>478<br>402<br>442/33 | | 82 | | - | |
| | Air | 6.0(9) | - (air irradiation) | 1.26(15) | - | 16 | | | 136<br>136<br>136<br>142<br>145<br>139/4 | 236<br>242<br>236<br>236<br>242<br>238/3 | 467<br>449<br>455<br>449<br>470<br>458/9 | 1239<br>1480<br>1521<br>1560<br>1767<br>1513/227 | 249<br>313<br>316<br>324<br>368<br>314/51 | | 82 | | - | |
| | Air | 4.45(8) | 1.95(13) (vacuum irradiation) | 5.45(13) | 2.1(12) | 7 | 1.0282<br>1.0270<br>1.0289<br>1.0194<br>1.0233 | -0.0112<br>-0.0108<br>-0.0107<br>-0.0107<br>-0.0102 | 97<br>94<br>91<br>100<br>---<br>96/4 | 164<br>157<br>164<br>167<br>---<br>162/5 | 273<br>266<br>285<br>288<br>---<br>278/11 | 1605<br>1765<br>1780<br>1780<br>----<br>1733/85 | 417<br>440<br>422<br>438<br>---<br>429/11 | | 90 | | 4(-7) | |
| | Air | 9.1(8) | 2.8(13) (vacuum irradiation) | 1.6(14) | 6.0(12) | 7 | 1.0212<br>1.0198<br>1.0306<br>1.0212<br>1.0264 | -0.0115<br>-0.0115<br>-0.0102<br>-0.0126<br>-0.0120 | 112<br>112<br>106<br>112<br>112<br>111/3 | 176<br>167<br>167<br>176<br>197<br>177/13 | 303<br>288<br>279<br>309<br>288<br>293/13 | 1797<br>1865<br>1815<br>1965<br>1880<br>1864/72 | 428<br>444<br>442<br>449<br>451<br>443/10 | | 90 | | 4(-7) | |
| | Air | 4.1(9) | 6.4(13) (vacuum irradiation) | 3.7(14) | 1.6(13) | 8 | 1.0267<br>1.0291<br>1.0279<br>1.0296<br>1.0337 | -0.0177<br>-0.0187<br>-0.0200<br>-0.0204<br>-0.0191 | 151<br>136<br>139<br>121<br>121<br>134/13 | 242<br>230<br>239<br>227<br>206<br>229/15 | 445<br>424<br>421<br>409<br>394<br>419/22 | 1665<br>1365<br>1939<br>1222<br>1605<br>1559/308 | 307<br>263<br>356<br>249<br>316<br>298/46 | | 160 | | 8(-7) | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-7 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Buna N O-rings 66-581 | Air | 0 | 0 | 0 | 0 | - | | | 139 | 198 | 317 | 1339 | 477 | | | | | |
| | | | (control specimens) | | | | | | 122 | 188 | 297 | 1290 | 472 | | | | | |
| | | | | | | | | | 142 | 209 | 330 | 1355 | 448 | | | | | |
| | | | | | | | | | 135 | 205 | 330 | 1386 | 468 | | | | | |
| | | | | | | | | | 139 | 201 | 314 | 1381 | 486 | | | | | |
| | | | | | | | | | 139 | 208 | 330 | ---- | --- | | | | | |
| | | | | | | | | | 136/8 | 202/8 | 320/13 | 1350/41 | 470/16 | | | | | |
| | Air | 1.5(8) | 3.3(12) | 3.0(13) | 1.1(12) | 11 | | | 149 | 214 | 330 | 1368 | 463 | | 80 | | - | |
| | | | (air irradiation) | | | | | | 149 | 214 | 330 | 1359 | 457 | | | | | |
| | | | | | | | | | 149 | 214 | 340 | 1355 | 434 | | | | | |
| | | | | | | | | | 149 | 214 | 330 | 1318 | 441 | | | | | |
| | | | | | | | | | 149 | 214 | 340 | 1314 | 418 | | | | | |
| | | | | | | | | | 149/0 | 214/0 | 334/4 | 1343/23 | 443/19 | | | | | |
| | Air | 1.36(9) | 1.8(13) | 2.5(14) | 9.5(12) | 11 | | | 182 | 264 | 429 | 1588 | 409 | | 82 | | - | |
| | | | (air irradiation) | | | | | | 165 | 264 | 445 | 1505 | 365 | | | | | |
| | | | | | | | | | 165 | 251 | 429 | 1551 | 402 | | | | | |
| | | | | | | | | | 165 | 251 | 429 | 1437 | 349 | | | | | |
| | | | | | | | | | 158 | 248 | 429 | 1572 | 398 | | | | | |
| | | | | | | | | | 167/10 | 256/7 | 432/7 | 1531/65 | 385/26 | | | | | |
| | Air | 7.5(7) | 4.6(12) | 5.2(12) | 2.35(11) | 10 | 1.1744 | -0.0036 | 149 | 214 | 330 | 1370 | 472 | | 80 | | 1.7(-7) | |
| | | | (vacuum irradiation) | | | | 1.1721 | -0.0026 | 149 | 214 | 330 | 1386 | 453 | | | | | |
| | | | | | | | 1.1673 | -0.0037 | 149 | 214 | 314 | 1355 | 435 | | | | | |
| | | | | | | | 1.1695 | -0.0032 | 149 | 214 | 347 | 1341 | 428 | | | | | |
| | | | | | | | 1.1731 | -0.0029 | 149 | 214 | 330 | 1355 | 451 | | | | | |
| | | | | | | | | | 149/0 | 214/0 | 330/14 | 1361/19 | 458/25 | | | | | |
| | Air | 1.8(8) | 8.4(12) | 1.85(13) | 7.6(11) | 9 | 1.1741 | -0.0019 | 158 | 228 | 347 | 1339 | 435 | | 80 | | 1.7(-7) | |
| | | | (vacuum irradiation) | | | | 1.1759 | -0.0018 | 149 | 224 | 350 | 1386 | 449 | | | | | |
| | | | | | | | 1.1783 | -0.0021 | 149 | 218 | 350 | 1355 | 426 | | | | | |
| | | | | | | | 1.1771 | -0.0018 | 145 | 221 | 350 | 1384 | 434 | | | | | |
| | | | | | | | 1.1751 | -0.0024 | 142 | 214 | 340 | 1351 | 415 | | | | | |
| | | | | | | | | | 149/7 | 221/6 | 347/4 | 1363/20 | 432/15 | | | | | |
| | Air | 9.1(8) | 2.8(13) | 1.6(14) | 6.0(12) | 7 | 1.1692 | -0.0029 | 158 | 238 | 379 | 1496 | 432 | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | 1.2060 | -0.0037 | 165 | 248 | 402 | 1568 | 450 | | | | | |
| | | | | | | | 1.1864 | -0.0027 | 149 | 231 | 379 | 1470 | 427 | | | | | |
| | | | | | | | 1.1600 | -0.0012 | 149 | 231 | 383 | 1386 | 372 | | | | | |
| | | | | | | | 1.1775 | -0.0026 | 149 | 231 | 379 | 1502 | 438 | | | | | |
| | | | | | | | | | 154/7 | 236/7 | 384/10 | 1484/78 | 424/34 | | | | | |

[a] Values given as: average value/standard deviation on an individual basis.

[b] Figures showing plotted data to be presented and listed in the annual report.

Table A-7 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | Neutron (n/cm²): E > 2.9 Mev | Neutron (n/cm²): E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Sample Weights: Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | Tensile Strength[a] (psi): at 50% Elongation | Tensile Strength[a] (psi): at 100% Elongation | Tensile Strength[a] (psi): Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Temperature: Fig. No.[b] | Pressure: Avg. (torr) | Pressure: Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Neoprene O-rings PRP2277 | Air | 0 | 0 | 0 | 0 | - | | | 184<br>174<br>174<br>167<br>154<br>151<br>167/13 | 308<br>291<br>278<br>274<br>268<br>290<br>285/16 | 585<br>561<br>521<br>521<br>508<br>485<br>530/39 | 2875<br>2648<br>2521<br>2601<br>2540<br>2720<br>2651/140 | 294<br>288<br>285<br>285<br>292<br>322<br>294/15 | | | | | |
| | | | (control specimens) | | | | | | | | | | | | | | | |
| | Air | 1.5(8) | 3.3(12) | 3.0(13) | 1.1(12) | 11 | | | 167<br>167<br>181<br>184<br>177<br>175/7 | 264<br>278<br>284<br>288<br>278<br>278/10 | 485<br>532<br>535<br>552<br>502<br>521/29 | 2893<br>2087<br>2682<br>2275<br>2962<br>2580/376 | 355<br>243<br>298<br>253<br>371<br>304/51 | | 80 | | - | |
| | | | (air irradiation) | | | | | | | | | | | | | | | |
| | Air | 1.36(9) | 1.8(13) | 2.5(14) | 9.5(12) | 11 | | | 151<br>201<br>201<br>211<br>201<br>193/26 | 284<br>335<br>342<br>352<br>335<br>330/29 | 552<br>669<br>669<br>669<br>669<br>646/50 | 2641<br>2523<br>2329<br>2820<br>1840<br>2431/421 | 301<br>243<br>231<br>276<br>201<br>250/43 | | 82 | | - | |
| | | | (air irradiation) | | | | | | | | | | | | | | | |
| | Air | 1.8(8) | 8.4(12) | 1.85(13) | 7.6(11) | 9 | 1.3162<br>1.3351<br>1.3273<br>1.3210<br>1.3224 | -0.0049<br>-0.0037<br>-0.0050<br>-0.0053<br>-0.0045 | 184<br>167<br>174<br>167<br>167<br>172/7 | 291<br>274<br>294<br>301<br>284<br>289/12 | 562<br>519<br>569<br>585<br>519<br>551/28 | 2815<br>2960<br>2760<br>2694<br>2535<br>2753/183 | 304<br>352<br>310<br>292<br>310<br>314/26 | | 80 | | 1.7(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |
| | Air | 4.45(8) | 1.95(13) | 5.45(13) | 2.1(12) | 7 | 1.3270<br>1.3211<br>1.3351<br>1.3254<br>1.3290 | -0.0054<br>-0.0052<br>-0.0056<br>-0.0048<br>-0.0046 | 201<br>167<br>194<br>184<br>191<br>187/15 | 318<br>291<br>311<br>301<br>318<br>308/12 | 619<br>575<br>569<br>603<br>585<br>590/21 | 2341<br>2810<br>2519<br>2571<br>2328<br>2514/207 | ---<br>298<br>279<br>264<br>256<br>274/16 | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |
| | Air | 9.1(8) | 2.2(13) | 1.6(14) | 6.0(12) | 7 | 1.3285<br>1.3302<br>1.3328<br>1.3261<br>1.3273 | -0.0050<br>-0.0050<br>-0.0054<br>-0.0058<br>-0.0053 | 184<br>184<br>194<br>201<br>184<br>189/7 | 318<br>308<br>335<br>335<br>318<br>323/12 | 619<br>569<br>652<br>635<br>603<br>616/36 | 2678<br>2843<br>2571<br>2694<br>2392<br>2636/194 | 276<br>332<br>253<br>267<br>252<br>276/34 | | 90 | | 4(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-7 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Viton B O-rings PRP19007 | Air | 0 | 0 | 0 | 0 | - | | | 192<br>210<br>---<br>189<br>192<br>196/11 | 287<br>315<br>---<br>280<br>297<br>295/17 | 553<br>605<br>---<br>560<br>587<br>576/25 | 2010<br>1999<br>1485<br>1835<br>1940<br>1854/226 | 280<br>261<br>216<br>259<br>264<br>256/28 | | | | | |
| | | | (control specimens) | | | | | | | | | | | | | | | |
| | Air | 1(9) (estimated) | (air irradiation) | | | 13 | | | 280<br>280<br>266<br>273<br>283<br>276/7 | 524<br>559<br>524<br>552<br>594<br>551/30 | 1294<br>1311<br>1308<br>1338<br>1339<br>1318/19 | 1825<br>1888<br>1538<br>1860<br>1565<br>1735/150 | 137<br>140<br>115<br>126<br>122<br>128/11 | | 105 | | | |
| | Air | 5(9) (estimated) | (air irradiation) | | | 13 | | | 1224<br>1182<br>1189<br>1189<br>1196/20 | ---<br>---<br>---<br>---<br> | ----<br>----<br>----<br>----<br> | 2028<br>1944<br>1825<br>2080<br>1969/124 | 44<br>45<br>44<br>47<br>45/1 | | 125 | | | |
| | Air | 3.1(8) | 6.98(12) | 3.92(13) | 1.56(12) | 8 | | | 210<br>210<br>213<br>206<br>217<br>211/5 | 350<br>367<br>374<br>350<br>385<br>365/15 | 798<br>798<br>794<br>770<br>840<br>800/30 | 2010<br>2058<br>2030<br>2030<br>2187<br>2053/76 | 211<br>215<br>204<br>214<br>215<br>212/5 | | 85 | | 2.5(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |
| | Air | 5.08(8) | 8.31(12) | 6.98(13) | 2.77(12) | 8 | | | 224<br>227<br>227<br>227<br>220<br>226/3 | 395<br>402<br>385<br>420<br>402<br>401/15 | 899<br>927<br>927<br>927<br>927<br>921/12 | 1672<br>2162<br>2140<br>2145<br>1365<br>1997/211 | 168<br>195<br>198<br>198<br>177<br>187/13 | | 87 | | 2.5(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

Table A-7 (continued)

| Material Trade Name | Test Condition | Radiation Exposure: Gamma [ergs/gm(C)] | Neutron (n/cm²): Thermal | E > 2.9 Mev | E > 8.1 Mev | Time Until Test (days) | Sample Weights: Original (gm) | Change (gm) | Tensile Strength[a] (psi): at 25% Elongation | at 50% Elongation | at 100% Elongation | Ultimate | Ultimate Elongation (%) | Specimen Color | Temperature: Avg. (°F) | Fig. No.[b] | Pressure: Avg. (torr) | Fig. No.[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRP737-70 FLX O-rings | Air | 0 | 0 | 0 | 0 | - | | | 186<br>230<br>196<br>230<br>196<br>186<br>204/17 | 339<br>339<br>339<br>359<br>346<br>346<br>345/8 | 848<br>848<br>830<br>864<br>864<br>820<br>846/17 | 2161<br>2000<br>1932<br>1865<br>1932<br>1870<br>1960/117 | 231<br>212<br>207<br>201<br>203<br>202<br>209/12 | | | | | |
| | | | (control specimens) | | | | | | | | | | | | | | | |
| | Air | 1(9) (estimated) | (air irradiation) | | | 13 | | | 278<br>271<br>247<br>258<br>241<br>259/16 | 522<br>475<br>481<br>505<br>492<br>459/20 | 1288<br>1207<br>1271<br>1451<br>1261<br>1296/105 | 2230<br>2156<br>2302<br>2197<br>2176<br>2214/58 | 181<br>181<br>187<br>180<br>180<br>182/3 | | 105 | | | |
| | Air | 5(9) (estimated) | (air irradiation) | | | 13 | | | 475<br>492<br>458<br>424<br>373<br>444/51 | 1125<br>1146<br>1078<br>1017<br>997<br>1073/64 | ----<br>2658<br>----<br>----<br>----<br>---- | 2593<br>2780<br>2427<br>2447<br>2508<br>2551/152 | 98<br>102<br>93<br>93<br>95<br>96/4 | | 125 | | | |
| | Air | 3.1(8) | 6.98(12) | 3.92(13) | 1.56(12) | 8 | | | 196<br>186<br>186<br>186<br>196<br>190/4 | 373<br>380<br>380<br>356<br>389<br>376/14 | 909<br>915<br>881<br>915<br>949<br>914/29 | 1750<br>1949<br>1220<br>1994<br>1762<br>1735/333 | 176<br>196<br>133<br>204<br>177<br>177/31 | | 85 | | 2.5(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |
| | Air | 5.08(8) | 8.31(12) | 6.98(13) | 2.77(12) | 8 | | | 220<br>230<br>186<br>196<br>230<br>212/19 | 424<br>389<br>389<br>407<br>389<br>400/15 | 1032<br>983<br>949<br>1016<br>966<br>989/36 | 1840<br>1981<br>1965<br>1769<br>1830<br>1877/91 | ---<br>189<br>188<br>161<br>179<br>179/14 | | 87 | | 2.5(-7) | |
| | | | (vacuum irradiation) | | | | | | | | | | | | | | | |

[a]Values given as: average value/standard deviation on an individual basis.

[b]Figures showing plotted data to be presented and listed in the annual report.

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