ATTACHMENT I

OYSTER CREEK PURGE AND VENT CONTAINMENT ISOLATION VALVES RESILIENT SEAL MAINTENANCE/SURVEILLANCE PROGRAM AND TECHNICAL BASIS

TABLE OF CONTENTS

1.0 INTRODUCTION

The NRC identified the need to replace, at least every 5 years, the resilient seals (seats) on Oyster Creek's purge and vent containment isolation valves. GPU Nuclear has conducted a technical review of these butterfly valves' resilient seals (seats) to determine their expected service life. Table 1 (Section 4.0 of this Attachment) summarizes the subject valves and seat type. This review determined that, for the specific anticipated seat/valve environment, EPDM seats have an expected service life of 40 years and the Nitrile and Viton seats have an expected life of 20 years. Based upon these findings of expected long life and the fact that when valve seats are replaced the seal of the new seat may not be as leaktight as the previous seat due to difficulties in valve seat alignment and the need for a "break-in" period, GPU Nuclear has concluded that replacement of the subject valve seats should be based on their physical condition as monitored by a maintenance/surveillance program rather than a fixed, 5 year, seat replacement schedule. This proposed program would be in addition to the existing seat leakage testing performed during each refueling outage. GPU Nuclear intends to implement the maintenance/surveillance program during the upcoming 15R Refueling Outage.

Section 2.0 of this Attachment provides the details of the maintenance/surveillance program and Section 3.0 provides a summary of the technical basis supporting the expected service life for the purge and vent valve seats.

2.0 MAINTENANCE/SURVEILLANCE PROGRAM

The maintenance/surveillance program for Oyster Creek's purge and vent containment isolation valves seats is intended to commence in the upcoming 15R Refueling Outage scheduled for September, 1994. During the 15R and 16R Outages one of the valves with an EPDM seat, one with a Viton seat and one with a Nitrile seat will be inspected. These two outage inspections will establish a trend for the as-found condition of the seats for each type of material. The maintenance/surveillance program will consist of inspecting the resilient seats with a portable hardness tester and making a visual inspection for hairline cracks. A sign of cracks or an increase shift in the durometer hardness average readings (disregarding readings near the disc shaft where the seat is re-enforced) in the range of 70 to 78 Shore A Durometer reading for the EPDM seat, or an increase shift in the range of 65 to 75 Shore A Durometer reading for the Viton seat, or an increase shift in the range of 70 to 80 Shore A Durometer reading for the Nitrile seat would indicate that material degradation is occurring and that the seats should be removed (at the existing or next outage of sufficient duration) for laboratory analysis. The frequency of these inspections after the 16R Outage will be based upon trending of the as-found condition of the seats.

3.0 SUPPORTING TECHNICAL BASIS

All of the subject valves, listed in Table 1, are located in the Reactor Building, outside the Drywell. They are required to mitigate all containment events. Valves V-27-1 through 4, V-23-13 through 16 and V-28-17 and 18 are normally closed. They are only operated in the 24 hour period preceding a shutdown, up to 24 hours following a startup, when a leak test is performed and for drywell entries. They may also be operated in accordance with procedure following accident conditions. All valves are also full stroke exercised for operability every 3 months.

An analysis of the environmental degradation on the resilient seat for each valve was performed to ensure that the valves will perform their intended functions during their normal service, accident and 48 day post-accident life. For conservatism, the valves were assumed to be exposed to the drywell level gamma radiation and not the Reactor Building gamma to which they are actually exposed. Those valves are closed during accident conditions. Therefore, there is no flow path for Beta radiation. Only the seat edge facing the drywell atmosphere (of the closest valve) will be exposed to Beta radiation. Deterioration of this seat edge is of no concern as it will not extend into the seating surface. Therefore, the effects of LOCA Beta radiation need not be addressed in this analysis.

Opening of the valves to vent the drywell and/or torus only occur during "beyond design basis" conditions. UE&C Calculation #7450.116 (GPUN DRF 069398) documents a $1x10^5$ Rad/hr Beta release. GPU Nuclear calculation (C1302-243-5450-062) has determined that valves V-23-13/14 and V-23-15/16 will be opened a maximum of six times per 24 hours for a loss-of-air event to decrease the drywell pressure at 55 psig. These valves can be open for 50 hours before they are exposed to the Viton hardness threshold of $5x10^6$ Rads or 6000 hours before reaching the 25% hardness degradation as noted in paragraph 3.2, Radiation Qualification.

EPRI NP-3877, Reference 1, describes the methodology used for qualifying active mechanical equipment for safety-related service in nuclear power plants. Mechanical equipment has been traditionally designed for replacement of parts that are subject to aging. The parts are usually those that are most subject to wear and to environmental degradation. The following sections provide the technical basis which demonstrates a long predicted seal service life (20 year minimum) and details GPU Nuclear's proposed maintenance/surveillance program for each resilient seal material type.

3.1 <u>CENTERLINE BUTTERFLY VALVES V-27-1/2/3/4</u>

The Centerline 18" butterfly valves EPDM seats (SSN 721-312-3300-1) properly stored, with a durometer hardness in the range of 70 to 78 Shore A Durometer Reading (see Appendix A), and visually inspected for ozone cracking are considered new parts.

Drywell ventilation exhaust valves V-27-1 and V-27-2 and drywell ventilation intake valves V-27-3 and V-27-4 are normally closed containment isolation valves which are only operated in the 24-hour period preceding a shutdown, up to 24 hours following a startup, when a leak test is performed, and for drywell entries and during quarterly operability tests. They may also be operated in accordance with procedures following accident conditions.

GPU Nuclear has reviewed the drywell ventilation intake and exhaust valves installed location, and service and predicted environment exposure during normal and design based accident conditions. Table 2 summarizes the conditions evaluated.

RADIATION QUALIFICATION

EPDM has a threshold radiation of $1x10^6$ rads gamma. Numerous tests have shown that mild to moderate damage will occur up to a radiation of $2x10^8$ rads gamma. However, Table 2 documents that the seats will only be exposed to a normal service of $1.23x10^4$ rads where no degradation would have occurred. EPRI NP-4172SP (Reference 2, pgs. B-34 thru B-44) documents that EPDM hardness is not affected below $1x10^7$ rads and 25% degradation at $6x10^7$ to $2.2x10^8$ rads. Therefore, the $3x10^7$ rads OCNGS LOCA would not affect the operability of the

valve. Table 3 summarizes data from the OCNGS EQ Cable files.

Radiation Normal & Accident Aging

Table 2 documents that these are ventilation inlet and exhaust valves which are normally closed. Table 3 documents that EPDM insulation was subjected to IEEE 323-74 test sequence which included a radiation exposure of $2x10^8$ rads TID gamma. During a Drywell LOCA, these valves would only be exposed to the Drywell LOCA gamma effects in the Reactor Building and the Reactor Building temperature. Table 2 documents a Reactor Building of $2.7x10^7$ rads TID (worst case) during the LOCA.

$$Margin\ of\ Safety = \frac{Test-Required}{Required} \times 100\% =$$

$$\frac{2x10^8 - 2.7x10^7}{2.7x10^7} \times 100\% = 640\%$$

However, GPU Nuclear assumed that the valve seats will be exposed to the full drywell LOCA $3x10^7$ rads gamma and $9.5x10^8$ rads beta. The closed valve seat working surface would be protected from beta radiation except for the seat edge on the drywell side of V-27-1 and V-27-4 (redundant series valves V-27-2 and V-27-3 are protected). The beta will be attenuated so long as the valves stay closed protecting the seat working surface.

$$Margin\ of\ Safety = \frac{Test - Required}{Required} \times 100\% =$$

$$\frac{2X10^8 - 5X10^7}{5X10^7} X\ 100\% = 300\%$$

THERMAL AGING

ICEA publication No. S-68-516, Part 3 documents that EPR has 90°C rating. Table 3 documents the material, activation energy and thermal aging that was conducted on cable. For conservatism, an aging test of 7 days (168 hours) at 121°C with an activation energy of 1.59eV was used to demonstrate the thermal aging normal, accident and post-accident life for the EPDM seats.

Normal Service Life

Valves V-27-1 and V-27-2 are exposed to a normal ambient temperature of 85°F. Use of the following Arrhenius equation to predict the ventilation valve seal service life:

$$t_1 = t_2 \exp \frac{\Theta}{K}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

where:

t_1 = service life at 85°F unknown
t_2 = 7 days test duration
T_1 = 85°F service temp (302°K)
T_2 = 121°C test temp (394°K) 249.8°F
Θ = 1.59eV
K = Boltzmann's Constant = 8.617E -5eV/°K

$$t_1 = 7\ days\ \exp \frac{1.59}{K} \left[\frac{1}{302°K} - \frac{1}{394°K}\right]$$

t_1 = 10,048,117 days = 27529 years at 85°F
or 150°F for 40 years

The ventilation intake and exhaust valves are located in the Reactor Building and will therefore only be exposed to the 85°F reactor building service temperature during a LOCA and post-LOCA. They also will be exposed to HELB. The 124.6°F for 40 years service life (Table 2) can be shown to envelope the 40 years service at 85°F and the LOCA or HELB plus the 48-day post-accident.

V-27-1/2/3/4 CONCLUSION

There is a significant margin to predict a 40 year service life, LOCA and 48-day post-LOCA for the worst harsh zone the ventilation valves are located in. However, GPU Nuclear is proposing that a maintenance/surveillance program be established to monitor one of the ventilation valve resilient seats with a portable hardness tester and make a visual inspection for hairline cracks. A test of the resilient seat was conducted on spares located in the OCNGS warehouse (see Appendix B). A sign of cracks or an increase shift in durometer hardness in the range of 70 to 78 Shore A Durometer reading would indicate that material degradation is occurring and that the seats should be removed (at the existing or next outage of sufficient duration) for laboratory analysis. The frequency of these inspections will be based upon trending of the as-found condition of the seats.

3.2 FISHER CONTROLS BUTTERFLY VALVES V-23-13/14/15/16

The Fisher 8" butterfly valves Viton seats (SSN 000-456-5830-1) properly stored, with a durometer hardness in the range of 65 to 75 Shore A Durometer reading (Appendix A), and visually inspected for ozone cracking are considered new parts.

Nitrogen purge valves V-23-13/14/15/16 will be subjected to a normal service life temperature of 81°F. These are normally closed containment isolation valves which are operated in the 24-hours period preceding a shutdown, up to 24 hours following a startup, when a leak test is performed, for drywell entries and during quarterly operability testing. They may also be operated in accordance with procedures following accident conditions.

GPU Nuclear has reviewed the nitrogen purge valves installed location, service and predicted environment exposure during normal and design based accident conditions. Table 4 summarizes the conditions evaluated.

RADIATION QUALIFICATION

Viton has a hardness threshold of $5x10^6$ rads and 25% hardness degradation at $6x10^8$ rads (Reference 2, pgs. B-151 and 152). Table 4 documents that the valves will be exposed to a maximum of $1.93x10^4$ rads gamma during their 40 years service life. This level of radiation is of no concern. During the LOCA accident and 48-day post-accident operation, these valves will be exposed to $3x10^7$ rads gamma. EPRI NP-4172 SP, Reference 2, documents that very little change in seat hardness will occur and the valves will perform their intended function during the LOCA and 48-day post-LOCA period.

THERMAL AGING

Dupont Catalog E-46315 documents that Viton compounds will retain usefully elastic indefinitely when exposed to laboratory air oven aging up to 400 °F. Continuous service limits are generally considered to be:

>3000 hours at 450°F
1000 hours at 500°F
240 hours at 550°F
48 hours at 600°F

The Arrhenius equation was used to predict the valve seal activation energy as follows:

$$Ea = \frac{\left(\ln \frac{t_1}{t_2}\right) K}{\frac{1}{T_1} - \frac{1}{T_2}}$$

where:

Ea = Activation energy eV/°K
t_1 = 3000 hour service life at 450°F
t_2 = 1000 hour service life at 500°F
T_1 = 450°F (505°K) for 3000 hours
T_2 = 500°F (533°K) for 1000 hours
K = Boltzmann's Constant = 8.617E - 5 eV/°K

$$Ea = \frac{\left(\ln \frac{3000}{1000}\right) K}{\frac{1}{505^\circ K} - \frac{1}{533^\circ K}} = 0.91 eV/^\circ K$$

Normal Service Life

The valve seat normal service life was determined using the following Arrhenius equation:

$$t_1 = t_2 \exp \frac{Ea}{K}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

where:

Ea = 0.91 eV/°K
t_1 = service life at 81°F (300°K)
t_2 = 1000 hours at 500°F (533°K)
T_1 = 81°F (300°K) service temperature
T_2 = 500°F (533°K) for 1000 hours
K = Boltzmann's Constant = 8.617E - 5eV/°K

$$t_1 = 1000\ hr \exp \frac{0.91}{K}\left(\frac{1}{300°K} - \frac{1}{533°K}\right)$$

t_1 = >500000 years at 81°F
or 281°F for 40 years

The nitrogen purge valves are located in the Reactor Building and will therefore only be exposed to the 81°F reactor building service temperature during LOCA and 48-day post-LOCA. They also will be exposed to HELB. The 281°F for 40 years service life can be shown to envelope the 40 year service at 81°F and the LOCA or HELB plus the 48 day post-accident.

V-23-13/14/15/16 CONCLUSION

There is a significant margin to predict a 40 year service life plus 48 day post-accident for the worst harsh zone the purge valves are located in. Because of the limited radiation data available on Viton, GPU Nuclear takes the conservative position that a 20 year service life is a reasonable expectation for this type seal. GPU Nuclear is proposing that a maintenance/surveillance program be established to monitor one of the purge valve resilient seats with a portable hardness tester and make a visual inspection for hair line cracks. A test of the Viton seat was conducted on spares located in the OCNGS warehouse (see Appendix B). A sign of cracks or an increase shift in durometer hardness in the range of 65 to 75 Shore A Durometer reading would indicate that material degradation is occurring and that the seats should be removed (at the existing or next outage of sufficient duration) for laboratory analysis. The frequency of these inspections will be based upon trending of the as-found condition of the seats.

3.3 FISHER CONTROLS BUTTERFLY VALVES V-28-17/18

The Fisher 12" butterfly valve Nitrile seats (SSN 408-556-1430-1) properly stored, with a durometer hardness in the range of 70 to 80 Shore A Durometer reading (Appendix A), and visually inspected for ozone cracking are considered new parts.

Torus vent exhaust valves V-28-17/18 will be subjected to a normal service temperature of 85°F. These are normally closed containment isolation valves which are only operated in the 24 hour-period preceding a shutdown, up to 24 hours following a startup, when a leak test is performed, for drywell and torus entries and during quarterly operability testing. They may also be operated in accordance with procedures following accident conditions.

GPU Nuclear has reviewed the torus vent exhaust valves installed location, service and predicted environment exposure during normal and design based accident conditions. Table 5 summarizes the conditions evaluated.

RADIATION QUALIFICATION

Nitrile has a compression threshold of 1×10^6 rads and hardness threshold of 1×10^7 rads with respective 25% degradation at 6×10^6 and 2×10^8 rads (Reference 2, pages B-155 to B-158). Table 5 documents that the valves will be exposed to a maximum of 1.23×10^4 rads gamma during their 40 years service life. This level of radiation is of no concern. During the LOCA accident and 48-day post-accident operation, these valves will be exposed to a maximum 3×10^7 rads gamma. Based upon EPRI NP-4172 SP, Reference 2, very little change in hardness would have occurred but compression set would be present. Some leakage could occur if the valves are operated post-accident.

THERMAL AGING

Fisher Controls thermally ages their nitrile seat material to 205°F for 70 days. The Arrhenius equation can be used to determine the maximum normal service life as follows:

$$t_1 = t_2 \exp \frac{Ea}{K}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

where:

Ea	=	Activation Energy Constant = 0.79 eV/°K
t_1	=	Service life
t_2	=	70 days test time at 205°F
T_1	=	85°F (302°K) service temperature
T_2	=	205°F (369°K) test temperature
K	=	Boltzmann's Constant = 8.617E-5 eV/°K

$$t_1 = 70\ days\ \exp \frac{0.79}{K}\left(\frac{1}{302^\circ K} - \frac{1}{369^\circ K}\right)$$

t_1 = 16,704 Days = 45.76 years at 85°F.

The torus vent exhaust valves are located in the Reactor Building and will therefore only be exposed to the 85°F reactor building service temperature during LOCA and 48 day post-LOCA. They also will be exposed to HELB. The 45.76 years service at 85°F can be shown to envelope the 40 year service at 85°F and the LOCA or HELB plus the 48-day post-accident.

V-28-17/18 CONCLUSION

GPU Nuclear's analysis documents that the torus to vent exhaust valve seals will perform their intended function through 40 years service, LOCA and 48 day post-LOCA operation. Because of the limited radiation data available on Nitrile, GPU Nuclear takes the conservative position that a 20 year service life is a reasonable expectation for this type seal. GPU Nuclear is proposing that a maintenance surveillance program be established to monitor one of the valves resilient seats with portable hardness tests and make a visual inspection for hair line cracks. A test of the Nitrile seat was conducted on spares located in the OCNGS warehouse (see Appendix B). A sign of cracks or an increase shift in durometer hardness from range 70 to 80 Shore A Durometer reading would indicate that material degradation is occurring and that the seats should be removed (at the existing or next outage of sufficient duration) for laboratory analysis. The frequency of these inspections will be based upon trending of the as-found condition of the seats.

4.0 TABLES

TABLE 1

TAG #	LOCATION	MANUFACTURER	SEAT TYPE
V-27-1	R4-RA(18'6")	Centerline	EPDM
V-27-2	R4-RA(18'6")	Centerline	EPDM
V-27-3	R4-RF(84')	Centerline	EPDM
V-27-4	R4-RF(84')	Centerline	EPDM
V-23-13	R4-RF(84')	Fisher Controls	VITON
V-23-14	R4-RF(84')	Fisher Controls	VITON
V-23-15	R2-RE(44'9")	Fisher Controls	VITON
V-23-16	R1-RE(44'9")	Fisher Controls	VITON
V-28-17	R4-RA(11'6")	Fisher Controls	NITRILE
V-28-18	R4-RA(11'6")	Fisher Controls	NITRILE

<u>TABLE 2</u>

TAG #	V-27-1	V-27-2	V-27-3	V-27-4
Location	R4-RA	R4-RA	R4-RF	R4-RF
Elevation	18'6"	18'6"	84'	84'
Function	Drywell Ventilation Exhaust	Drywell Ventilation Exhaust	Drywell Ventilation Intake	Drywell Ventilation Intake
Valve position	Closed	Closed	Closed	Closed
RB Service temp	85°F	85°F	81°F	81°F
RB HELB temp	124.6°F	124.6°F	124.6°F	124.6°F
DW LOCA temp	N/A	N/A	N/A	N/A
RB Normal Gamma	$1.23x10^4$	$1.23x10^4$	$1.1x10^4$	$1.1x10^4$
DW Normal Beta	N/A	N/A	N/A	N/A
DW LOCA Gamma	$3x10^7$	$3x10^7$	$3x10^7$	$3x10^7$
DW LOCA Beta	*	*	*	*
RB TID	$2.7x10^7$	$2.7x10^7$	$2.7x10^7$	$2.7x10^7$
RB Beta	N/A	N/A	N/A	N/A
DW TID	$5x10^7$	$5x10^7$	$5x10^7$	$5x10^7$
DW Normal Gamma	$2x10^7$	$2x10^7$	$2x10^7$	$2x10^7$
Post-Accident Operation	48 days	48 days	48 days	48 days

* During accident conditions, the valves will be closed. Valves V-27-1 and V-27-2 are in series as are V-27-3 and V-27-4. Valves V-27-1 and V-27-4 are closer to the drywell and will be exposed to Beta radiation at the seat edge facing the drywell atmosphere. Deterioration of this seat edge is of no concern as the deterioration will not extend into the sealing surface.

Note: TID, Gamma and Beta units are rads for this table.

TABLE 3

EQ FILE	CABLE INSULATION	TEST THERMAL AGING	ACTIVATION ENERGY	TEST TEMP	TEST RADIATION
EQ-OC-311	EPR	168HR@121°C	1.62eV	346°F	$2x10^8$
EQ-OC-341	EPR	1440HR@155°C	1.138eV	340°F	$2x10^8$
EQ-OC-348	EPR	168HR@150°C	1.21eV	385°F	$2x10^8$
EQ-OC-379	EPR	168HR@150°C	1.69eV	346°F	$2x10^8$
EQ-OC-383	EPDM	168HR@121°C	1.59eV	375°F	$2x10^8$
EQ-OC-385	EPR	504HR@150°C	1.44eV	345°F	$2x10^8$

Note: EPR and EPDM belong to the same family and therefore the data can be used to demonstrate generic values.

TABLE 4

TAG #	V-23-13	V-23-14	V-23-15	V-23-16
Location	R4-RF	R4-RF	R2-RE	R2-RE
Elevation	84'	84'	44'9"	44'9"
Function	Purge	Purge	Purge	Purge
Valve position	Closed	Closed	Closed	Closed
RB Service temp	81°F	81°F	81°F	81°F
RB HELB temp	233°F	233°F	133°F	133°F
DW LOCA temp	N/A	N/A	N/A	N/A
RB Normal Gamma	$1.12X10^4$	$1.1x10^4$	$1.93x10^4$	$1.93x10^4$
DW Normal Beta	N/A	N/A	N/A	N/A
DW LOCA Gamma	$3x10^7$	$3x10^7$	$3x10^7$	$3x10^7$
DW LOCA Beta	*	*	*	*
RB TID	$6x10^4$	$6x10^4$	$2x10^6$	$2x10^6$
RB Beta	N/A	N/A	N/A	N/A
DW TID	$5x10^7$	$5x10^7$	$5x10^7$	$5x10^7$
DW Normal Gamma	$2x10^7$	$2x10^7$	$2x10^7$	$2x10^7$
Post-Accident Operation	48 days	48 days	48 days	48 days

* During accident conditions the valves will be closed. Valves V-23-13 and V-23-14 are in series as are V-23-15 and V-23-16. Valves V-23-14 and V-23-16 are closer to the Drywell and will protect V-23-13 and V-23-15 from beta radiation. Valves V-23-14 and V-23-16 seat edge facing the Drywell atmosphere will be deteriorated by the beta radiation. This is of no concern as the deterioration will not extend into the sealing surface.

Note: TID, Gamma and Beta units are rads for this table.

TABLE 5

TAG #	V-28-17	V-28-18
Location	R4-RA	R4-RA
Elevation	11'6"	11'6"
Function	Torus to Vent Exhaust	Torus to Vent Exhaust
Valve position	Closed	Closed
RB Service temp	85°F	85°F
RB HELB temp	N/A	N/A
DW LOCA temp	N/A	N/A
RB Normal gamma	$1.23x10^4$	$1.23x10^4$
DW Normal beta	N/A	N/A
DW LOCA gamma	$3x10^7$	$3x10^7$
DW LOCA beta*	$9.6X10^8$	$9.6X10^8$
RB TID	$2.7X10^7$	$2.7X10^7$
RB Beta	N/A	N/A
DW TID	$5x10^7$	$5x10^7$
DW Normal Gamma	$2x10^7$	$2x10^7$
Post-Accident Operation	48 days	48 days

* During accident conditions the valves will be closed. Valves V-28-17 and V-28-18 are in series. Valves V-28-17 is closer to the Drywell and will be exposed to beta radiation at its seat edge facing the Drywell atmosphere. Deterioration of this seat edge is of no concern as the deterioration will not extend into the sealing surface.

Note: TID, Gamma and Beta units are rads for this table.

5.0 REFERENCES

1. EPRI NP-3817, "Qualification of Active Mechanical Equipment for Nuclear Plants", dated March, 1985.

2. EPRI NP-4172SP, "Radiation Data for Design and Qualification of Nuclear Plant Equipment".

6.0 APPENDICES

Appendix A - Manufacturer's Seat Hardness Data

(201) 670-8070

Valley Technical Sales, Inc.

1 Hollywood Ave. 2A, Ho-Ho-Kus, N.J. 07423
Fax (201) 670-8778

March 24, 1994

GPU Nuclear Corporation
One Upper Pond Road
Parsippany, New Jersey 07054

Attention: Paul E. Boucher

Reference: Service Life of Valve Seat
Your Letter of 3/22/94
5350-94-056

Dear Paul:

Confirming our phone conversation, Center Line's standard EPDM seat durometer is 70 to 78, shore A.

Sincerely,

VALLEY TECHNICAL SALES, INC.

D. L. Whittemore

David L. Whittemore

FISHER

Memorandum

To: Jon McElhaney
C.B. Ives, Inc.

From: Paul Gassman

cc: Peg Cline
Paul Abens

Date: April 20, 1994

Subject: Butterfly Liner Material Questions from GPU Nuclear

Jon;

In response to GPU Nuclear's questions of March 16 (attached), we can respond as follows:

1. Fisher publishes a maximum recommended service life of 4 years for elastomeric parts in nuclear service. (See attached "Elastomeric Parts Service Life" statement from Catalog 11).

This is based on elevated temperature testing that was performed on nitrile parts a number of years back. The actual life may vary, depending on temperature and radiation levels. It is entirely possible that the customer may experience a longer service life; the results of the testing were considered to be somewhat conservative, and many diaphragms, liners, etc. have lasted longer in mild temperature environments.

2. If hardness checks indicate that the hardness of the elastomeric liners is beginning to fall outside of those specified for the material, Fisher would consider it "out of spec", with the possibility of high break-out torques developing. Additionally, the T-seal could begin to crack or even break off in areas.

3. The durometer hardness specified for the viton liners is Shore "A" 70 +/- 5, measured at 70 degrees F (+/- 5 degrees).

Our current nitrile liner vendor specifies a hardness of 60 +/- 5. It should be noted that another liner supplier that has also been used for nitrile liners has specified 70 +/- 5 for their product.

I hope that this answers the bulk of your customer's questions. If they desire, they can call me at 515-754-2380 , or fax me at 515-754-2830 if they need additional info.

Best regards,

Paul Gassman
Fisher Nuclear Power Team

Appendix B - Oyster Creek Test Hardness Data for New Warehoused Seats

SPEED MEMO

Subject: DUROMETER READINGS OF SPARE VALVE SEATS - <SEE TAG #'s BELOW>

Date: 4-1-94

From: J. Miller - Procurement Engineering

Location: Oyster Creek/PEB

Memo #: 2254-94-036

To: PAUL BOUCHER
EQ ENGINEER - MCC F1

PROCUREMENT ENGINEERING HAS PERFORMED DUROMETER READINGS ON SPARE VALVE SEATS FOR THE FOLLOWING VALVE TAGS:

VLV TAG NO.
V-27-1,2
V-27-3,4
V-28-17,18
V-23-13,14,15,16

ATTACHED IS A COPY OF THE RESULTS OF THESE READINGS.

PLEASE NOTE THAT VALVE TAGS V-27-1+2 ARE NOT THE SAME AS V-27-3+4. AS PREVIOUSLY TRANSMITTED TO YOU.

If you have any questions please contact Procurement Engineering.

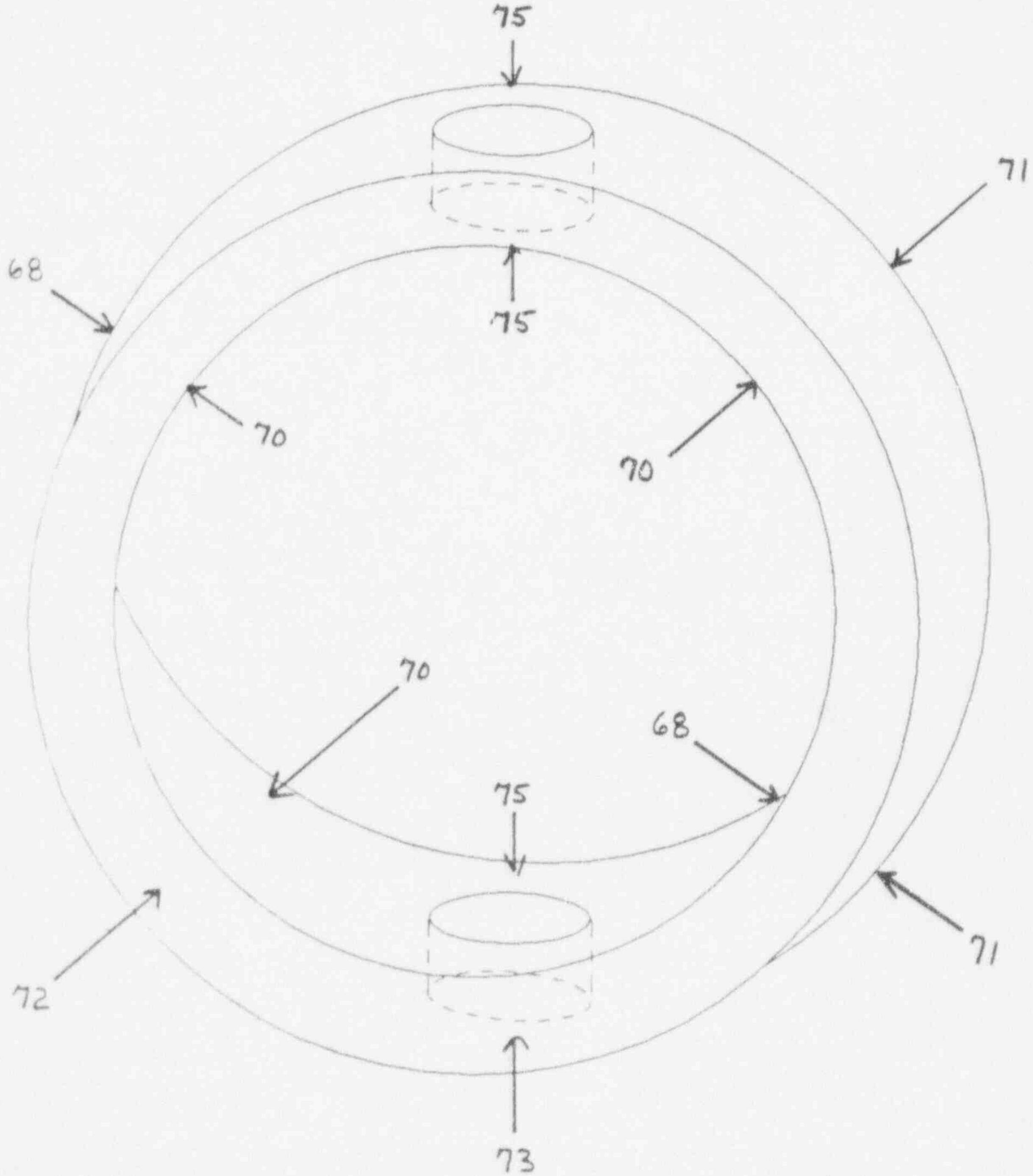
J. Miller, Ext. 2490

Approved:

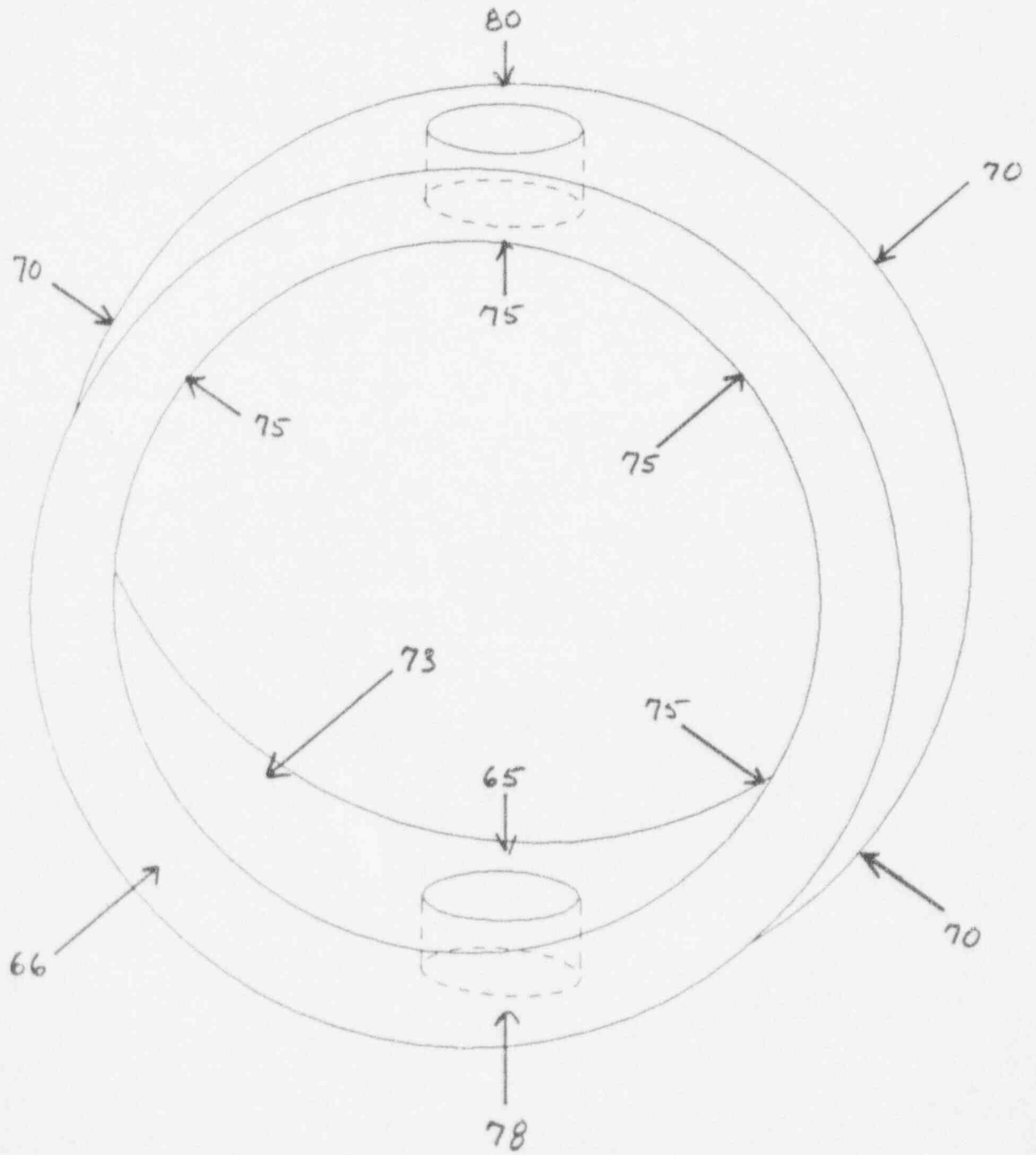
R. Larzo, Ext. 4639

cc:

DUROMETER READINGS 3-31-94 ✱MATL: EPDM
SEAT F/V-27-1,2 <SPARE>
SSN: 721-313-1200-1
P.O. : 068947
REC'D: 9-12-88



DUROMETER READINGS 3-31-94 * MATL: EPDM
SEAT F/V-27-1.2 <SPARE>
SSN: 721-313-1200-1
P.O. : 072298
REC'D: 12-28-88



DUROMETER READINGS 3-31-94 X MATL: EPDM
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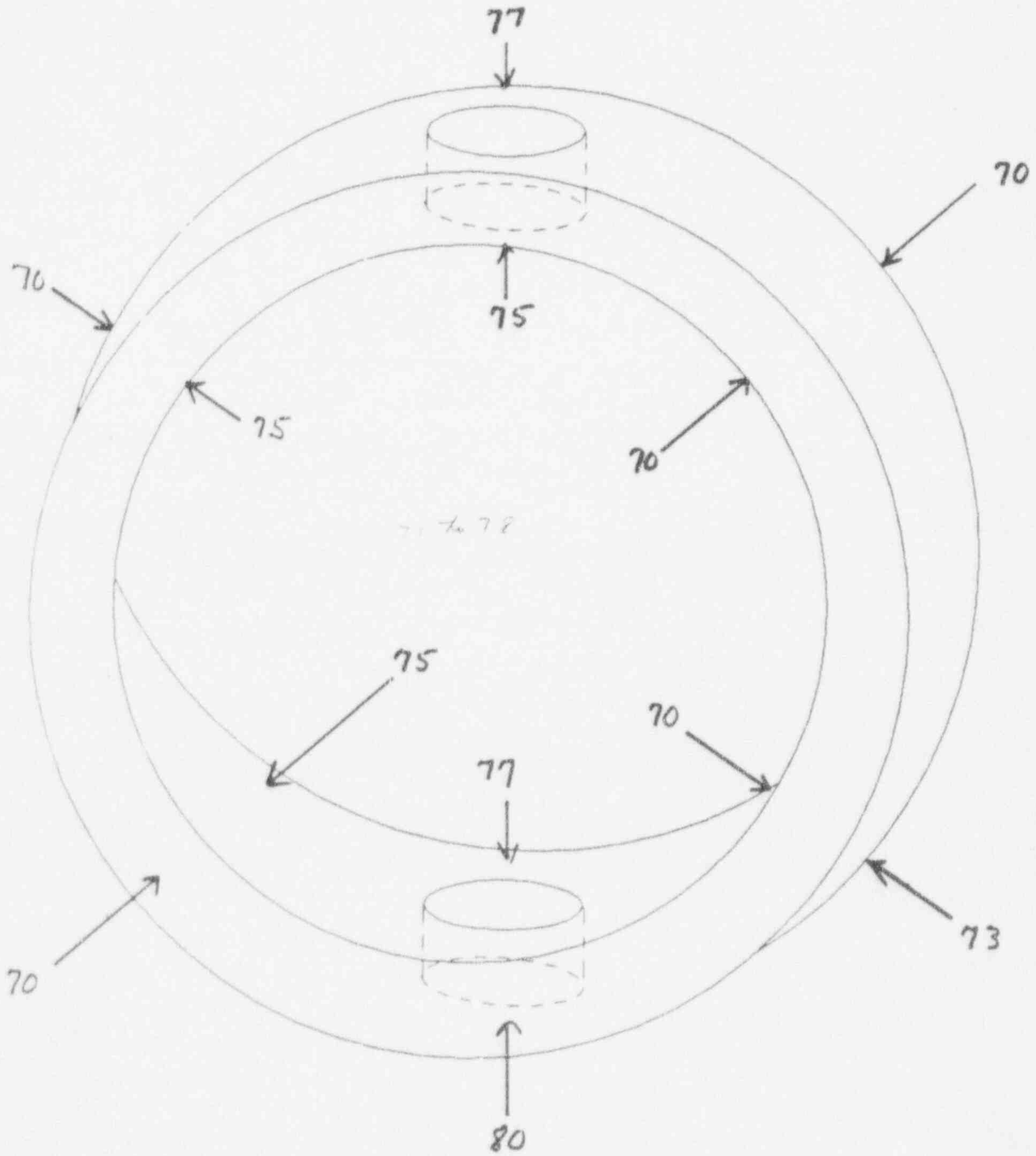

DUROMETER READINGS 3-31-94 * MATL: EPDM
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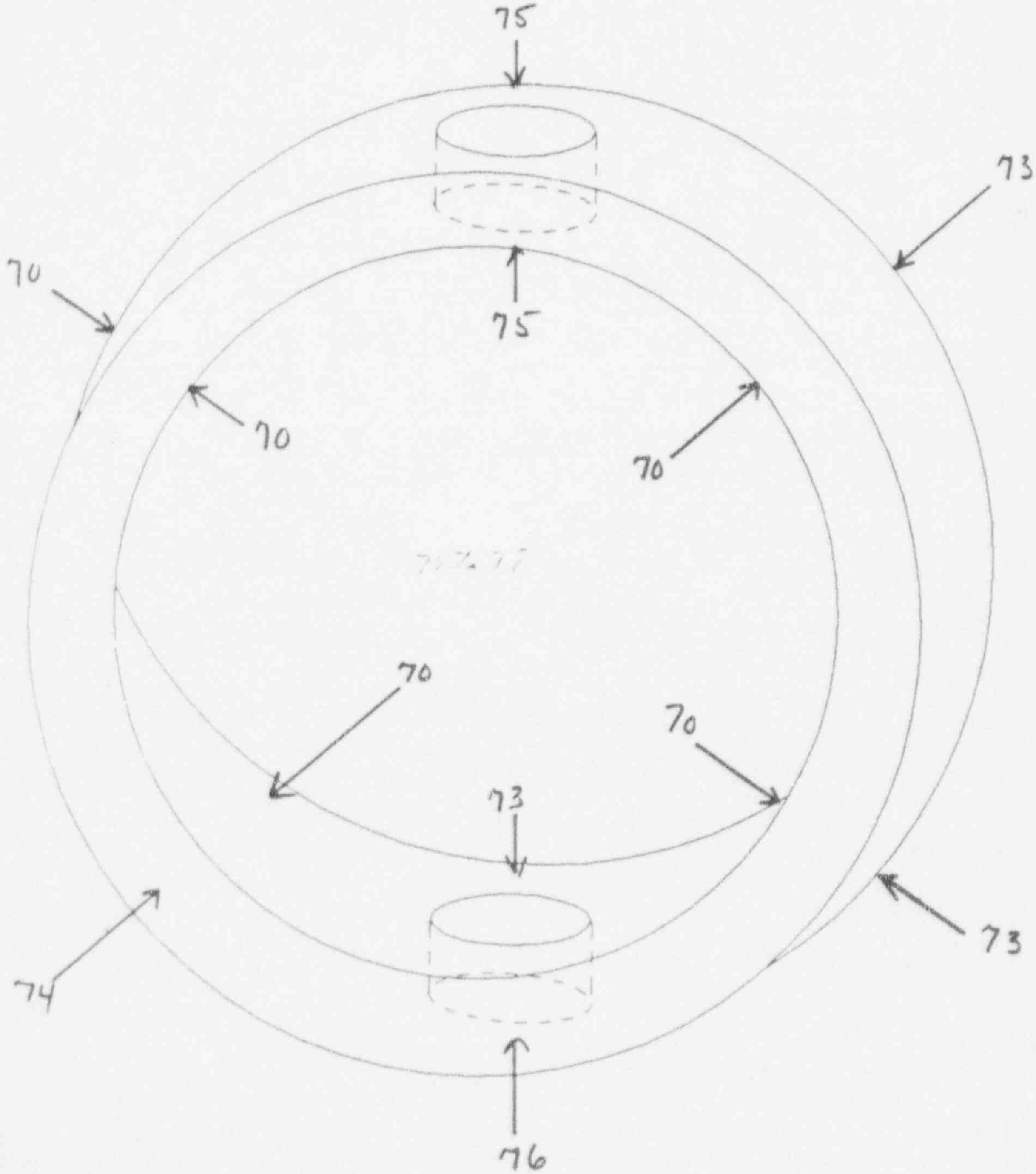

DUROMETER READINGS 3·31·94 * MATL: EPDM
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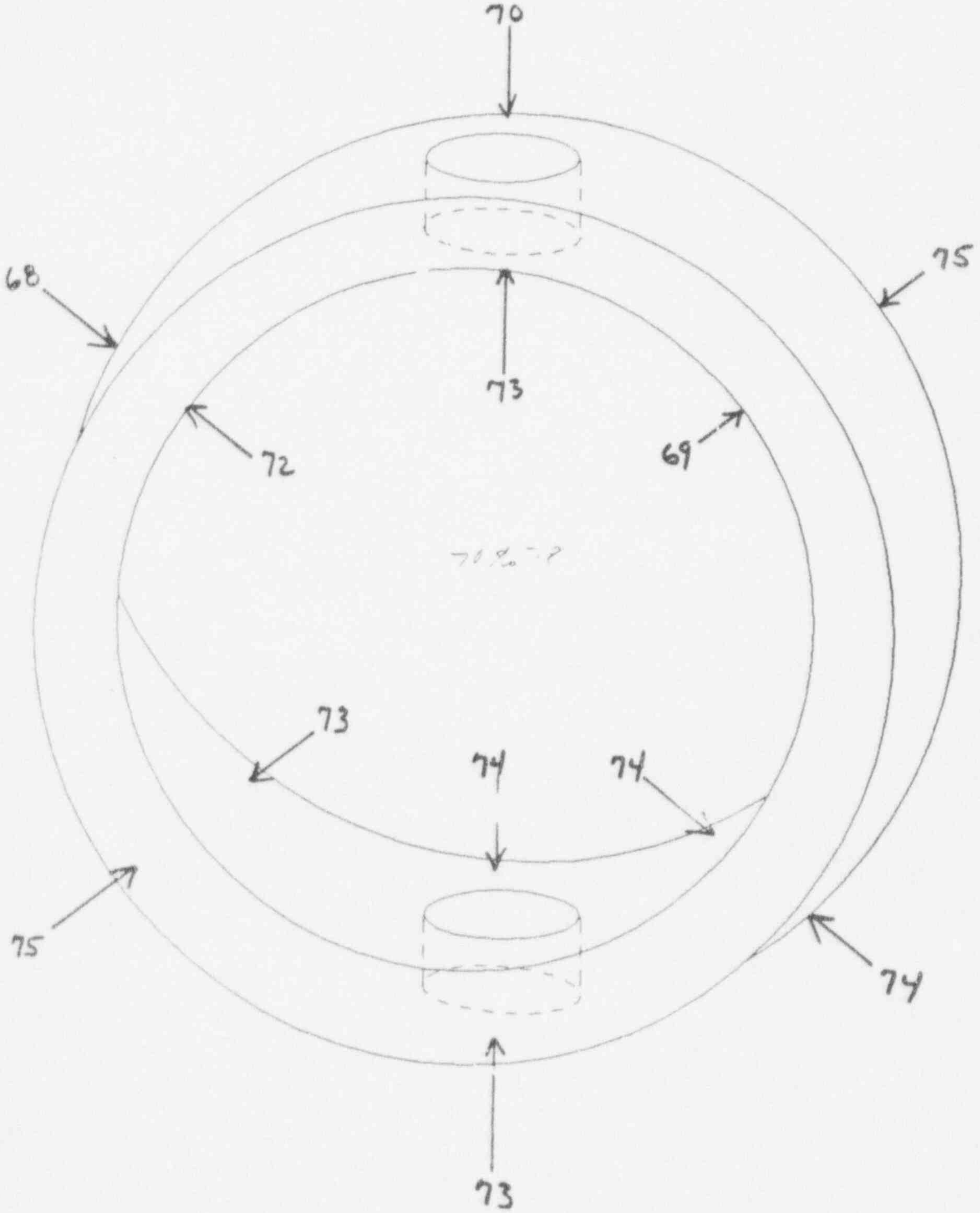
P.O.: 055416
REC'D: 8·20·87



DUROMETER READINGS 3·31·94 * MATL: EPDM
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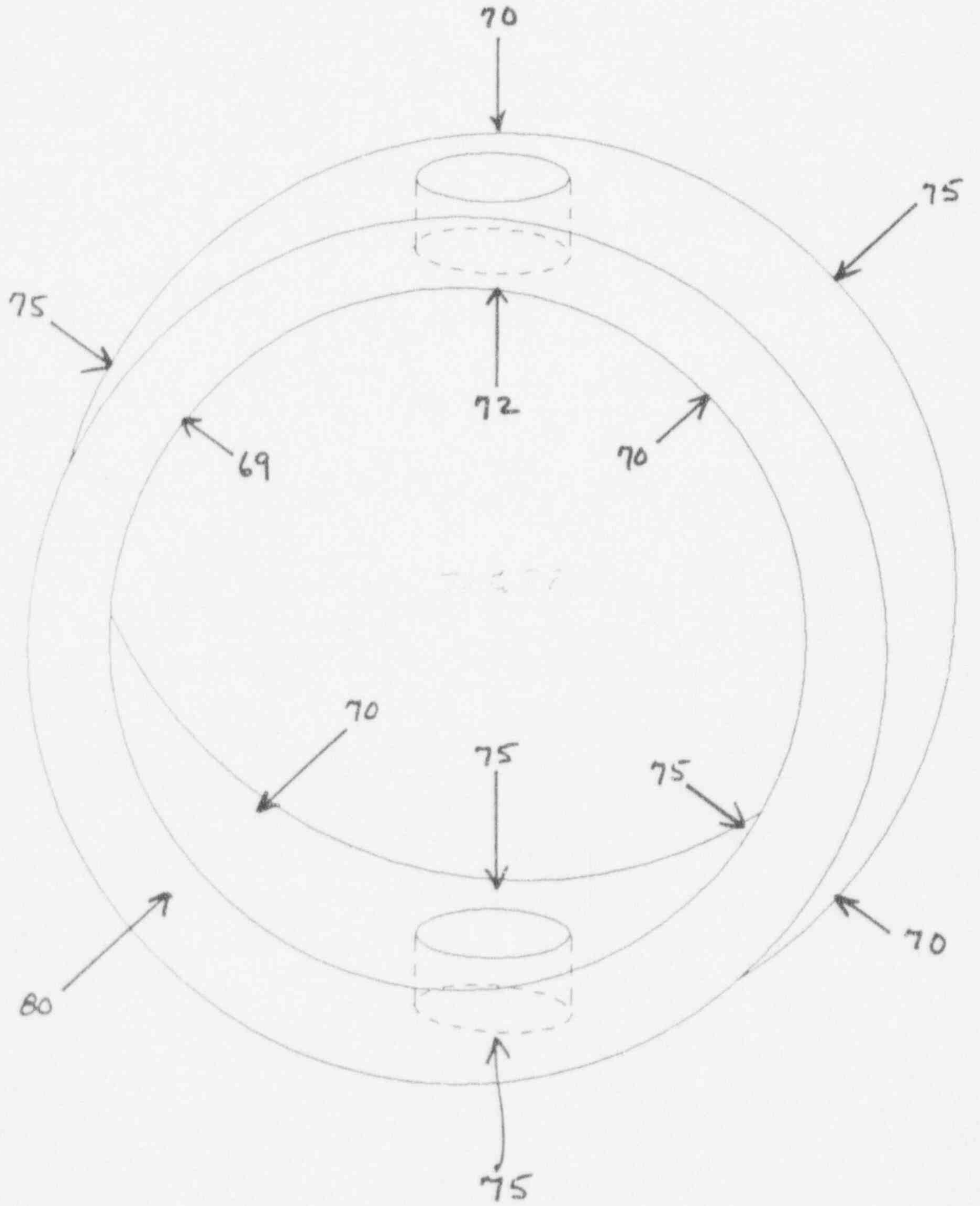

DUROMETER READINGS 3·31·94 * MATL: VITON
SEAT F/ V-23-13,14,15,16 <SPARE>
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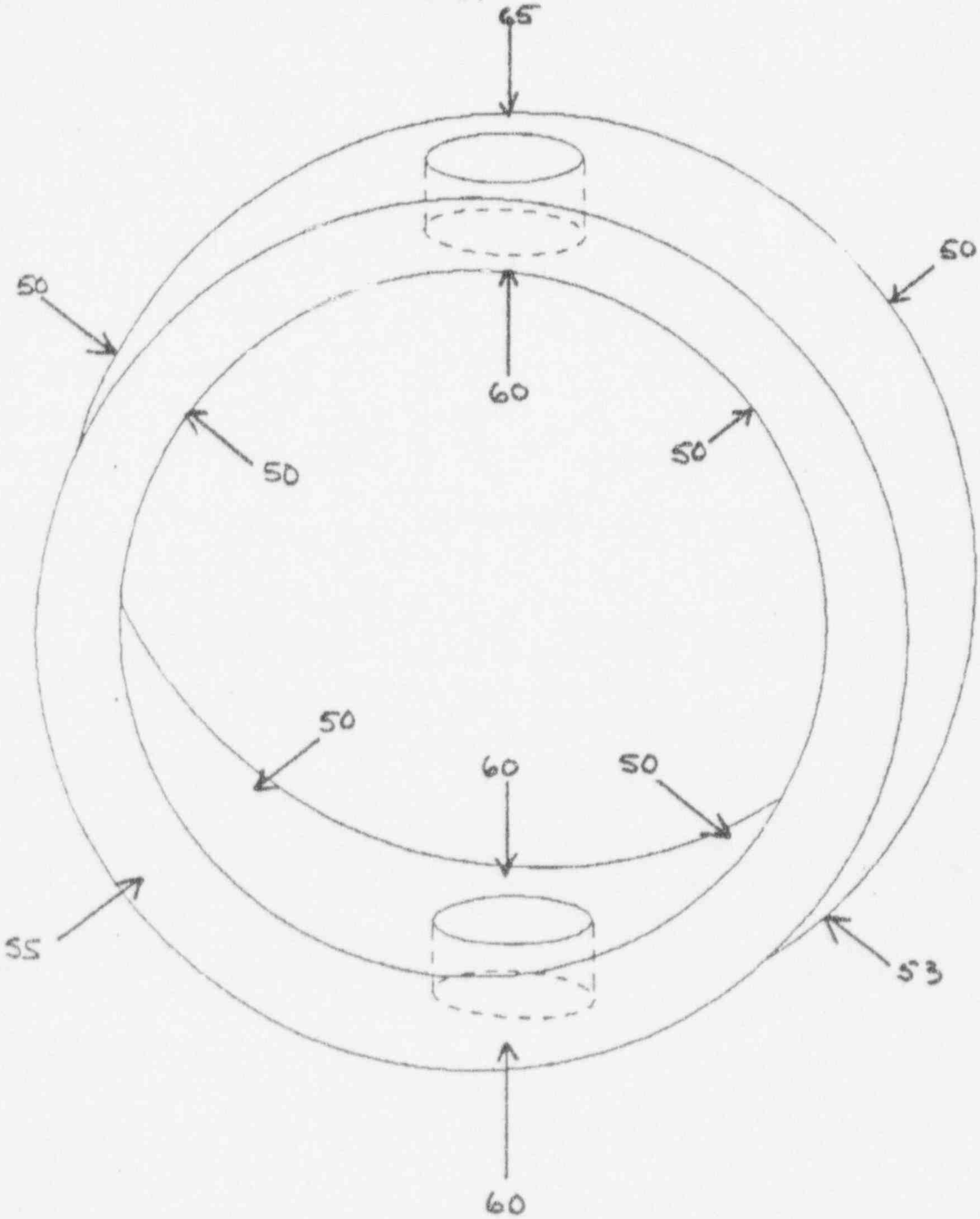
NOTE: DEDICATED # 92-69



DUROMETER READINGS 3·31·94 * MATL: NITRILE
SEAT F/ V-28-17,18 <SPARE>
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P.O.: 0050164
REC'D: 3-11-87