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VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

July 2, 1979

Norman C. Moseley, Director
Division of Reactor Operations Inspection
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Serial No. 90A
PO/DLB:baw
Docket No.: 50-338
License No.: NF -4

Subject: IE Bulletin 79-01
North Anna Power Station Unit No. 1

Dear Mr. Moseley:

This letter is in response to IE Bulletin 79-01, "Environmental Qualification of Class IE Equipment."

In response to IE Bulletin 79-01, we directed our architect-engineer (A-E) and our NSSS supplier to review the environmental qualification of all class IE electrical equipment at North Anna Units No. 1 and 2.

This review by our A-E has been completed for Unit No. 1. Results are included as Table 1, which contains all class IE equipment, both safety related and non-safety related, that was procured by the A-E.

Only two potential qualification problems have been identified:

1. Chiller Equipment

The chiller equipment room contains control and relay room air conditioning equipment. The chiller equipment room is located adjacent to the turbine building and has a ventilation duct which is open to the turbine building. Under a postulated condition such that a steam line break in the turbine building directs a jet of steam directly into the area of the ventilation duct, the temperature in the chiller equipment room could reach 211°F. We have no information indicating qualification of the chiller equipment under these conditions. Chiller equipment affected is listed on pages 1, 2, 3 and 10 of Table 1.

2. Safeguards Building Ventilation Fans

The emergency ventilation fans located in the safeguards building, designed as seismic Class I, are provided for ventilation of the recirculation spray and safety injection pumps area in the unlikely event the ventilation exhaust system is disabled. The ventilation exhaust system is run by two seismic Class I fans located in the auxiliary building and has the capability of diverting the effluent through the common iodine filter bank. Ventilation is designed to limit temperatures during warm weather to a maximum of 120°F and

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during cool weather to a minimum of 75°F. The spaces containing the recirculating spray and safety injection pumps and their valve rooms are subject to potential radioactive contamination from gland leakage. Our A-E has estimated that under accident conditions the radiation dose to the emergency ventilation fans could reach approximately 10⁶ rads. We have no information on the qualification of these fans to such a radiation exposure.

We will continue to pursue qualification or an alternate resolution of these two outstanding items and will inform you of our actions on or about July 31, 1979.

Qualification data for safety-related equipment provided by the NSSS vendor are included in documents which have previously been submitted to the NRC as vendor proprietary. In many cases the non-proprietary versions of these documents which we have received are not sufficiently detailed to determine qualification. We have made arrangements to receive more detailed documents and will forward qualification data in a subsequent submittal on or about July 31, 1979.

IF Bulletin 79-01A was received following the final preparation of the attachment. Several ASCO solenoid valves previously identified as not qualified have been replaced or will be replaced as soon as possible. These valves were located in the BCS sampling system. Our letter, serial no. 466, dated June 14, 1979, and addressed to Mr. Victor Stello provides additional information.

Very truly yours,

C. M. Stallings

C. M. Stallings
Vice President-Power Supply
and Production Operations

cc: James P. O'Reilly, Director
Office of Inspection and Enforcement
Region II

North Anna Power Station Unit No. 1
Environmental Qualification of A-E Supplied
Class 1E Equipment

Table 1

| <u>Equipment Description & Mark No.</u> | <u>Description of Accident Environment</u> | <u>Environment to Which Equip. Is Qualified</u> | <u>Manner of Qualification</u> | <u>Qualification Document</u> |
|--|--|---|--------------------------------|-------------------------------|
| <u>Control & Relay Room A/C Chillers</u> Buildinghouse: 1-EV-E-A, B, C; D. MA-247; located in chiller room. | MSLB in turbine bldg. Equipment outside crane wall exposed to: 1. High ambient temperature 211°F for duration of steam discharge in vicinity of chiller room air intakes - 30 minutes. 2. High ambient moisture content- saturated steam, 100% RH for duration of steam discharge - 30 minutes. | None | None | None |
| <u>Line Pumps - Air Conditioning</u> Singham-Willmetts Company; EV-P-20A, B, C; 1-EV-P-22A, B, C; D. MA-276; located in Chiller Room. | MSLB in turbine bldg. Equipment outside crane wall exposed to: 1. High ambient temperature 211°F for duration of steam discharge in vicinity of chiller room air intakes - 30 minutes. 2. High ambient moisture content- saturated steam, 100% RH for duration of steam discharge - 30 minutes. | None | None | None |

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Equipment Description & Mark No.

Air Conditioning Self-Cleaning
Evaporator - Elliott Company;
1-EV-5-1A,8; P.O. MA-149; located in
Chiller Room.

Description of Accident Environment

MSLB in turbine bldg. Equipment
outside crane wall exposed to:

1. High ambient temperature 211°F
for duration of steam discharge in
vicinity of chiller room air
intakes - 30 minutes.
2. High ambient moisture content-
saturated steam, 100% RH for
duration of steam discharge - 30
minutes.

Environment to which Equip. is Qualified

None

Manner of Qualification

None

Qualification Document

None

Propeller Fan - Aerovent Fan
Company, Incorporated; 1-FV-F-24;
P.O. MA-241; located in Chiller Room.

MSLB in turbine bldg. Equipment
outside crane wall exposed to:

1. High ambient temperature 211°F
at saturated atmosphere

1. High ambient temperature 211°F
for duration of steam discharge in
vicinity of chiller room air
intakes - 30 minutes.

2. High ambient moisture content-
saturated steam, 100% RH for
duration of steam discharge - 30
minutes.

Vendor's reply to TLX inquiry

TLX-1-29-79 - W. B. Shumacher
J. E. Krechting

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| Item Description & Part No. | Description of Accident Environment | Environment to Which Eval'd. Is Qualified | Manner of Qualification | Qualification Document |
|---|--|---|-------------------------|-------------------------------------|
| KA-255/1255 V alum. power cable Triplex Cable -3 Triplex 1000 MCM -4 3/c 500 MCM alum. armor -5 3/c 1250 MCM alum. armor -6 3/c 1250 MCM st. armor -7 3/c 2500 MCM -8 3/c 1250 MCM alum. armor -9 3/c 470 MCM alum. armor -10 Triplex 470 MCM -11 1/c 1300 MCM | Loss of coolant accident (LOCA) Radiation: 1 x 10 ⁴ rads (based on 6 months LOCA). In addition the 40 year radiation dose of 4 x 10 ⁴ rads must be considered for a total possible radiation dose of 1.04 x 10 ⁴ rad*. | 2 x 10 ⁴ rads | Test | General Cable Letter dated 12-22-71 |

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Equipment Description & Mark No.

P.O. No-254/1256
600 V Alum. Power Cable
General Cable
MCA-5 Triplex 500 MCN
MCA-7 Triplex 250 MCN
MCA-11 Triplex 2/0 AWG
MCA-12 Triplex 1 AWG

Description of Accident Environment

Loss-of-Coolant Accident (LOCA)
Reduce from 280°F to 150°F
30 to 60 min
150°F
360 min
Reduce from 65 to 0 psig
0 to 30 min
0 psig
30 to 60 min
7.2 x 10⁵ rads
360 min
Spray: 0-4 hrs. Solution of boric acid (2000-2400 ppm boron) buffered to a pH of 8.5 to 9 with NaOH. >4 hrs similar solution with a pH of 7 to 8

Environment to which Equip. is Qualified

Loss-of-Coolant Accident (LOCA)
Irradiated to 55 x 10⁵ rads
100 psig & 300°F for 4 hrs
62 psig & 310°F for 1 hr
20 psig & 260°F for 43 hrs
2.5 psig & 260°F for 5 days

Spray: Throughout test cycle solution
consisting of a 2000 ppm solution of boron as boric acid buffered with H₂O to a pH of 9.0
Irradiated an additional 1.45 x 10⁵ rads bringing the total exposure to 2 x 10⁵ rads

Manner of Qualification

Test - Sequential

Qualification Reference
General Cable Letter dated

12-22-71

POOR ORIGINAL

503 290

Equipment Description & Mark. No.

P.O. NO-128/1128
600 V Cu. Power Cable
Okonite

NCA-20 1/w 250 MCM
NCA-21 1/c 2/0 AWG
NGB-15 Triplex #4 AWG
NGB-16 Triplex #4 AWG
NGB-17 3/c #8 AWG
NGB-18 3/c #10 AWG
NCA-19 3/w #12 AWG

Description of Accident Environment

Loss-of-Coolant Accident (LOCA)

280°F 0 to 30 Min
Reduce from 280°F to 150°F 30 to 60 Min
150°F >60 Min
#5 psig 0 to 30 Min
Reduce from #5 30 to 60 Min
to 0 ps
0 psig >60 Min
7.2 x 10⁻⁶ rads

Spray:

0-4 hr Solution of boric acid
(2000-2100 ppm boron) buffered to
a pH of 8.5 to 11 with NaOH
>4 hr Similar solution
with a pH of 7 to 9

Main Steam Line Break (MSLB)

#30°F 0 to 3 Min
280°F 2 to 60 Min
165°F >60 Min
40 psig 0 to 60 Min
0 psig >60 Min
3 x 10⁷ rads

Environment to Which Equip. is Qualified

Loss-of-Coolant Accident (LOCA)

Aged 168 hr @ 121°C
Irradiated to 2 x 10⁶ rads

PWR exposure:

80 psig @ 324°F For 4 hr
16 psig @ 252°F For 7 days

Spray: 10,000 ppm boric acid
Buffered with NaOH to a pH of 10.5
throughout the PWR exposure period

Boiling Water Reactor Exposure (BWR)

A series of transient cycles each consisting of a rise to a specified pressure and temp for a specified time and a gradual return to initial conditions. Following transient cycles 100 day exposure to live steam 0 psig, 212°F

BWR exposure includes a transient cycle at 104 psig at 345°F for 3 hours and 20 min.

MSLB

Same as "Description of Accident Environment"

Manner of Qualification

Test - Sequential

Qualification Document

Okonite's Engineering Report
No. 141 dated 2/29/72

Additional Supporting Documents

Outline of Franklin Institute
Research Laboratory report P-C1698

IEEE Transaction Paper T 74 044 4

Test - Analysis

Maximum calculated surface temperature during limiting MSLB is 315°F which does not exceed qualification temperature of 345°F given in BWR exposure portion of LOCA qualification.

Pressure and Radiation - Test
Refer to LOCA qualification.

MSLB Qualification Documents

FSAR Section 3C and response to
Comment 7.17 (Note to be revised to include this item).

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Equipment Description & Mark No.

P.O. KA-359/1359
High Temperature Cable
Cerro Wire and Cable Company

MCA-15 Triplex 250 MCM
MCA-17 Triplex #2/0 AWG
MCA-33 6/c 2-#8 and 4-#12
MCA-61 7/c #12 AWG
MCA-36 4/c #16 AWG
MCA-37 2/c #8 AWG

Description of Accident EnvironmentLoss of Coolant Accident (LOCA)

280°F 0 to 30 Min
Reduce from 280°F
to 150°F 30 to 60 Min
150°F >60 Min
45 psig 0 to 30 Min
Reduce from 45
to 0 psig 30 to 60 Min
0 psig >60 Min
7.2 x 10⁷ rads

Sprays:

0-4 hr Solution of boric acid
(2000-2100 ppm boron) buffered to
a pH of 8.5 to 11 with NaOH
24 hr Similar solution
with a pH of 7 to 9

MSLB

430°F 0 to 2 Min
280°F 2 to 40 Min
165°F >60 Min
40 psig 0 to 40 Min
0 psig >60 Min
3 x 10⁷ rads

Environment to Which Equip. Is QualifiedLOCA

Irradiated to 2 x 10⁸ rads
50 psig and 274°F 12 hr

Sprays: Last 2 hr of 12 hr period with a
solution of borated water containing
approximately 1,720 ppm of boron as boric
acid

Reduced to 5 psig and 164°F over an
unspecified time with spray continuing

164°F at 5 psig for the remainder of the
7 day period without spray
F-C 750 indicates that in an earlier
test the spray was buffered with
NaOH to pH of 9

MSLB

Same as "Description of Accident
Environment"

Manner of Qualification

Test - Sequential

Qualification Document

Franklin Institute Research
Laboratory Report F-C2857

Cerro's Supplement to F.I.R.L.
Report F-C2857

Franklin Institute Research
Laboratory Report F-C2750

Cerro's Supplement to F.I.R.L.
Report F-C2750

Temperature - Analysis

Maximum calculated surface tempera-
ture during limiting MSLB is 135°F
which does not exceed qualification
temperature of 460°F given in
Rockbestos' (formerly Cerro) letter
dated 4/25/77

Pressure and Radiation - Test

Refer to LOCA Qualification

FSAR Section 3C and response to
Comment 7.17

Rockbestos's letter dated 4/25/77

LOCA qualification documents

Environment Description & Mark No.

P.O. MA-312/1312

400 V Control Cable

Control Wire and Cable Company

MCA-19 2/C 42 ANG
MCA-34 1/C 418 ANG
MCA-35 2/C 418 ANG
MCA-36 2/C 418 ANG
MCA-37 3/C 418 ANG
MCA-38 7/C 418 ANG
MCA-39 9/C 418 ANG
MCA-40 11/C 418 ANG
MCA-41 13/C 418 ANG
MCA-42 15/C 418 ANG
MCA-43 17/C 418 ANG
MCA-44 19/C 418 ANG
MCA-45 21/C 418 ANG
MCA-46 23/C 418 ANG
MCA-47 25/C 418 ANG
MCA-48 27/C 418 ANG
MCA-49 29/C 418 ANG
MCA-50 31/C 418 ANG
MCA-51 33/C 418 ANG
MCA-52 35/C 418 ANG
MCA-53 37/C 418 ANG
MCA-54 39/C 418 ANG
MCA-55 41/C 418 ANG
MCA-56 43/C 418 ANG
MCA-57 45/C 418 ANG
MCA-58 47/C 418 ANG
MCA-59 49/C 418 ANG
MCA-60 51/C 418 ANG
MCA-61 53/C 418 ANG
MCA-62 55/C 418 ANG
MCA-63 57/C 418 ANG
MCA-64 59/C 418 ANG
MCA-65 61/C 418 ANG
MCA-66 63/C 418 ANG
MCA-67 65/C 418 ANG
MCA-68 67/C 418 ANG
MCA-69 69/C 418 ANG
MCA-70 71/C 418 ANG
MCA-71 73/C 418 ANG
MCA-72 75/C 418 ANG
MCA-73 77/C 418 ANG
MCA-74 79/C 418 ANG
MCA-75 81/C 418 ANG
MCA-76 83/C 418 ANG
MCA-77 85/C 418 ANG
MCA-78 87/C 418 ANG
MCA-79 89/C 418 ANG
MCA-80 91/C 418 ANG
MCA-81 93/C 418 ANG
MCA-82 95/C 418 ANG
MCA-83 97/C 418 ANG
MCA-84 99/C 418 ANG
MCA-85 101/C 418 ANG
MCA-86 103/C 418 ANG
MCA-87 105/C 418 ANG
MCA-88 107/C 418 ANG
MCA-89 109/C 418 ANG
MCA-90 111/C 418 ANG
MCA-91 113/C 418 ANG
MCA-92 115/C 418 ANG
MCA-93 117/C 418 ANG
MCA-94 119/C 418 ANG
MCA-95 121/C 418 ANG
MCA-96 123/C 418 ANG
MCA-97 125/C 418 ANG
MCA-98 127/C 418 ANG
MCA-99 129/C 418 ANG
MCA-100 131/C 418 ANG

Description of Accidents Environment

Loss of Control Accidents

280°F 0 to 30 Min
Reduction from 280°F 30 to 40 Min
150°F 30 to 40 Min
45 psig 30 to 40 Min
Reduce from 45 0 to 30 Min
to 0 psig 0 to 30 Min
0 psig 0 to 30 Min
7.2 x 10⁵ rads 30 to 40 Min
Spray: 0-8 hrs Solution of boric acid
(2,000-2,100 ppm boron) buffered
to a pH of 8.5 to 11 with NaOH
24 hr similar solution with a
pH of 7 to 9

MSLR

430°F 0 to 2 Min
280°F 2 to 40 Min
150°F 40 to 60 Min
40 psig 60 to 80 Min
0 psig 80 to 100 Min
3 x 10⁵ rads 100 to 120 Min

Environment to which Group 1a Qualified

LOCA

Irradiated to 2 x 10⁵ rads
50 psig and 375°F
Spray: Last 2 hr of 12 hr
solution of boric acid containing
approximately 1,720 ppm of boron as boric
acid
Reduce to 5 psig and 160°F over an un-
specified time with spray continued
160°F at 5 psig for the remainder of
7 day period with no spray

MSLR

Thermally aged for 1300 hrs @ 150°C.
Irradiated at a rate of 0.30 x 10⁵ rads per
hr for total dose of .01 x 10⁵ rads.
Spray: Solution of 4.00 ppm boron and
Hydrazine solution maintain at a pH value
of between 8.4 and 10.0 for 359 hrs.
375°F @ 58 psig 0 to 12 min
375°F @ 62 psig 12 to 15 min
364°F @ 62 psig 15 to 20 min
337°F @ 60 psig 20 to 25 min
327°F @ 60 psig 25 min to 3.4 hrs
Reduce from 327°F
@ 60 psig to 320°F
@ 12 psig 3.4 to 359 hrs

Manner of Qualification

Test - Sequential

Qualification Document
Franklin Institute Research
Laboratory Report F-C2857

Carro's Supplement to F.I.R.L.
Report F-C2857

Test - Sequential

Rockbestos Company
Report 11-10-07-1028-11-2
Test was performed on cable
of a similar construction as
that supplied in P.O. MA-312
and 1312

POOR ORIGINAL

503 293

Equipment Description & Mark No.

P.O. MA-265/1265
300 V Instrument Cable
(Costco Insulated Wire and Cable)

MEA-40 4/c No. 16 AWG
MEA-55 45/c No. 16 AWG
MEA-67 19/c No. 16 AWG
MEA-68 12/c No. 16 AWG
MEA-69 2/c No. 16 AWG
MEA-70 18/c No. 16 AWG
MEB-35 2/c No. 16 AWG
MEB-39 1/c No. 16 AWG

Description of Accident Environment

LOCA
280°F 0 to 30 min
Reduce from 280°F to 150°F 30 to 60 min
150°F >60 min
45 psig 0 to 30 min
Reduce from 45 to 0 psig 30 to 60 min
0 psig >60 min
7.2 x 10⁸ rads
Spray:
0-4 hrs solution of boric acid (2000-2400 ppm boron) buffered to a pH of 8.5 to 11 with NaOH
>4 hrs similar solution with a pH of 7 to 9

Environment to Which Equip. Is Qualified

LOCA
Irradiated to 1 x 10⁸ rads
280°F at 45 psig 60 min
205°F at 0 psig 24 hrs
Spray: Throughout 25 hr period

Solution of 0.20 molar boron as boric acid with the pH adjusted to 8-8.5 with a 0.019 molar solution of NaOH

Manner of Qualification

Test - Sequential

Qualification Document

B.I.W. Letters dated
1-17-72
12-14-71

Main Steam Line Break (MSLB)

430°F 0 to 2 min
280°F 2 to 40 min
145°F >60 min
40 psig 0 to 40 min
0 psig >60 min
1 x 10⁸ rads

MSLB

Same as "Description of Accident Environment"

Temperature - Analysis
Maximum calculated surface temperature during limit
MSLB is 343°F which does not exceed qualification temperature of 460°F given in B.I.W. letter dated 10-12-76.

Pressure and Radiation - Test
refer to LOCA qualification

FSAR Section 3C and response to comment 7.17

B.I.W. letter dated 10-12-76
LOCA Qualification documents

POOR ORIGINAL

503 294

Equipment Description & Mark No.

P.O. NO-253
Thermocouple Extension Wire
(G.I.I.V. Wires and Cables)

MCB-48 1 pair No. 16 Copper-
Constantan
MCB-49 1 pair No. 16 Iron-
Constantan

Description of Accident Environment

Loss of Coolant Accident (LOCA)
180°F Reduce from 280°F 0 to 30 min
to 150°F 30 to 60 min
150°F 60 min
45 psig Reduce from 45 0 to 30 min
Reduce to 0 psig 30 to 60 min
0 psig 60 min
7.2 x 10⁶ rads

Spray: 0-4 hrs Solution of boric acid (2000-2100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH 36 hrs similar solution with a pH of 7 to 9

Environment to which Equipment is Qualified

LOCA
Irradiated to 2 x 10⁶ rads
50 psig at 275°F 12 hrs
Spray: Last 2 hrs of 12 hr period solution of boric acid containing approximately 1720 ppm of boron as boric acid
Reduce to 5 psig and 180°F over an unspecified time with spray continued. 180°F at 5 psig for the remainder of 7 day period without spray.
P-C2750 indicates that in an earlier test the spray was buffered with NaOH to a pH of 9

Manner of Qualification Test - Sequential

Qualification Document
Franklin Institute Research
Laboratory Report P-C2857
Cerro's Supplement to P.I.R.L.
Report P-C2857

Franklin Institute Research
Laboratory Report P-C2750
Cerro's Supplement to P.I.R.L.
Report P-C2750

POOR ORIGINAL

503 295

Equipment Description & Mark No.

P.O. NO-175/1175

5 ft Alum. Power Cable

CPD001751

MCA-4 3/8 500 MCM
MCA-12 3/8 1000 MCM
MCA-3 Triple 1000 MCM
MCA-13 3/8 84/0 AWG

Description of Accident Environment

Radiation

4.2 x 10⁴ rads (based on 6 month LCCA). In addition, the 40 year radiation dose of 3 x 10⁴ rads must be considered for a total possible radiation dose of 7.2 x 10⁴ rads.

Environment to which Equip. is Qualified

2 x 10⁴ rads

Range of Qualification

Test

Qualification Document

Chenite's Engineering Report No. 181 dated 2/29/72

Additional Supporting Documents

Outline of Franklin Institute Research Laboratory Report F-C1694

IEEE Transaction Paper T78 084 6

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Equipment Description & Mark No.

P.O. NO-184/1384
600 w Aluminum Power Cable
Okonite

MCB-5 Triplex 500 MCM
MCB-7 Triplex 250 MCM
MCB-11 Triplex #12 AWG.
MCB-12 Triplex #1 AWG.

Description of Accident EnvironmentLoss-of-Coolant Accident (LOCA)

| | |
|----------------------------|--------------|
| 280°F | 0 to 30 min |
| Reduce from 280°F | |
| to 150°F | 30 to 60 min |
| 150°F | >60 min |
| 45 psig | 0 to 30 min |
| Reduce from 45 to | |
| 0 psig | 30 to 60 min |
| 0 psig | >60 min |
| 7.2 x 10 ⁷ rads | |

Spray:
0-4 hr Solution of boric acid
(2,000-2,100 ppm boron)
buffered to a pH of 8.5 to 11
with NaOH.
>4 hr Similar solution with a
pH of 7 to 9.

Environment to Which Equip. Is QualifiedLOCA

Aged 168 hr at 121°C
Irradiated to 2 x 10⁷ rads

PWR Exposure:

| | |
|---|------------|
| 324°F at 80 psig | 0 to 4 hr |
| 252°F at 16 psig | for 7 days |
| Spray: 10,000 ppm boric acid buffered with NaOH to a pH of 10.5 throughout the PWR exposure period. | |

Boiling Water Reactor Exposure:

A series of transient cycles each
consisting of a rise to a specified
pressure and temperature for a specified
time and a gradual return to initial
condition. Following transient cycles
100 day exposure to live steam
0 psig @ 212°F.

Manner of Qualification

Test - Sequential

Qualification Document

Okonite's Engineering Report
No. 141 dated February 29, 1972

Additional supporting documents

Outline of Franklin Institute
Research Laboratory Report F-C1694

IEEE Transaction Paper T 78-344 4

POOR ORIGINAL

503 297

Remission Description & Mark No.

P.O. 12-192/1392

300 V Instrument Cable
(GSEIO-MIS AND COPS)

MA-47 19/c No. 16 AMG.
MA-48 12/c No. 16 AMG.
MA-70 18/c No. 16 AMG.
MA-35 2/c No. 16 AMG.
MA-39 1/c No. 16 AMG.

Description of Accident Environment

LOCA

245°F Reduce from 280°F 0 to 30 min.
to 150°F 30 to 60 min.
150°F >60 min.
45 psig 0 to 30 min.
Reduce from 45 to 0 psig 30 to 60 min.
0 psig >60 min.
7.2 x 10⁷ rads

Spray:
0-4 hrs solution of boric acid
(2000-2100 ppm boron) buffered to
pH of 8.5 to 11 with NaOH >4 hrs
similar solution with a pH of 9
to 9

MSLB

230°F 0 to 2 min
280°F 2 to 40 min
145°F >60 min
40 psig 0 to 60 min
0 psig >60 min
3 x 10⁷ rads

Environment to which Equip. is Qualified

LOCA

Aged 1000 hrs. @ 150°C
Irradiated to 2 x 10⁶ rads
280°F @ 70 psig 0 to 10 sec
rise to 340°F @ 10 sec to 5 min
113 psig
340°F @ 113 psig 5 min to 3 hr
Reduce to 140°F 5 hr to 5 hr @ 10 sec
280°F @ 70 psig 5 hr @ 10 sec to 5 hr
Rise to 340°F 5 min
340°F @ 113 psig 5 hr @ 5 min to 8 hrs
335°F @ 93 psig 8 hr to 11 hr
315°F @ 49 psig 11 hr to 15 hr
265°F @ 28 psig 15 hr to 4 day
212°F @ 0 psig 4 day to 30 day

Spray:
1st 24 hrs of 30 day period - solution
of the following composition
0.28 molar Na₂SO₄
0.064 molar Na₂SO₃
NaOH to make pH between 9-11
Following above 30 day LOCA period and
additiona period of 100 day at 200°F.

MSLB

Same as "Description of Accident Envir-
onment"

Manner of Qualification

Test - Sequential

Qualification Documents

Rockbestos (formerly Carrol)
Letter dated 2-21-79 and its
attached report

TV Gamma - Analysis
Maximum calculated surface
temperature during limiting
MSLB is 353° which does not
exceed qualification tem-
perature of 460° given in
Rockbestos (formerly Carrol)
letter dated 4-25-77
Pressure and Radiation - Test
Refer to LOCA Qualification

PEAR Section 3C and response
to comment 7.17
Rockbestos letter dated
4-25-77
LOCA qualification document

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| Reference Identification & Mark. No. | Description of Accident Environment | Environment to which Equip. is Qualified | Manner of Qualification | Qualification Document |
|---|--|---|-------------------------|--|
| P.O. M-408/118 Thermocouple, Resistance Wire Resistor Insulated Wire & Co. Ag | Loss of 5% of 100% (100%) (100%) | LOCA Irradiated to 1 x 10 ⁶ rads 280°F at 85 psig 40 min 203°F at 0 psig 24 hrs | Test - Sequential | B.I.M. letters dated: 2-7-75 1-17-72 12-14-71 |
| MCB-48 1 pair 816 copper- constantan | 280°F 0 to 30 Min Reduce from 280°F 30 to 60 Min to 150°F 150°F >60 Min Reduce from 45 0 psig 30 to 60 Min to 0 psig >60 Min 7.2 x 10 ⁶ rads | Solution of 0.20 molar boric acid acid with the pH adjusted to 8-8.5 with a 0.019 molar solution of NaOH for 25 hr period. | | |

Spray:

0-4 hrs Solution of boric acid
(2000-2400 ppm boron) buffered to
a pH of 8.5 to 11 with NaOH
>4 hr similar solution
with a pH of 7 to 9

POOR ORIGINAL

503-299

Expenditure Description & Mark No.

Co. No. 422/1422
Triaxial Cab's

Exposure Insulated Wire & Cable

CA-72 T. 1422

Description of Accident Environment

Loss of Coolant Accident (LOCA)

280°F Reduce from 280°F 0 to 30 min
to 150°F 30 to 60 min
150°F >60 min
45 psig 0 to 30 min
Reduce from 45 to 0 psig 30 to 60 min
7.2 x 10⁶ rads >60 min

Sprays:

0-4 hr. Solution of boric acid (2,000-2,100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH.
>4 hr. Similar solution with a pH of 7 to 9.

Environment to which Equip. Is Exposed

LOCA

Irradiated to 2 x 10⁶ rads 0 to 15 min
200°F & 80 psig
Reduce to 252°F 15 to 45 min
8.16 psig 45 min to 17 day
252°F & 16 psig

Sprays:

Throughout 17 day period. A solution of 2,000 ppm boric acid buffered to a pH of 8 to 8.5 with NaOH.
Following above, an additional 17 days exposure to 200°F & 0 psig.

Manner of Qualification

Test - Sequential

Qualification Document

E.I.W.'s Engineering Comments
No. 2665-1P Rev. 4
(specifically Test No. 75C008)

POOR ORIGINAL

503 300

27C 010 AMC

0-4 hr. solution of boric acid (2,000-2,100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH. 24 hr. similar solution with a pH of 7 to 8.

Aged 16 days at 250°g
 Irradiated to 5 x 10⁶ rads and aged at
 200°g for 7 days
 For 31 day period
 280°g/70 paig
 Rise to 346°g/
 111 paig
 346°g/113 paig
 Reduce to 240°g
 280°g/70 paig
 Rise to 346°g/
 111 paig
 346°g/113 paig
 315°g/95 paig
 315°g/95 paig
 265°g/28 paig
 312°g/0 paig

Spray:
Continuously for 31 day period solution of 2,000 ppm boron as boric acid buffered with NaOH to a pH to 9-11.
Irradiated to 1.5×10^6 rads during the 31 day period. Total 2×10^6 rads

Qualification Document
Franklin Institute Research
Report P-C1692
Additional Supporting Data
IEEE Transaction Paper

Equipment Description & Mark No.

Motor Operated Valves - Elliot
Company: 1-20V-115-1, 2
1-20V-115-1, 2;
P.O. NA-259; located in Chiller Room
is components of self-cleaning
trainers.

Description of Accident Environment

MSLB in turbine bldg. Equipment
in Chiller Room exposed to:

1. High ambient temperature 211°F for
duration of steam discharge in
vicinity of chiller room air
intakes - 30 minutes.
2. High ambient moisture content-
saturated steam, 100% RH for
duration of steam discharge - 30
minutes.

Environment to Which Equip. Is Qualified

None

Manner of Qualification

None

Qualification Document

None

Chiller Room Pump Pumps -
Edmonton Pump Company: 1-DB-P-10A,
CB; P.O. NA-421; locat 1 in
Chiller Room.

MSLB in turbine bldg. Equipment
in chiller room exposed to:

1. High ambient temperature 211°F for
duration of steam discharge in
vicinity of chiller room air
intakes 30 minutes.
2. High ambient moisture content-
saturated steam, 100% RH for
duration of steam discharge - 30
minutes.

1. High ambient temperature 211°F
at saturated atmosphere

Vendor reply to TLX inquiry

TLX 3-28-79 - John Anderson
to J. E. Krechting

POOR ORIGINAL

503 302

| Equipment Description & Mark No. | Description of Accident Environment | Environment to which Equip. is Exposed | Manner of Qualification | Qualification Documents |
|--|---|--|-------------------------------|--|
| Centrifugal Fans - Buffalo Forge Co., P.O. No. 246 V. 1-2V-1-40A,B located in Auxiliary Bldg., El. 2910-10= | LOCA - Fan motors exposed to: 1. Radiation zone IV 40 yr dose = LOCA dose = 880 + 160 = 1040 rads | Radiation Dose of 7×10^6 rads | Vendor's reply to TIX inquiry | TIX-3-29-79 - W. B. Schumacher J. E. Kretzing |
| Radial Flow Fans - Joy Mfg. Co., P.O. No. KA-201; 1-2V-7-71A,B located in Safeguards Bldg., El. 2077-6 | LOCA - Fan motors exposed to: 1. Radiation 40 yr dose - 7×10^6 rads | None | None | None |

POOR ORIGINAL

503 303

Equipment Description & Mark No.

10. NA 313/1313
 Reactor Containment Electrical
 Installation - 503A

Conaxtron Inc. No. 5531
 Polysulfone Terminal Blocks

Description of Accident Environment

Loss-of-Coolant Accident (LOCA)

280°F Reduce from 280°F 0 to 30 min
 to 150°F 30 to 60 min
 150°F 60 min
 45 psig 0 to 30 min
 Reduce from 45 to 0 psig 30 to 60 min
 0 psig 60 min
 7.2 x 10⁷ rads
 Spray = 0 to 4 hours; ion of borate
 acid (2000-2100 ppm). (buffer) to
 a pH of 8.5 to 11.0 with NaOH. Beyond
 4 hours similar solution with a
 7 to 9.

Main Steam Line Break (MSLB)

430°F 0 to 2 min
 280°F 2 to 60 min
 165°F 60 min
 40 psig 0 to 60 min
 0 psig 60 min
 3 x 10⁷ rads

Environment to which Equip. is Qualified

LOCA

Radiation: 2.5 x 10⁷ rads minimum
 253°F & 25 psig 0 to 30 sec
 282°F & 45 psig 30 to 60 sec
 285°F & 45 psig 60 to 90 sec
 298°F & 57.5 psig 90 to 120 sec
 292°F & 48 psig 2.5 to 4 min
 289°F & 49 psig 4 to 5 min
 300°F & 56 psig 5 to 10 min
 293°F & 47 psig 10 to 15 min
 287°F & 47 psig 15 to 30 min
 Range
 Thermo aging 300°F for 74 hr

SPRAY

Solution boron 1,403 ppm
 Buffered to 7.7 pH at a
 +190°F, 10 gpm for 30 min.
 140°F & 0 psig for 30 hr

Manner of Qualification

Test

Qualification Document

Conax Corp. Test
 Report 125-107

POOR ORIGINAL

503 304

REGISTRATION AND RENEWAL

As above

with a 100% success rate.

503 305

Equipment Description & Mark No.

NAMCO Model EA-180
Limit Switches
Located on the following
Control Valves

TV-80 100B, D, F
CC 101B
CC 102B, D, F
CC 103A, B, C
DA 100B
DG 100B
EM 100C
VG 100B
SS 100A
SS 101A
SS 102A
SS 103A
SS 104A
SS 105A
SS 112A

Description of Accident Environment

Loss-of-Coolant Accident (LOCA)

280°F 0 to 30 min
Reduce from 280°F to 150°F 30 to 40 min
150°F >40 min
45 psig 0 to 30 min
Reduce from 45 to 0 psig 30 to 40 min
0 psig >40 min
7.2 x 10⁷ rads

Spray:
0-4 hrs solution of boric acid
(2000-2100 p.p.m. boron) buffered
a pH of 8.5 to 11 with NaOH
> 4 hrs similar solution with a
pH of 7 to 9

Main Steam Line Break (MSLB)

230°F 0 to 2 min
280°F 2 to 40 min
165°F >40 min
40 psig 0 to 40 min
0 psig >40 min
3 x 10⁷ rads

Environment to Which Equip. Is Qualified

LOCA

Heat aging @ 200°F for 200 hrs mechanical
aging 100,000 cycles under electrical load

340°F 0 to 3 hrs
Reduce from 340°F to 120°F 3 to 5 hrs
SEQUENCE REPEATED
250°F to 3.5 days
200°F 3.5 to 30 days
70 psi 0 to 8 hrs
10 psi 8 hrs to 30 days

Radiation Exposure 2.04 x 10⁶ rads

Spray: Boric acid and water buffered to
a pH of 10-11 with NaOH solution for 4
days, water spray for 26 days spray
density = .015 gpm/ft²

MSLB

Maximum surface temperature is 285°F per
ESG calculation 11712-ES-197-0 dated
3-16-78 and is well below qualification
temperature
Radiation Exposure see LOCA Test.

Manner of Qualification

Sequential Test -

Heat Aging
Mechanical Aging
Radiation Exposure
Seismic Testing
LOCA Test

Qualification Document

Report Entitled:

*Qualification of NAMCO controls
limit switch Model EA-180 to IEEE
Standards 344 (*75) 323 (*74)
and 362 (*72)*
dated 3-3-78 and revised 4-7-78

MSLB

Calculation

ESG Calculation 11712-ES-197-0
dated 3-16-78

POOR ORIGINAL

503 306

| Equipment Description & Mark No. | Designation of Accident Environments | Environment to which Equip. is Qualified | Manner of Qualification | Qualification Record |
|--|---|---|-------------------------|--------------------------------------|
| P.O. 8A-174/1174 Motor Control Centers Blackburn Model 111 | Loss of Coolant Accident (LOCA) | | Test | Blackburn-Model 111 dated 3/16/73 |
| MCC-181-2N MCC-181-2N MCC-181-2N MCC-181-2N | Radiation: 1 x 10 ⁴ rads (based on 6 month LOCA). In addition, the 40 year radiation dose of 4 x 10 ⁴ rads must be considered for a total possible radiation dose of 1.04 x 10 ⁴ rads. | Minimum total integrated doses of 1.8 x 10 ⁴ rads of gamma source radiation. | | |

POOR ORIGINAL

503 307

| Lowest Penetration & Mark No. of Cracked Joints | Description of Accident Environment | Environment to Which Equip. Is Qualified | Manner of Qualification | Qualification Document |
|--|---|---|---|---|
| No. 019a (Flanged & Wafer Type Butt Valves) | Loss-of-Coolant Accident (LOCA) Radiation: 1×10^4 rads (based on 6 month LOCA). In addition, the 40 year radiation dose of 4×10^4 rads must be considered for a total possible radiation dose of 1.04×10^4 rads. | Radiation Level: 40 yr integrated - 2×10^4 rads | 2.0×10^4 rads gamma radiation at Isomedix, Inc. Parampany, NJ | Limitorqua Report No. 80003 |
| 8W-111A, B (Fuel Pool Cooler Section) 8W-112A, B (Fuel Pool Cooler Section) | Radiation: 1×10^4 rads (based on 6 month LOCA). In addition, the 40 year radiation dose of 4×10^4 rads must be considered for a total possible radiation dose of 1.04×10^4 rads. | 40 yr integrated - 2×10^4 rads | Same as above | Limitorqua Report No. 80003 |
| 8W-113A, B (Containment Iso- lation) | Radiation: 1×10^4 rads (based on 6 month LOCA). In addition, the 40 year radiation dose of 4×10^4 rads must be considered for a total possible radiation dose of 1.04×10^4 rads. | Radiation Level 10^4 rads | Unknown | Letter from Vendor C. Bell (GI) March 10, 1979 |

POOR ORIGINAL

503

308

Equipment Description & Mark No.
P.O. No-311/1113
Sector Containment Electrical
Emission - Con.A

Item 1 of 2

Penetration Assemblies

- Type IA - Instrumentation
IB - Control
IC, IIA, IIB, IIC, IID and
IIE - Low Voltage Power
III - Triaxial
IV - Thermocouples

Description of Assembly Environment

Loss-of-Coolant Accident (LOCA)

280°F 0 to 30 min
Reduce from 280°F 30 to 60 min
to 150°F 240 min
150°F 0 to 30 min
45 psig 0 to 30 min
Reduce from 45 to 0 psig
0 psig 4.2 x 10⁶ rad/a
Sprays
0-4 hrs solution of boric acid (2,000-
2,100 PPM boron) buffered to a pH of
8.5 to 11.0 with NaOH beyond 4 hrs
similar solution with a pH of 7 to 9.

Environment to which Equip. is Qualified

Chemical Spray - From 0-30 min. No chemical
spray was introduced from 20 min to 10 days
assembly was subjected to spray solution:
Boron content was .23 molar as H₂BO₃
NaOH = 10⁻⁴ to 4 x 10⁻² molar
pH = 5.0 to 8.0

Pressure and Temperature

Pressure >45 psig & >280°F 0 to 30 min
Decrease from 45 psig to 0 psig 0 to 30 min
and 280°F to 245°F 30 to 60 min
150°F + 20°F & 0 psig 1 hr to 10 days
-4°F

Radiation

1 x 10⁶ rads gamma radiation minimum

Manner of Qualification

Penetration assemblies were tested by
using a prototype with characteristics
pertinent to each individual type.
It was first exposed to radiation
then pressure and temperature and
finally chemical spray.

Qualification Document

Conax report "Maximum Emergency
Environmental Test Report for
Electrical Penetration Assemblies"
No. IPS-73.8 dated 5/13/75
Radiation Test Almaraz service
test conax report IPS-137.

POOR ORIGINAL

503 309

Equipment Description I Mark No.

Item 2 of 2

Splices (Field and Factory)

Description of Accident Environment

Loss of Coolant Accident (LOCA)

280°F Reduce from 280°F to 150°F
 150°F 45 psig Reduce from 45 to 0 psig
 0 psig 8.2 x 10⁻⁴ rads
 Spray: 0 to 4 hrs solution of boric acid (2,000-2,100 ppm boron) buffered to a pH of 8.5 to 11.0 with NaOH beyond a fire similar solution with a pH of 7 to 9.

Environment to which Equip. is Qualified

Chemical Spray - From 0+ -2:0 hr spray continuously with a solution of the following contents:
 Boron content = .21 molar (3,900 PPM)
 NaOH content = 10⁻⁴ to 4 x 10⁻⁴ MOLA
 pH = 7.7 to 7.8

Temperature and Pressure

280°F ± 45° psig Reduce from 45 to 0 psig
 Reduce from 280°F to 150°F
 Raised from 150°F to 280°F

Manner of Qualification

Splices were made using various representative cable types and sizes which had been attached to a prototype penetration assembly. The prototype was first subjected to radiation exposure, then temperature, pressure and chemical spray concurrently.

Qualification Document

Conax Report "Test Procedure and Report on Electrical Terminations Subjected to Design Basis Accident Environment" No. IFS-107 dated 10/5/73

Radiation: Almaraz Service Test
 Conax Report IFS-117.

Radiation

10 x 10⁷ rads gamma radiation minimum

POOR ORIGINAL

503 310

Equipment Description & Mark No.

P.O. No. 111/111
REACTOR CONTAINMENT ELECTRICAL
PERMEATION TESTER

Item 1 of 2

Penetration Assemblies
 Type IA - Instrumentation
 Type IB - Control
 Type IC, IIA, IIB, IIC, IID and
 IIE - Low Voltage Power

Description of Accident Environments

Main Steam Line Break (psi/g)
 3200g 0 to 2 min
 2800g 2 to 40 min
 1850g 240 min
 80 psi/g 0 to 40 min
 0 psi/g 0 to 40 min
 3.5 x 10⁶ rads 240 min

Environment to which Equip. is Qualified

(MSTB)
 2800g 0 to 30 min
 Range 2920g
 to 2200g
 Range 2450g
 to 1460g
 (Note 1)
 Range 67 to
 56 psi/g
 0 psi/g
 2.3 x 10⁶ rads gamma radiation minimum
 240 min

NOTE 1 - Temperature qualification by
 analysis per Qualification Document #2.

Manner of Qualification

(MSTB)

Penetration assemblies were tested
 by using a prototype with
 characteristics pertinent to each
 individual type. This was first
 exposed to radiation then pressure
 and temperature.

Qualification Documents

(MSTB)

1. QNDI Report "Maximum Emergency
 Environmental Test Report for
 Electrical Penetration Assemblies,"
 No. 110-71.4 Dated May 13, 1975.
2. PSAR Appendix X "Safety Related
 Equipment Temperature Transients
 During the Limited Main Steam
 Line Break" and LFC Comment 7.17
 of the same subject.

POOR ORIGINAL

503

811

Environment Description & M.A.T. No.
 P.O. No. 111/1111
 Reactor Containment Electrical
 Installation - SC-AM
 Item 1 of 2
 Splices (field and factory)

Description of Accident Experiments

Main Steam Line Break (MSLB)
 430°F 0 to 2 min
 240°F 2 to 40 min
 165°F >40 min
 40 psig 0 to 40 min
 0 psig >40 min
 3.4 x 10⁶ rads

Environment to Which Equip. Is Qualified

MSLB
 Raise from 109°F 0 to 30 sec
 to 253°F 1 to 2 min
 Raise from 253°F 2 to 30 min
 to 290°F 30 to 60 min
 282°F 60 min to 240 hr
 Range 184°F 0 to 30 sec
 to 294°F 1 to 30 min
 Range 160°F 30 min to 240 hr
 to 150°F 0 to 30 sec
 0 to 24 psig 1 to 30 min
 45 psig 30 min to 240 hr
 0 psig 30 min to 240 hr
 2.5 x 10⁶ rads gamma radiation minimum

NOTE 1 - Temperature

Qualification by analysis per Qualification
 Document #2.

Manner of Qualification

MSLB
 Splices were made using various
 representative cable types and
 sizes which had been attached to a
 prototype penetration assembly. The
 prototype was first subjected to
 radiation exposure, then temperature
 and pressure, concurrently.

Qualification Document

- MSLB
 1. COMAR Report "Test Procedure and
 Report on Electrical Terminations
 Subjected to Design Basis Accident
 Environment" No. 1P5-107
 dated October 5, 1973.
 2. FSAR Appendix 3C "Safety Related
 Equipment Temperature Transients
 During the Limited Main Steam
 Line Break" and NSC Comment 7.17
 of the same subject.

POOR ORIGINAL

503 312

Equipment Description & Mark No.

E.O. MA-155

Inside Recirc. Spray Pump Motor
General Electric - 100 hp, 440 V,
1.1 S.F., Class B insulation,
Model: 5K3175-J1B

Description of Accident EnvironmentLoss-of-Coolant Accident (LOCA)

| | |
|------------------------|---------------|
| 280°F | 0 to 30 min |
| Reduce from 28°F | |
| to 150°F | 30 to 60 min. |
| 150°F | >60 min. |
| 45 psig | 0 to 30 min |
| Reduce from 45 | |
| to 0 psig | 30 to 60 min |
| 0 psig | >60 min |
| 1.2×10^7 rads | |

Spray: 0 to 4 hr solution of boric acid (2000-2100 ppm boron, buffered to a pH of 8.5 to 11.0 with NaOH. Beyond 4 hrs similar solution with a pH of 7 to 9.

Environment to Which Equip. Is QualifiedLoss-of-Coolant Accident (LOCA)

Pressure and Temperature - 45 psig at 275-280°F from 0-30 min. Pressure was reduced to 0 psig at 100°F $\pm 5^\circ$ F within next 30 min. During this 60 min steam exposure motor was sprayed with chemical solution at 20 gpm. Motor was at full load throughout. Four cycles were run as described above, stopping motor between each cycle to take readings. At the fifth cycle till end of 7 day temp reduced to 150°F at 0 psig and sprayed continuously with chemical solution.

Radiation - Motor was exposed to an equivalent dose of 2×10^6 rads at a dose rate of $<0.5 \times 10^6$ rads/hr

Chemical Spray - Spray continuously 0-7 days with a water solution of boric acid, lithium hydroxide and sodium hydroxide with the following concentrations:

Boron - 0.23 molar (as boric acid)
lithium hydroxide - 1.0×10^{-2} molar
sodium hydroxide - 1.0×10^{-2} molar

The above will result in a pH of 5.5 to 8.5.

Manner of Qualification

Motor was tested sequentially by first subjecting it to the cumulative radiation dose and then the steam/-chemical spray with elevated temperature and pressure.

Qualification Document

Topical Report on G.E. Vertical Induction Motors Inside Containment Recirculation Spray Pump Motors Surry Power Station - Second Addendum to Cover Heat Aging, Radiation Exposure, Vibration, Steam/Chemical Spray Exposure Qualification Tests - Docket No 50-260 and 50-261 by M. W. Shee Vertical Motor Products Section General Electric Company, San Jose, California June 12, 1973 (pages 34 to 64)

POOR ORIGINAL

Equipment Description & Mark No.

KA-255

Inside Recirc. Spray Pump Motor
General Electric - 100 hp, 440 v,
1.15 S.F., Class B Insulation,
Model: 5X6319XJ1B

Description of Accident Environment

Main Steam Line Break (MSLB)

430°F 0 to 2 min
390°F 2 to 60 min
165°F >60 min
40 psig 0 to 60 min
0 psig >60 min
 3×10^4 rads

Environment to Which Equip. Is Qualified

Main Steam Line Break (MSLB)

Temperature - Motor was qualified to the design environment by analysis.

Pressure - See LCA qualification for this motor.

Radiation - Motor was exposed to an equivalent air dose of 2×10^4 rads at a dose rate of $<0.5 \times 10^4$ rad/hr.

Manner of Qualification

The motor was qualified by utilizing the LOCA qualification test results i.e., radiation exposure, temperature, pressure. A heat transfer calculation was performed (Ref. PSAR, Section 3C) to obtain the maximum surface temperature that will be experienced during a MSLB. This value (271°F) was then compared to the value (280°F) that the motor was tested for. Since the motor was qualified for the LOCA at a temperature of 280°F, the lower surface temperature of 271°F proved the acceptable operation of the motor during a MSLB.

Qualification Document

1. Final Safety Analysis Report - Section 3C, (pages 1 to 21)
2. Topical Report on GE Vertical Induction Motors - Inside Containment Recirculation Spray Pump Motors - Surry Power Station - Second Addendum to Cover Heat Aging, Radiation Exposure, Vibration, and Steam/Chemical Spray Exposure Qualification Tests - Docket Number 50-280 and 50-281 by M. W. Sheets
Vertical Motor Products Section,
General Electric Company -
San Jose, California
June 12, 1973
(pages 36 to 64)

POOR ORIGINAL

503 314

Equipment Description & Mark No.

SCV-80 100A, B, C, D, E, F
 CC 100A, B, C
 CC 101A, B
 CC 102A, B, C, D, E, F
 CC 103A, B
 CC 104A-1, A-2, B-1, B-2, C-1, C-2
 CC 105A, B, C
 CV 106A, B, C, D
 DA 107A, B
 DG 108A, B
 LA 109A, B, C, D, E, F, G, H
 LA 110A, B
 B-1 101A, B
 B-1 102A, B
 B-1 103A, B
 B-1 104A, B
 B-1 105A, B
 B-1 106A, B
 B-1 107A, B
 B-1 108A, B
 B-1 109A, B
 B-1 110A, B
 B-1 111A, B

Description of Accident Environment

Loss of Coolant Accident (LOCA)
 Reduce from 280 psig to 150 psig
 30 to 40 min
 150 psig
 45 psig
 Reduce from 45 to 0 psig
 30 to 40 min
 0 psig
 7.2 x 10⁵ rads
 Sprays
 0-4 hrs Solution of boric acid (2000-2500 ppm boron) buffered to a pH of 8.5 to 11 with NaOH 24 hrs
 Similar solution with a pH of 7 to 9
 Main Steam Line Break
 430 psig
 280 psig
 165 psig
 40 psig
 0 psig
 3 x 10⁵ rads

Environment to which Equipment is Qualified

LOCA
 Reduce from 460 psig to 340 psig
 Reduce from 340 psig to 240 psig
 150 psig
 128 psig
 118 psig
 Reduce from 118 to 25 psig
 13.5 psig
 Radiation Exposure 5 x 10⁵ rads
 0 to 2 min
 2 to 8 min
 8 to 35 min
 52 min to 14 days
 0 to 2 min
 2 to 32 min
 32 to 34 min
 52 min to 14 days

MLF
 Uncompassed by above LOCA Test

Manner of Qualification

Sequential Test
 Radiation followed by Environmental Exposure

Qualification Document

Franklin Institute
 Research Laboratories
 (FRI); Test Report F-C4539

POOR ORIGINAL

503 315

503 31

MR. INTERSECTION & MARK NO.

Q. No. 1A-11
V. 1A-11
1A-11-01 (1981)
1A-11-02 (1981)
1A-11-03 (1981)
1A-11-04 (1981)
1A-11-05 (1981)

Description of Accident Environment

Loss-of-Coolant Accident (LOCA)
Radiation: 1×10^6 rads
Heated on 5 month LOCA. In
addition, the 40 year radiation
dose of 1×10^6 rads must be
considered for a total possible
radiation dose of 1.05×10^6 rads.

Environment to which Equip. is Qualified

Loss-of-Coolant Accident
Radiation: 1×10^6 rads

Manner of Qualification

Loss of Coolant Accident
Tested

Qualification Document

Loss of Coolant Accident
Letters dated 3/21/79 and
4/25/79 certifying compliance
with IEEE 323 Int. Imperial Corp

POOR ORIGINAL

Equipment Description & Mark No.

Marathon Series 200 and 1500
terminal blocks (Phenolic)

Connectron Type MSZ-3,
MSZ-1 and PSU's Terminal
Blocks. (Nylon)

Thermo-Electric Terminal
Block No. 3225 (Thermosetting
Phenolic)

GE Terminal Blocks
EB5 and EB25 (Phenolic)

Westinghouse Type TBAL
Terminal Blocks (Nylon)

Description of Accident Environment

Loss-of-Coolant Accident (LOCA)
Extrapolation: 1×10^6 rads (Based on
4 month LOCA). In addition, the 40 year
radiation dose of 4×10^6 rads must be
considered for a total possible radiation
dose of 5.0×10^6 rads.

Environment to Which Equip. Is Qualified

Radiation: Unfilled Phenolic can with-
stand a gamma exposure dose over
 1×10^6 rads before there is any signifi-
cant effect on the phenolic.

Radiation: Nylon has been test to a gamma
exposure dose over 10^6 rads with no effect.

Manner of Qualification

Terminal Block material was compared
with identical material for the
effects high level radiation

Qualification Document

REIC Report No. 21 Radiation
Effect Information Center,
Columbus, Ohio. Buchanan Product
Manual Insert 2.1 Rev. 8/23/76

POOR ORIGINAL

503 317

| Environment Description & Park No. | Description of Accident Environment | Environment to which Equip. is Qualified | Manner of Qualification | Qualification Document |
|--|---|---|--|--|
| Chonite Termination Tape Field Purchased | Loss of Coolant Accident (LOCA) | LOCA | Test - Sequential | Okonite's Engineering Report No. 141 dated February 29, 1972 |
| T-55 Insulating Tape | 280°F Reduce from 280°F to 150°F 150°F 45 psig Reduce from 45 to 0 psig 0 psig 7.2 x 10 ⁵ rads Spray: 0-4 hr solution of boric acid (2,000-2,100 ppm boron) buffered to a pH of 8.5 to 11 with NaOH or a similar solution with a pH of 7 to 9 | Ages. 168 hr at 121°C Irradiated to 2 x 10 ⁵ rads PWR Exposure: 80 psig 324°F for 8 hours 16 psig 325°F for 7 days Spray 10,000 ppm boric acid buffered with NaOH to a pH of 10.5 throughout the PWR exposure period. SWR Exposure: A series of transient cycles each consisting of a rise to a specified pressure and temp. for a specified time and a gradual return to initial conditions. Following transient cycles 100 day exposure to live steam 0 psig, 212°F | Temperature - Analysis Maximum calculated surface temperature during limiting PSIB is 270°F which does not exceed qualification temperature of 324°F given in Okonite Engineering Report No. 141. Pressure and Radiation - Test Refer to LOCA qualification | SWR Calculation ES-103 Equipment Temperature Transient for Okonite Tape Splices Okonite's Engineering Report No. 141 dated February 29, 1972 |
| T-55 Jacketing Tape | Main Steam Line Break (MSLB) | MSLB | | |
| | 330°F 280°F 145°F 40 psig 0 psig 3 x 10 ⁵ rads | Time as "Description of Incident Environment" 0 to 2 min 2 to 40 min 40 min 0 to 40 min 0 psig 3 x 10 ⁵ rads | | |

POOR ORIGINAL

503 318

Equipment Description & Mark No.

Raychem heat shrinkable field
splicing material HCSF type coated
with Type-M adhesive

Raychem high voltage terminations
EVT

Raychem high voltage bus connectors
EVC

Description of Accident Environment

Loss-of-Coolant Accident (LOCA)

Radiation: 1×10^6 rads (based on
6 month LOCA). In addition, the
40 year radiation dose
of 4×10^6 rads must be
considered for a total possible
radiation dose of 1.04×10^7 rads.

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6 month LOCA). In addition, the
40 year radiation dose of 4×10^6 rads
must be considered for a total possible
radiation dose of 1.04×10^7 rads.

Environment to Which Equip. Is Qualified

Postulated loss-of-coolant accident with a
radiation exposure of 1.5×10^6 rads plus
an additional 5×10^6 rads of gamma
irradiation for a total qualified dose of
 2×10^7 rads

Irradiation of the materials in a cobalt
60 gamma source at 0.50 Mrads per hour to
total doses of 2×10^7 rads

Irradiation of the material with 5×10^6 rads

Manner of Qualification

Combined thermal and radiation aging
period followed by a simultaneous
exposure to steam, chemical spray
and gamma radiation

Sequence of test 1st thermal aging
then irradiation

Sequence of test 1st thermal aging
followed by irradiation

Qualification Document

Raychem Technical Report F-CN033,
Jan. 1975

Raychem Report #71100 Revision 1

Letter from Raychem dated 4/22/79
and EPSCRT FRO Raychem Report
ET1502/1

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