February 27, 1980 Revised***
July 17, 1979 Revised**
April 26, 1979 Revised**
April 12, 1979

ESTIMATION OF QUALIFIED LIFE OF EA740 SERIES NUCLEAR SWITCH

Switch P/No. EA740-20000 Rev. C, D or E
Date of Qualification Report 2/20/78 and 2/22/79

The Namco Controls qualification test procedure for the EA740 Nuclear Switch includes thermal aging at 200° F (93° C) and 100% R.H. for 200 hours. The purpose of this report is to provide a corresponding estimated qualified life. As a result of an Engineering study, the lever shaft o ring and the cover gasket were determined to be the switch components most susceptible to thermal aging.

During our Engineering study, the plastic parts and lubricants were reviewed. The plastic parts are all Thermoset plastics and are not considered in this investigation because they have been used for 8 years in our standard switches for industrial applications without detectable deterioration. The lubricant manufacturer was unable to provide thermal aging characteristics for the synthetic lubricants used in these switches, however, our experience indicates that the application of, and proper amount of lubricant, is more critical than the thermal aging characteristics of the lubricants.

The cover gasket material is a complex compound on NBR. (Nitrile-Butadiene Rubber) and Asbestos Fibers. The NBR is approximately 20% of the compound. The finished gaskets are impregnated with a polyester plastic to seal minor pores.

The manufacturer of the material was unable to provide test data regarding the aging characteristics of the material.

It was determined that a conservative approach would be to estimate the life of the NBR alone.

Aging calculations were made using the Arrhenius equation, as demonstrated in IEEE 382, Ref. 3.

An activation energy of reaction (eV) factor of .958 was used. This factor was derived from an article published by the National Bureau of Standards in 1959 (Ref. 1).

The following chart lists the calculated qualified life for various ambients (based upon stated aging conditions).

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AMBIENT	QUALIFIED LIFE
30° C	12.9 Years
35° C	7.1 Years
40° C	4.0 Years

The lever shaft o ring is an Ethylene Propylene compound and manufactured by Parker Seals.

Parker Seals conducted a very comprehensive aging test and computer study (Ref. 2).

The results of this test were as follows:

1. At temperatures more than 100° F below maximum ratings for the material, seal life appeared to be independent of thermal aging.

2. Predicted seal life for the ambient temperatures of 55 to 75° C ranged from 5 to 15 years.

Conclusion: As a result of the thermal aging study, the lever shaft o ring will not be considered a factor in the qualified life estimation.

Based upon this study, the estimated qualified life of a switch assembly aged at 200° F (93° C) for 200 hours will be based upon the cover gasket estimation of 4 to 7 years for ambients of 35 to 40° C.

This report is based upon the best Engineering information available to us on this date.

References:

1. Journal of Research of National Bureau of Standards, Volume 63C, 1959, Measurement of Aging of Rubber Vulcanization, J. Mandel, F. L. Roth, M. N. Steel and R. D. Stiehler.

2. Stress Relaxation Long Term Aging, EA740 Nuclear, Report No. 10, 4781, January 10, 1979, Parker Seals, Culver City, California, 90230.

3. IEEE 382 ANSI-N41.6, Draft 3, Revision 6, November, 1978, Trial-Use Guide for Type Test of Class 1 Electrical Valve Operators for Nuclear Power Generating Stations.

Prepared By

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Nuclear Switch Coordinator

Approved By

Joseph Buzogany
Chief Engineer

JRB/nlm

are fulfilled by cutting to length specified on the purchase order and Barton register. Standard length is thirty (30) inches. Anything else is special.

Document number	Title
R1-S344-5	Components for Radiation Environments
9999.2278.2	Wire Radiation Resistant 18 Gage
9999.2267.2	Wire Radiation Resistant 22 Gage
0038.1175.T	Terminal
0068.0004.T	Material Specification

Sincerely yours,

Edward Zepeda

Edward Zepeda
Applications Engineer
Differential Pressure Instruments

EDZ/lhc

cc: Tennessee Instrument Company, Inc. TIC
ITT Barton register 011551-00-00
ITT Barton register 06048 Master File
ITT Barton register 06048-00-17

Enclosures

12/4/80 - FWC:PAD
cc: MEDS, E4B37 C-K

EEB '801204 034

Barton Instruments
A Unit of
International Telephone and Telegraph Corporation
900 S. Turnbull Canyon Rd.
P.O. BOX 1882
City of Industry, Ca. 91749
Tel. (213) 961-2547
Telex 67-7476

November 20, 1980

Tennessee Valley Authority
W8C126 Commercial Realty Management Building
400 Commerce Avenue
Knoxville, Tennessee 37902

8012080047 4 (2)

Attention: F.W. Chandler

Reference: TVA contract 73C38-83530-2
ITT Barton register 011551-00-00

Sequoyah, Watts Bar
pressure gauges, switches
+ level switches

Gentlemen:

The following is submitted as evidence of radiation qualification for switches supplied to TVA on the above referenced register. Model 288A indicating switches serial numbers 288-28657 through 28662 are made up of the following part numbers:

Part Number	Description
S401.0110.Z	Low switch assembly, DPDT radiation resistant wire
S666.0201.Z	External wiring assembly eight (8) feet long
S666.0203.Z	External wiring assembly eight (8) feet long

Along with the drawings of the part numbers noted above, are included the sub-assemblies which identify the individual components. In particular, the snap action switch is Barton part number 0068.0004.T. The switch is purchased from Licon Division, Illinois Tool Works, Incorporated, 6615 West Irving Park Road, Chicago, Illinois. The Licon switch was tested and the results are published in Barton Document R1-S344-5, which is enclosed. Note that the length of the external wire assemblies, S666.0201.Z and S666.0203.Z, is twenty (20) feet long. This is done to avoid unnecessary inventory at Barton. The customer requirements

EEB 810115 025

DTF 010

DATE 1/9/81

VALCOR ENGINEERING CORP.
2 Lawrence Road, Springfield, N.J.
TWX 710-998-0878 - CABLE VALCOR
201-467-8400

Gary Kristoff
ORIGINATOR

DATA TRANSMITTAL FORM

TO: Chief, Elec. Eng. Branch
Tennessee Valley Authority
400 Commerce Avenue W8 C126
Knoxville, Tenn. 37902

ATTN:

PROJECT: Contract 80 KJ3-826034
Sequoyah Nuclear Plant

CONT. NO: 80 JK3-826034

S/O. : E17168

REPLY BY: 2/9/81

ITEM NO.	DOC. NUMBER	REV	DESCRIPTION	COPIES P	COPIES T	APPR.	REF.	REF
1	MR70900-301-1	A	Seismic Qualification Test Report on V70900-301	1		X		

ELECT ENVIR BRANCH

REMARKS:

1/15/81 - FWC:PAD
cc: MEDS, E4B37 C-K

1 993

ECO	LTR	REVISIONS DESCRIPTION	DATE	APPROVED
	—	Initial Issue	10/22/80	EGM
	A	Para. 3.0: Added first para. Para. 4.0: Added first 3 Para's. Added Tables I and II. Added para. 4.2. and Appendix V.	1/19/80	EGM

APPROVED FOR NUREG 0588 CAT. II
Don Reed
1-20-81

"A"
1-20-81

FOR APPROVAL PURPOSES ONLY JAN 9 1981

APPROVED
This approval does not relieve the Contractor from any part of his responsibility for the correctness of design, details and dimensions.
TENNESSEE VALLEY AUTHORITY
Date JAN 28 1981 F. W. CHANDLER

FILE

PROJECT Sequoyah Nuclear Plant
CONTRACT 80KJ3-826034
DRAWING NO. MR70900-301-1
SHEET ____ REV A UNIT 1&2

REV.																													
SHEET	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53

REV. STATUS OF SHEETS																									
REV.	A		A		A	A	A	A	A					A	A										
SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS FRACTIONS ANGLES

DRAWN E.J. Namiotka DATE 10/22/80
CHECKED
ENGINEER E.J. Namiotka 10/22/80
QC J. Schmidt 11/6/80
PRODUCTION

VALCOR ENGINEERING CORPORATION
SPRINGFIELD, NEW JERSEY

TITLE: SEISMIC QUALIFICATION TEST REPORT ON SOLENOID VALVE V70900-301

SIZE A | CODE IDENT. NO. 96487 | DOCUMENT NO. MR70900-301-1

SCALE | SHEET 1 of 24