MISSISSIPPI POWER & LIGHT COMPANY
Helping Build Mississippi
P. O. BOX 1640, JACKSON, MISSISSIPPI 39205

NUCLEAR PRODUCTION DEPARTMENT

December 21, 1981

Mr. Robert L. Tedesco
Assistant Director of Licensing
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Tedesco:

SUBJECT: Grand Gulf Nuclear Station
Units 1 and 2
Docket Nos. 50-416 and 50-417
File: 0260/0277/L-860.0/L-814.1
Re: AECM-81/231; July 1, 1981
AECM-81/335; September 1, 1981
Equipment Qualification
NUREG-0588 Evaluation
Supplement 2
AECM-81/502

Mississippi Power & Light Company's letter of July 1, 1981 (AECM-81/231) provided evaluations of Class 1F electrical equipment qualification to the requirements of NUREG-0588. The results of Mississippi Power & Light Company's review indicates that the majority of the Class 1E electrical equipment was fully qualified, or that testing performed to date was sufficient to justify interim operation.

Since Mississippi Power & Light Company's July 1, 1981 submittal, a successful NRC audit was conducted during the week of October 19 to 22, 1981.

The purpose of this letter is to provide additional information to the Equipment Qualification Branch for equipment identified previously (AECM-81/335) as needing interim operation justification prior to fuel load. With the attached information, qualification or interim operation justification will have been established on all equipment at Grand Gulf Nuclear Station, Unit 1 subject to the NUREG-0588 harsh environment review.

The following information is provided:

A048
s
1/1

A. Attachment No. 1

Provides interim operation justification for equipment previously identified as needing interim operation justification prior to fuel load.

B. Attachment No. 2

Attached is Revision 1 to Section 6.0 of the NUREG-0588 submittal introduction document. This revision clarifies radiation calculation methodologies as requested by the NRC November 10, 1981 audit of the containment dose model.

If you have any questions regarding this information, please advise.

Yours truly,

L F Dale

L. F. Dale
Manager of Nuclear Services

RAB/TMJ:dr

Attachment

cc: Mr. N. L. Stampley
Mr. R. B. McGehee
Mr. T. B. Conner
Mr. G. B. Taylor

Mr. Richard C. DeYoung, Director
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

ATTACHMENT 1

EQUIPMENT REVIEWED AND JUSTIFICATION
FOR INTERIM OPERATION IS ATTACHED

1.	N/A	Electric Interface
2.	J-301	Rosemount Transmitter (GB9)
3.	J-359.1	CGC Heat Tracing
4.	J-363	Area Radiation Detectors
5.	M-190	Hydrogen Recombiner
6.	M-632	SGTS Motor, Heater, and Heater Controls
7.	M-50.1	Drywell Purge Compressor
8.	M-242	Air Operated Valves
9.	M-242/251	D. C. Motor Operated Valves
10.	M-257/58	Air Operated Valves
11.	NSSS	1151 Rosemount Transmitters
12.	NSSS	1152 Rosemount Transmitters

SUPPLEMENT 2

I. EQUIPMENT DESCRIPTION

Qualification of Class IE equipment has been done on a component basis, with little consideration by the manufacturer as to how their device would interface with other components. The method in which electrical circuits are connected to devices, including any ancillary equipment, is considered the "electrical interface".

To properly achieve a complete review of the electrical interface, it has been broken down into three areas:

1. Equipment wire entrance sealing
   Specification: 9645-E-062.3

   a) Manufacturer: RAYCHEM
      Component: Heat Shrinkable Tubing
      Model #: Type WCSF-N
      Test Reports: RAYCHEM Report II's
      EDR-2001, 5008, 5009, 5011, 5019, 5021, and
      5040 - Wyle Laboratories Report #58442-1

   b) Manufacturer: RAYCHEM
      Component: Nuclear Cable Breakout and end sealing kits
      Model: 403A112-52 (Cable Breakout)
      101A021-52 (End Cap)
      Test Report: Wyle Laboratories Report
      #58442-2, RAYCHEM
      Report II EDR-5043

   c) Manufacturer: RAYCHEM
      Component: Nuclear Motor Connection Kits
      Model: N-MCK
      Test Report: 58442-3

2. Terminal Blocks

   a) Manufacturer: KULKA
      Component: Terminal Blocks w/glass filled ALKYD material
      Model #: 5TB, 7TB, 17TB, & 27TB
      Test Report: IPS-586

   b) Manufacturer: KULKA-DIALLYL PHATHALATE
      Component: Terminal Blocks w/GDI-30F glass-filled Diallyl
      Model #: 600J-J, 601J-5, 602J-J, 604J-J
      Test Report: IPS-675

   c) Manufacturer: Buchanon
      Component: Terminal Blocks
      Model #: 0222, and 0524
      Test Report: F-C 3441

d) Manufacturer: TRW-Cinch, Marathon
Component: Terminal Blocks
Model #: TRW-Cinch, 141 & 542 series
Marathon - 300 series and 1433563

e) Manufacturer: General Electric
Component: Terminal Blocks
Model #: CR151B, CR151D, CR2960, EB-5, and EB-25
Test Report: PEN-TR-80-83

3. Moisture excursion within the wire strands
Documents Reviewed: NRC Circular 79-05
Moisture leakage in stranded wire conductors

Bechtel Power Corp.'s "Discussion of the Electrical Interface Review" (Ref. MPB-81/0616 dated December 10, 1981).

II. QUALIFICATION STATUS AT TIME OF ORIGINAL SUBMITTAL (July '31)

At the time of the original submittal, no test reports were available. It was determined, based on the above, that the equipment did not meet NUREG-0588 Category I requirements. However, operating experience from other plants has shown satisfactory use in normal environments. It was stated, therefore, that the equipment could be used for an interim period until it could be qualified.

III. QUALIFICATION STATUS AT TIME OF SUPPLEMENT 1 (Sept. '81)

No additional comments were added. No change in justification for interim operation was given.

IV. QUALIFICATION UPDATE

A. Equipment Sealing:

It is recognized that equipment which has been LOCA tested has generally been sealed at the electrical supply entrance to prevent LOCA environments from entering the device. Field application however, may utilize a local junction, which has weep holes &/or is open via open conduit (See Figure 1). Equipment sealing is therefore advisable whenever a device is located in a pressure harsh environment which would serve as a driving force for the LOCA environment to enter the device. The sealing material chosen is the RAYCHEM WCSF-N breakout assembly with heat shrink tubing.

Qualification of the RAYCHEM WCSF-N Compound, as used with
1) Nuclear in-line cable splice assemblies
2) Heat shrinkable tubing
3) Nuclear motor connection kits
4) Nuclear cable breakout and end sealing kits
was documented by Wyle Laboratories on three separate test reports.

The actual testing, however, was conducted at one time, with four (4) specimens listed above included. Results of that test are as follows:

1) Test specimens were thermally aged for 1000 hours at 150°C (302°F). Data was collected and an Arrhenius thermal plot was constructed. Based on a conventional Arrhenius analysis, with a continuous operating temperature of 91°C, a demonstration of 40 year qualified life was shown.

2) Test specimens were subjected to gamma radiation for a Cobalt-60 source. The total dose given ranged from 200 MRADS to 290 MRADS, which is greater than the integrated normal and accident dose of 56.1 MRADS. (Seal system has sufficient thickness of RAYCHEM WCSF-N material to act as shield against beta radiation.)

3) Test specimens were subjected to a LOCA/MSLB event (See Figure 2 for temp./pressure profile) which well enveloped the GGNS DBA profile.

B. Terminal Blocks

One of the more common items in electrical construction is the terminal block. This standard component is manufactured by a number of firms and is used practically everywhere in electrical circuits. As shown on Figure 1, terminal boxes can be located within a NEMA-4 box or supplied as part of the locally mounted equipment. The variety and type of terminal blocks supplied by the vendors is numerous, however test reports have been received and are currently under review. A preliminary review of the subject test reports has shown the following:

1) Test samples have, at a minimum, been thermally aged for 100 hours at 150°C. Application of Arrhenius methods have shown at least a 40 year qualified life.

2) Test samples were exposed to at least 200 MRADS, which is far greater than the 56.1 MRADS (gamma) taken to be the total integrated normal and accident gamma dose. Terminal boards are located inside metal NEMA boxes. The boxes are thick enough to shield the boards from beta radiation due to plateout and airborne sources external to the boxes. The boxes are small enough so that the beta dose due to the airborne cloud internal to the box does not cause total beta plus gamma dose to exceed 200 megarads.

3) Under LOCA conditions, certain terminal blocks (Example: KULKA 600 series) had a decrease in insulation resistance. When used in current loop instrument circuits or high voltage power circuits (i.e. 480v and above), these terminal blocks will be replaced with in-line splices and sealed using qualified heat shrink materials, discussed in paragraph IV-A, prior to fuel load. The design documents which identifies equipment to be sealed and wiring to be spliced, in accordance with criteria discussed herein, is drawing E-0730 and field electrical termination cards.

C. Moisture Leakage in Stranded Wire Conductors

The IE Circular No. 79.05 dated March 20, 1979 referenced a checkout test for cable leaks performed at Sandia Laboratories in August 1978. This test shows that most stranded wire conductors, when subjected to a differential pressure across the conductor ends, will leak steam or moisture between the strands of wire. The test has also shown that solid conductors, under similar conditions, do not leak. The circular also stated that moisture incursion into a qualified splice is not possible.

The Sandia report also indicates that moisture incursion is dependent on duration and pressure difference. For the duration and magnitude of the predicted LOCA/HELB pressure transient for Grand Gulf, only stranded wire with an unsealed end a distance (defined by note below) from a sealed instrument will be affected by moisture incursion. A nominal distance of 50' was generally applied.

Stranded wires terminated in local terminal boxes adjacent to sealed equipment will be determinated and in-line spliced with a qualified splicing procedure as described in IV A.

NOTE: "A Distance" was determined, on a case by case basis, using an engineering evaluation developed from the following:

1) Size of wire
2) Number of strands
3) Size of strands
4) Type of wire
5) NUREG/CR-1682 SAND 80-1957 RV
6) US NRC IE Circular No. 79-05
7) NUREG/CR-0696 SAND 79-2254

V. QUALIFICATION STATUS WITH REGARD TO INTERIM OPERATION JUSTIFICATION

Justification

Summarizing the above, equipment sealing methods reviewed should be able to meet NUREG-0588 Category I requirements, after a detailed test report review has been completed. The terminal blocks, after the required in-line splice replacement program has been completed, should also meet Category I or II requirements (depending on purchase date). A complete test report review is underway. In-line splices will replace stranded wire terminations in areas adjacent to sealed equipment.

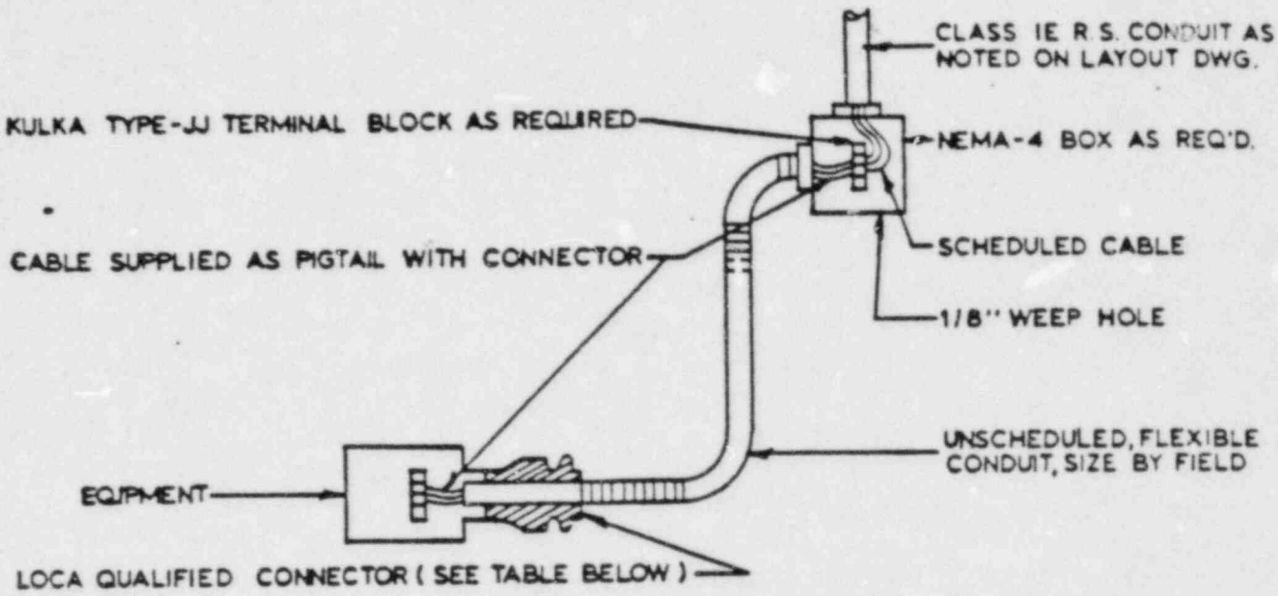
Based on the above, safe operation of the electrical interface in the plant until June 1982 is justified.

VI. FOLLOW UP PROGRAM

The review of the subject test reports will be completed by June 1982.

MPL NO. SR912255E

FIGURE 1



TYPICAL INSTALLATION FOR LOCA QUALIFIED CONNECTORS (SEE TABLE SH. 55A)

I/F

ELECTRICAL FILE Q

FIGURE 1

MPL NR SR91 2255E

No.	DATE	REVISIONS	BY	CH'K	DESIGN SUPV	ENG'R	PROJ ENGR	APP'R
3	2-3-81	VOID DCN #3, REV & MOVED TABLE TO SH. 55 A	DG					N/R
2	4-3-80	INCORP. DCN #2 & REVISED AS SHOWN.						N/R
1	1-15-80	INCORP. DCN #1 AND REVISED AS SHOWN						N/R
0	10/31/79	ISSUED FOR CONSTRUCTION						

SCALE NONE | DESIGNED | DRAWN | CHIEF ENGR

BECHTEL

RACEWAY NOTES, SYMBOLS & DETAILS
MISSISSIPPI POWER & LIGHT COMPANY
GRAND GULF NUCLEAR STATION

JOB NO. 9645

Drawing No E-0725 | REV 3

D-13276 8/78 (G231-...)

FIGURE 2

The test pressure profile envelopes the DBA profile for the severe portions of the curve. The fact that for the low pressure region the test profile does not address the DBA profile is not considered to be a concern because the high pressure region of the test profile was much more severe than that required using an activation energy of 1.26 eV and an Arrhenius calculation, the test profile can be extrapolated to envelope the entire GGNS DBA temperature profile.

Loss of Coolant Accident and Main Steamline Break (LOCA/MSLB) Environmental Exposure

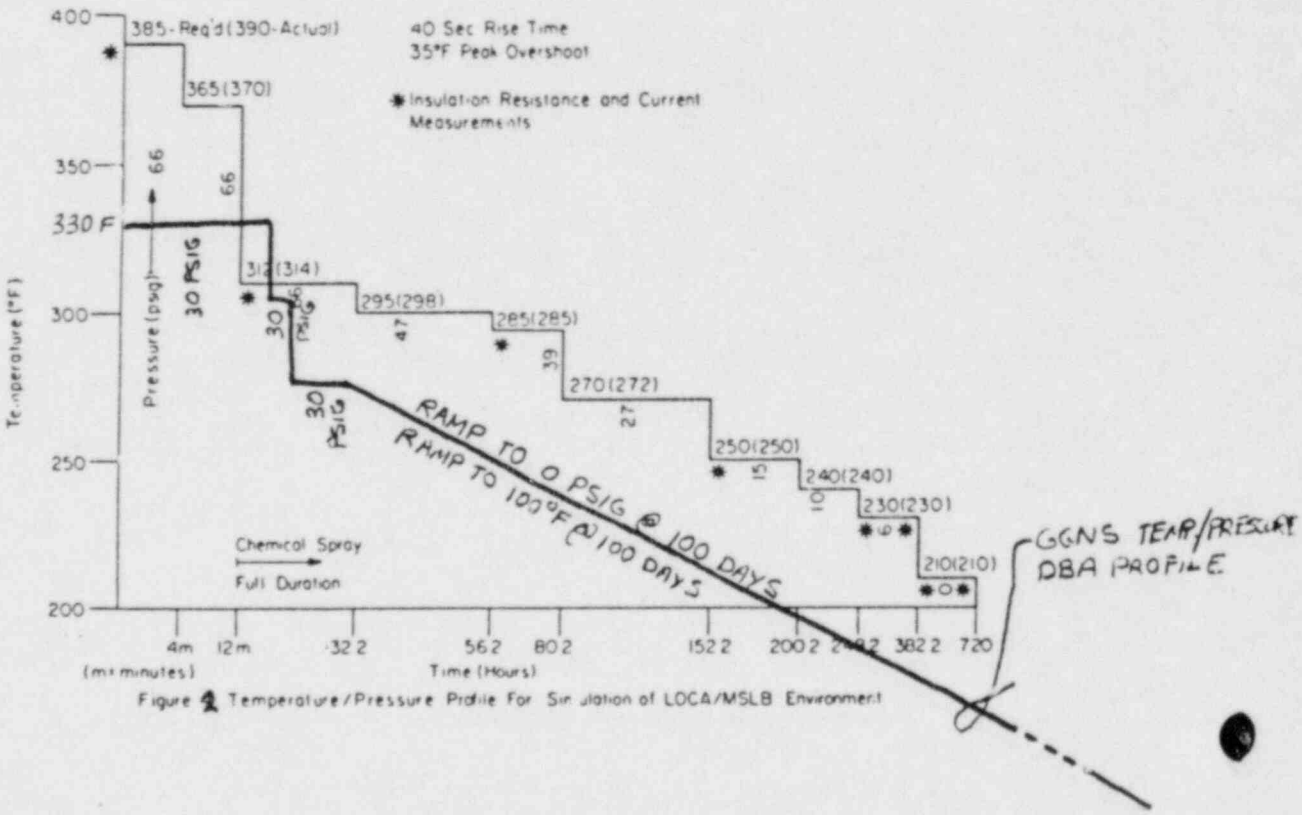


Figure 2 Temperature/Pressure Profile For Simulation of LOCA/MSLB Environment

SUPPLEMENT NO. 2

Equipment Description

A.	SPECIFICATION NO.:	9645-J-301.0A
B.	COMPONENT:	Level Transmitter
C.	MANUFACTURE:	Rosemount
D.	MODEL NO.	1153GB9

Qualification Status at Original Submittal (July 1981)

The original testing of the Rosemount Transmitter Model 1153GB9 demonstrated satisfactory operation under the required environments. However, during steam/temperature testing a similar transmitter, Model 1153HB7,95, failed due loss of silicone oil in the "high" side of the sensor module. This leakage was due to a solder failure which was the method of sealing the fill tube whereby the oil was inserted in the sensor cell. This failure was used to disqualify the 1153GB9 in the original submittal.

Qualification Status at Supplement 1 Submittal (September 1981)

Rosemount, Inc. was performing supplementary testing on redesigned Model 1153GB9.

Qualification Status Update (December 1981)

In the interim period, Rosemount, Inc. has developed a new method of sealing the sensor oil fill tube employing spot welding and TIG welding. Rosemount has tested the new design per Rosemount procedure #48123. The results of the supplementary testing are described in Rosemount Test Report #88114, Rev. A. The Supplementary test report #88114, Rev. A successfully proved the adequacy of the redesign with no anomalies noted.

Qualification Status with Regard to Interim Operation Justification

No interim operation justification is needed because the combined results of Rosemount Test Reports #88114, Rev. A and #108025 adequately demonstrates that the Rosemount Model 1153GB9 electronic transmitter meets Category 1 requirements of NUREG-0588.

Follow Up Program

None

SUPPLEMENT 2

I. Equipment Description

SPECIFICATION NUMBER: 9645-J-359.1
COMPONENT: Comb. Gas Control; Heat Tracing System
MANUFACTURER: Thermon Manufacturing Company
PLANT I.D. NUMBER: (See Attachment)
MODEL NUMBER: EQ-2399-80

Heat tracing cable is located in containment for the purpose of maintaining hydrogen analyzer sample lines at 275°F, control panel is located in the Auxiliary Building

II. Qualification Status at Time of Original Submittal (July 1981)

The equipment associated with this specification was still undergoing testing at the time of the July 81 submittal of "Response to NUREG-0588." No test data or status was available at that time.

III. Qualification Status at Time of Supplement 1 (September 1981)

Supplement 1 stated that a justification for interim operation would be provided prior to fuel load, based on a satisfactory completion of 30 days of a 100 day LOCA test, due to be completed by January 1982.

IV. Qualification Status Update

On November 5, 1981, the Southwest Research Institute provided Thermon Manufacturing Company with an interim status report of the nuclear component testing program underway at SWRI.

The test was conducted in two (2) separate parts, one covering the control panels (located outside containment), while the other covered the heat tracing cable assemblies and RTD's (both inside and outside containment).

Following a summary of the testing completed as of November 1981.

1. Heat tracing control panels (located outside containment):

   Thermal Aging - All components of the panel were thermally aged at 120°C for from 1056 to 1138 hours with minimum activation energy of 0.71eV for all materials and maximum normal temperature of 80°F (26.68°C), using the Arrhenius Method, the components of the heat tracing control panels have a qualified life of 40 years.

   Irradiation - All components of the subject panels have been exposed to 5.25×10^4 rads of gamma radiation. With the total of the 40 year normal and a 180 day integrated accident dosage equal to 5.54×10^3 rads, the test dosage envelopes the plant requirements with margin.

LOCA Test - The control panel is currently being subjected to an accident environment simulation test. While exposed to 119°F at 90% or greater humidity, the panel has completed 29 days of a 100 day LOCA test, remaining in a functional condition. Plant accident conditions around the panel installation location are non harsh therefore this test exceeds requirements.

2. Heat Tracing Cable Assembly and RTD's (Inside and Outside Containment):

Test were conducted using the worst case environments (inside containment)

Thermal Aging - The cable assembly and RTD's were thermally aged at 590°F (310°C) for 143.5 hours. The normal operating temperature of the heat tracing cable is 275°F, with both the normal and accident room temperatures (Table B-2 and Figure B-8) at or below 200°F.

Using a 1.0eV activation energy and the Arrhenius Equation, the qualified life is 40 years with margin.

Irradiation - The cable assembly and the RTD's have been exposed to 8.4×10^6 rads of gamma radiation with the total of the 40 year normal and a 180 day integrated accident dosage equal to 7.71×10^6 rads, the test dosage envelopes the plant requirements with margin.

Beta radiation is of no concern as the cable assembly and RTD's are enclosed in stainless steel sheathing.

Functional Testing - Functional tests performed before, periodically during, and after both thermal and radiation aging were successful. Prior to the seismic testing however, an open circuit was found in the heat tracing cable. Investigations by Thermon, after the assembly was disassembled, determined the cable, at the point of failure, had a manufacturing defect (conductors not spaced per specification). Since this type of cable has already passed similar testing programs for other utilities Thermon concluded this was a random failure. A new cable assembly is currently undergoing thermal and radiation aging testing, which will be followed by vibration degradation (seismic tests).

V. Qualification Status with Regard to Interim Operation Justification:

Based upon the above information, safe operation of the plant until June 1982 is justified.

VI. Follow Up Program

Equipment associated with this specification is still in the testing phase at this time. The equipment will be qualified by test by June 1982, or as soon thereafter as possible.

J-359.1

ATTACHMENT I

MPL Numbers:	1EG1-T003	Inside Containment
	1EG1-T001	Inside Containment
	1EG1-TE-N038 A&B	Inside Containment
	1EG1-TE-N042 A&B	Inside Containment
	1EG1-T002	Outside Containment
	1EG1-T004	Outside Containment
	1EG1-T006	Outside Containment
	1EG1-T008	Outside Containment
	1H22-131'	Outside Containment
	1EG1-TE-N039 A&B	Outside Containment
	1EG1-TE-N040	Outside Containment
	1EG1-TE-N041	Outside Containment
	1EG1-TE-N043 A&B	Outside Containment
	1EG1-TE-N044	Outside Containment
	1EG1-TE-N045	Outside Containment
	1H22-P131B	Outside Containment
	1H22-P139 A&B	Outside Containment
	1H22-P143	Outside Containment
	1H22-P144	Outside Containment

KEY: P Denotes Panel
T Denotes Cable
N Denotes RTD

J-359.1

SUPPLEMENT 2

I. EQUIPMENT DESCRIPTION

Specification No.:	9645-J-363
Component:	Area Radiation Monitoring Detector/Cable
MP&L No.:	1021-RE-N048A,B,C,D/D21-T002
Manufacturer:	Victoreen/Boston Insulated Wire & Cable Co.
Model No.:	877-1/RG-59B/U Coaxial

II. QUALIFICATION STATUS AT TIME OF ORIGINAL SUBMITTAL (July 1981)

The review on Specification 9645-J-363 was incomplete as testing was still under way.

III. QUALIFICATION STATUS AT TIME OF SUPPLEMENT 1 (Sept. 1981)

A test report was received from Victoreen involving the radiation detector and the cable assembly. A preliminary review of the report (Victoreen Report 950.301) was performed with the expectation that a complete review would yield qualification. The review was to be completed prior to fuel load.

IV. QUALIFICATION STATUS UPDATE

Victoreen Qualification Report 950.301 has been reviewed for qualification of the Victoreen Model 877-1 Radiation Detector and Victoreen Model 878-1 cable assembly. The Model 877-1 Detector is the same model employed at GGNS. The 878-1 cable assembly involves the cable itself along with necessary connectors and seals. The GGNS cable is BIW Model RG-59 B/V coaxial. According to Section IV paragraph 3.2 of Report 950.301, the cable employed in the model 878-1 cable assembly is the cable described in BIW Report B913 of which the model RG-59 B/V coaxial is a member. Therefore, Victoreen Report 950.301 is used to qualify the detector and connectors and BIW Report B913 is used to qualify the cable itself.

A comparison of test profiles as compared to required profiles reveals the following:

(1) detector and cable assembly were thermally aged to 40 years, and LOCA testing for 30 days reached peaks of 148 psia, 357°F, and radiation exposure of 2.2×10^8 rads. This compared favorably with predicted environments of 44.7 psia, 330°F and 2.88×10^7.

(2) cable was thermally aged to a 40 year qualified life, and LOCA tested for 159 days reaching peaks of 120 psia, 340°F, and radiation exposure of 200×10^6 RADS. This also compares favorably with a predicted environment of 44.7 psia, 330°F, and 28.8×10^6 RADS.

V. QUALIFICATION STATUS WITH REGARD TO INTERIM OPERATION JUSTIFICATION

The equipment of specification 9645-J-363 is justified for interim operation to June 1982.

VI. FOLLOW UP PROGRAM

A detailed research of the data in the above mentioned test reports will be conducted to yield full qualification to June 1982.

NOTE: Test anomilies were experienced relative to moisture excursion into the electrical connector via telecon of 12/16/81 to Ajit Rawtani, Bechtel will ensure that equipment sealing is performed on this device to ensure this anomolie does not affect our qualification.

SUPPLEMENT 2

Equipment Description

A. Specification No.: 9645-M-190.0
B. Component: Electric Hydrogen Recombiner/Hydrogen Recombiner Power Supply
C. Manufacture: Westinghouse
D. Model No.: Model B

Qualification Status of Original Submittal (July 1981)

A. Description of Extensive LOCA Testing

The hydrogen recombiner has been extensively LOCA tested (pressure, temperature, and humidity) as follows by Westinghouse:

1. 0-4 hours: 316°F, 85 psia, saturated steam
2. 4-24 hours: 259°F, 35 psia, saturated steam
3. 1-22 day: 155°F, 20 psia, saturated steam
4. 23-352 day: 155°F, 20 psia, saturated steam (with variations in temperature from 138°F to 200°F).

The Grand Gulf environments are as follows:

1. 0-1 hour: 125°F to 200°F, 30 psia, 100% humidity
2. 1-10 hour: 200°F, 30 psia, 100% humidity
3. 10-30 hour: 200°F to 176°F, 30 psia, 100% humidity
4. 30-300 hour: 176°F to 125°F, 30 psia to 20 psia, 100% humidity
5. 300 hour-100 day: 125°F to 100°F, 20 psia to 14.7 psia, 100% humidity

Comparison of the test profile and the Grand Gulf required profile illustrates the extensive amount of margin that exists between the tested and required profiles.

B. Hydrogen Recombiner

Did not meet Category 1 requirements of NUREG-0588 for the following reasons:

1. The affects of beta radiation not known (required=280×10^6 Rads (beta) + 11×10^6 Rads (gamma) = 291×10^6 Rads TID) vs. (Tested = 200×10^6 Rads TID)
2. Questionable aging data
3. Insufficient containment spray testing
4. Environmental conditions used in 330 day LOCA testing not clearly defined

C. Hydrogen Recombiner Power Supply

Did not meet Category 1 requirements of NUREG-0588 due to insufficient radiation testing (radiation is the only harsh environment).

Qualification Status at Supplement 1 Submittal (September 1981)

A. Hydrogen Recombiner

Interim operation justification based on extensive LOCA testing at pressure, temperatures, and humidity that far exceed the required Grand Gulf profiles with the question of beta radiation to be addressed prior to fuel load.

B. Hydrogen Recombiner Power Supply

Interim operation justification based on temporary shielding of power supply to remove radiation harsh environment.

Qualification Status Update (December 1981)

A. Hydrogen Recombiner

1. Beta Radiation

Further design review has determined that all components except the metal sheated electrical heaters (which are not susceptible to beta radiation damage) are enclosed within a sealed terminal box. The conduit leading into this terminal box will be environmentally sealed with the Raychem NEIS kit. Consequently, the components within the terminal box will not be exposed to beta radiation.

2. Containment Spray

The hydrogen recombiner has been determined to be completely enclosed and that the internals are protected against impingement from containment spray. Also, calculated containment pressure drops from a peak of 9.5 psig to less than 5.0 psig within ten (10) seconds following the LOCA. Since containment spray is not initiated until 9.0 psig is exceeded after a ten (10) minute time delay period, spray is not expected following a DBA. Therefore, containment spray is considered not to be a problem with the Grand Gulf hydrogen recombiner.

B. Hydrogen Recombiner Power Supply

1. Radiation

The radiation environment for the power supply has been re-evaluated using the exact location of the power supply rather than the room environment. The power supply is located behind a concrete wall inside room 1A306 and 1A309. Also, the penetrations to those rooms are shielded rather than open as assumed before. The radiation predictions are now less than $3x10^4$ Rads which is essentially non-harsh.

M-190.0

2. Materials Susceptible to Radiation

The power supply consists essentially of an isolation transformer, SCR Module, Auxiliary control power transformer and a main line contactor. The power supply is located in the Auxiliary Building and is exposed to radiation as it's only harsh environment at a level of $3x10^4$ Rads which is essentially non-harsh.

The following is pertinent to the power supply relative to radiation tolerance:

1. The SCR diodes have been successfully tested to $5x10^6$ Rads per a November 20, 1981 letter from Westinghouse to Bechtel, which qualifies the SCR controller.

2. Organic materials used in electrical equipment have been identified and extensively reviewed in EPRI Report NP-2129 (November 1981). This report concludes that radiation levels of 10^5 Rads produces no significant degradation of mechanical or electrical properties (with the exception of Teflon and semiconductor devices) for the organic materials reviewed in the EPRI Report NP-2129.

3. MP&L via Bechtel has confirmed through Westinghouse that the power supply contains no teflon or semiconductor devices.

4. The 10^5 Rad threshold considers radiation tolerance of all known organic materials used in plant equipment, including: 1) 15 types of thermosetting plastic organic polymers; 2) 39 types of thermoplastic organic polymers; 3) 16 elastomers; 4) numerous lubricants, adhesives, and protective coatings.

Attachment 1 - Figure 1-4 (Power Supply Panel Drawing)
Attachment 2 - Figure 1-5 (Power Supply Schematic)
Attachment 3 - Figure 1-6 (Power Controller Bill of Materials)

Note: These attachments are not included they are retained in MP&L's central file

Qualification Status with Regard to Interim Operations Justification

A. Hydrogen Recombiner

Interim operation is justified based on the extensive LOCA and the additional design review on the affects of the beta radiation to the hydrogen recombiner.

B. Hydrogen Recombiner Power Supply

1. Radiation

Interim operation is justified based on the re-evaluation of the actual radiation exposure the power supply is now exposed

to. Radiation exposure is now less than $3x10^4$ Rads which is considered to be non-harsh.

To further substaniate interim operation justification, the materials the power supply is composed of have been reviewed to determine their radiation tolerance. The review has concluded that no materials in the Grand Gulf hydrogen recombiner power supply is susceptible to radiation damage at the 10^5 Rad exposure level which exceeds our required level of $3x10^4$ Rads.

Follow Up Program

A. Hydrogen Recombiner

Will be qualified to Category 1 of NUREG-0588 by June 1982 or as soon thereafter as possible. Further evaluation of test report and clarification documents from Westinghouse is expected to yield full qualification.

B. Hydrogen Recombiner Power Supply

Will be qualified to Category 1 of NUREG-0588 by June 1982 or as soon thereafter as possible.

M.190.0

EXHIBIT 3-A

I. EQUIPMENT DESCRIPTION

Spec. No.:	9645-M-632
Component:	SGTS Electric Motor/Heater and Heater Control
MPL No.:	Q1T48 D001 A-A, D001 B-B
Manufacturer:	Westinghouse/CVI
Model No.:	256T/20HP/460V/unknown

II. QUALIFICATION STATUS AT TIME OF ORIGINAL SUBMITTAL (July 1981)

The required environment is radiation harsh only at a level of 5.7×10^5 Rads. The motor qualification was based on Buffalo Forge test report DO-146F. This report demonstrated LOCA testing of 30 days at 3 psig and 212°F, and a radiation value of 1.13×10^8 Rads. The motor qualification was left open due to dissimilarities between the test unit and the Grand Gulf unit with regard to lead material and joint insulation material.

No IEEE-323 qualification data was submitted on the heater and control since Reg. Guide 1.52 governed standby gas treatment design. This reg guide referenced ANSI N-509-1976 as the design guidelines.

III. QUALIFICATION STATUS AT TIME OF SUPPLEMENT 1 (Sept. 1981)

Westinghouse notification of similarity was obtained to address differences in the test motor as compared to the Grand Gulf motor. Qualification of heater and heater controls remained open, to be addressed prior to fuel load.

IV. QUALIFICATION UPDATE

1) Motor qualification

The Westinghouse qualification report WCAP-9112 has been evaluated relative to qualification of the Grand Gulf motor. Qualification has been demonstrated to a radiation level of 200 megarads based on motorette testing. In addition, Westinghouse has provided information which indicates that the motor grease is qualified to levels in excess of 100 megarads. Operability is thus assured for our required harsh environment of 5.7×10^5 Rads.

2) Qualification of SGTS heater and heater controls is as follows:

CVI Drawing B193-9900 illustrates the system layout. The system consists of a demister, heater, pre-filter, 2 HEPA filters, charcoal beds and exhaust fan arranged in the manner as shown on the referenced drawing.

CVI Drawing B193-5900 illustrates the control panels contained within the system. These control panels are the heater control panel and the fire protection control panel. The humidity controls are located in the heater control panel.

CVI Drawing B193-6000 demonstrates the composition of the heater control panel. The panel consists of a transformer, humidity indicator and controls, air flow indicator and controls, temperature switch and controls, heater relay, and heater contactors.

CVI Drawing B193-6002 contains a bill of materials for the heater control panel. This bill of materials must be inspected to uncover any radiation susceptible materials.

An inspection of the bill of materials for the heater panel uncovers the organic materials as listed in Attachment 1. A review of Attachment 1 illustrates radiation tolerances for each of these materials as delineated in EPRI Report NP-2129. Our harsh environment is 5.7×10^5 Rads interim operation justification is thus demonstrated.

An in depth inspection of the fire protection panel is not necessary because the panel only provides an alarm upon high temperature in the charcoal beds to the control room. For the water spray to be initiated, the operator must operate one of two valves manually. Both valves are located in the local area and with the high radiation conditions for this area imposed by a LOCA, the valves cannot be operated.

V. QUALIFICATION STATUS WITH REGARD TO INTERIM OPERATION JUSTIFICATION

Based on the information supplied in this review, interim operation to June 1982 is justified for the equipment of 9645-M-632.

VI. FOLLOW UP PROGRAM

Qualification documentation will be upgraded prior to June 1982 yielding full qualification to NUREG 0588 requirements.

M-632.0

ATTACHMENT 1

A. Organic materials extracted from heater controls bill of material (Ref.: CVI DWG. B193-6002)

ITEM	COMPONENT	ORGANIC MATERIAL	RADIATION TOLERANCE
8	Microswitch	Phenolic	$2x10^6$ Rads
		Synthetic rubber	$2x10^6$ Rads
		Buna-N	$6x10^6$ Rads
10, 12, 14,	Terminal Blocks	Phenolic	$>10^6$ Rads
28, 29, 30	Fuse Blocks	Phenolic	$>10^6$ Rads
34, 36, 39, 42, 44, 45	Westinghouse Electrical Components	Similar to MCC of Spec. E-018.0	$1.4x10^6$ Rads (Note 1)
48, 50, 52 54, 56, 58	Terminals	Vinyl	$>10^6$ Rads
60, 64, 100	Rockbestos cable	---	$2x10^8$ Rads
66	Stat-o-seal	Buna-N	$6x10^6$ Rads

M-632.0

E5rg3

B. Organic materials contained in heater control circuitry not found on CVI DWG. B193-6002.

COMPONENT	ORGANIC MATERIAL	RADIATION TOLERANCE
Watlow heater	Silicone	10^6 Rads
	Rubber	$2x10^6$ Rads
	Ceramic	$>10^6$ Rads
Dwyer 1900 Series Air Flow Switch	Polyester Film	10^8 Rads
	Polyvinyl Acetate	$5x10^6$ Rads
	Mica Filled Phenolic	$2x10^6$ Rads
	Polyester	10^8 Rads
	Buna-N	$6x10^6$ Rads
	Silicone	10^8 Rads
	Acrylic	$7x10^5$ Rads
	Polyester Type Resin	10^5-10^6 Rads
	Cellulose fiber with zinc chloride	10^8 Rads
	Bisphenol A Type	10^5-10^6 Rads
	Nonylphenol	10^5-10^6 Rads
	Diethylene Triamine	10^5-10^6 Rads
	Talc	10^8 Rads
	Mica	10^8 Rads
	Trichloroethane	10^6 Rads
	Rubber Base	10^6 Rads
Barksdale Temperature Switch	Neoprene	$1.7x10^6$ Rads
	Buna-N	$6x10^6$ Rads
	Mylar	$4x10^7$ Rads
	Phenolic	$2x10^6$ Rads
	Thermoplastic	10^8 Rads (Note 2)

NOTES: 1) Westinghouse electrical components consist of a 480V/120V transformer and heater contactor similar to those provided in 480V. motor control centers, which have been tested to $1.4x10^6$ Rads for Grand Gulf.

2) The thermoplastics exist in a micro switch sub-assembly within the Barksdale temperature switch. This micro switch is a BZ series which has been tested to 10^8 Rads (Ref. EPRI E.Q. data bank). In addition, EPRI NP-2129 reports that thermoplastics exhibit radiation tolerances up to $8.8x10^7$ Rads.

M-6320

SUPPLEMENT 2

I. EQUIPMENT DESCRIPTION

Specification Number: M-050.1

Component: Drywell Purge Compressor Motors

MPL Number: Q1E61-C001 A & B

Manufacturer: Turbonetics

Model Number: Frame: 445 TS
Enclosure: TEFC-XT

II. QUALIFICATION STATUS AT ORIGINAL SUBMITTAL

Component was qualified to NUREG-0588 at the time of the original submittal (July 1981).

III. QUALIFICATION STATUS AT SUPPLEMENT 1

At this time no response was made concerning the Drywell Purge Compressor Motors since they are considered qualified.

IV. QUALIFICATION STATUS UPDATE

During the NRC NUREG-0588 audit, the following questions were raised concerning the validity of the qualification of the drywell purge compressors.

1. What would be the expected compressor motor power consumption as a function of post-DBA containment temperature and pressure?

   The compressor motor power consumption is directly proportional to the mass being transported which is proportional to pressure. The drywell purge compressors will not automatically start until at least one minute into the accident, when the initiation setpoint (LOCA plus 20 seconds) is reached. A review of attachment 1 demonstrates that pressure during compressor operation is 6.5 psig for a duration of 5.6 hours. Compressor operation with a containment pressure of 6.5 psig will require from 105% to 112% of the rated motor output. The 74.6 KW nameplate rating means that the expected power consumption will be from 78.3 KW to 83.5 KW as a result of conditions imposed by the DBA. This compares favorably to the test conditions of 15 psig which resulted in 22 hours of demonstrated operability at 143% load.

2. What would be the effects of 90% voltage per Reg. Guide 1.9?

   In the event the motor is required to operate at 90% voltage for the entire 5.6 hours at peak operating pressure, the resulting motor temperatures would be increased by 23%. A review of test results reveals that peak temperatures expected at worst case suction conditions (6.5 psig) are 148°F, 145°F and 155°F for the Free end motor bearing, coupling end motor bearing, and motor winding respectively when compared to max test measurements of 260°f, 295°F, 305°F and max allowable value of 400°F, 400°F, 356°F, it can be seen that more than 23% margin exists.

3. Did testing monitor potential hot spots in the motor windings and bearings?

   A total of six thermocouples were imbedded into the motor windings, and recorded an average motor winding temperature that varied only 5°F in the worst case. Six more thermocouples recorded the temperature of bearings and drives. The excellent conduction within the motor windings and bearings make it extremely unlikely that hot spots would develop, much less go undetected, especially with the number of temperature measurements.

4. Could containment spray become entrained into the compressor, and impose excessive loads on the motor?

   The attached profile shows that the peak 9.5 psig pressure falls to below 5.0 psig within five seconds following the DBA, while the compressor will not start until at least one minute into the accident when the initiation setpoint is reached. Because containment spray does not initiate until 9.0 psig is exceeded and maintained for a ten minute time delay, spray is not expected following a DBA.

   In spite of the fact that no spray is expected, a canopy with a 2.5 foot radius will be installed over the compressor inlet. This will be completed prior to proceeding above 1% reactor power (vessel closed). Because the canopy will prevent spray entrainment, the 100% humidity test conditions are considered bounding. The canopy will prevent the spray from being inducted into the compressor, using information obtained from "Industrial Ventilation", the Manual of Recommended Practice by the Committee on Industrial Ventilation (published by the American Conference of Governmental Industrial Hygienists, 1974 13th edition). Table 4-1, pages 4-5 presents a range of capture velocities (air flow) required to ensure entrainment of contaminants. Capture velocity for evaporation ranges from 50-100 ft/min. The capture velocity required in spray booths is 100-200 ft/min. With the canopy in place over the compressor inlets, the velocity at the edge of the canopy is conservatively predicted to be 27.5 ft/min, well below the required velocity to entrain water droplets.

The containment spray is not expected to be initiated, but the addition of the canopy will ensure that water droplets will not be entrained by the compressor even in the unlikely event of containment spray initiation.

5. Will containment SIT pressure adversely impact motor seals?

In preparation for the containment SIT, all equipment manufacturers were formally requested to identify whether special precautions would be required. Turbonic's (purge compressor vendor) reply was negative. The small pressure above that tested (17.25 vs. 15 psig) plus the slow rate of SIT pressurization poses no problems. Similar compressors have been supplied by Turbonics which require continuous operation at 250 psig and 400°F.

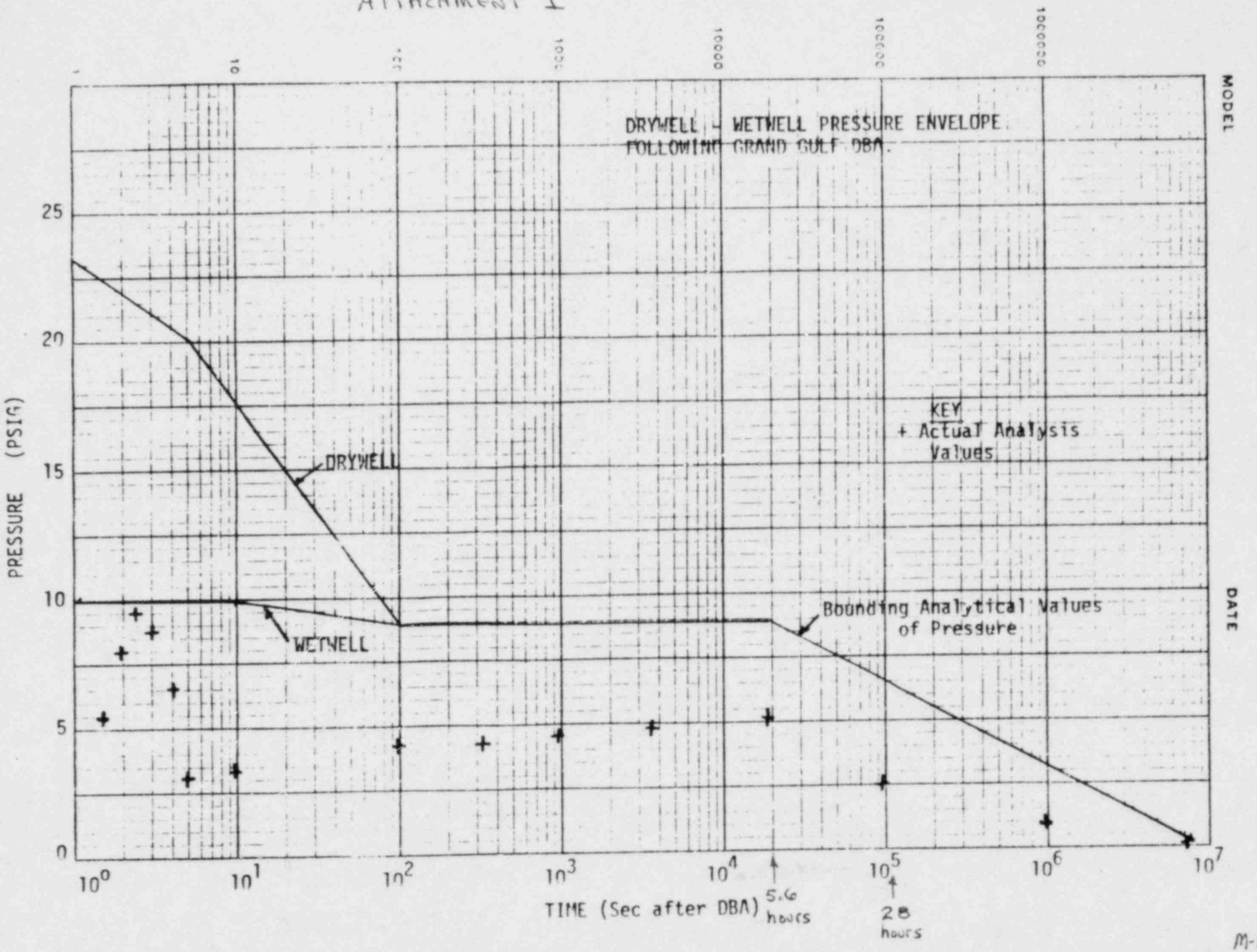
V. STATUS WITH REGARD TO INTERIM OPERATION

This item is qualified per NUREG-0588.

VI. FOLLUP UP PROGRAM

None

ATTACHMENT I



M-50.1

SUPPLEMENT 2

I. EQUIP. DESCRIPTION

Spec #:	9645-M-242.0
Component:	Valves; Air actuated (in/out containment)
MPL Numbers:	See Attachment 1a, 1b, 1c, 1d
Manufacturer:	William Powell
Model No.:	Solenoid (ASCO HTX 8320A20V)
	Limit Switch (Micro LSQ-101)
	Terminal Block (G.E. EB-25)
	Position Switch (NAMCO EA740)

II. QUALIFICATION STATUS AT TIME OF ORIGINAL SUBMITTAL

The original submittal separates these actuators by location; specifically, Auxiliary Building (51 valves) Room 1A112 (2 valves) and the containment (8 valves). The electrical components consist of an ASCO Solenoids, Micro Limit Switches, and a Terminal Block. NAMCO Position Switches were also identified on 32 of the actuator assemblies.

The actuators were listed as incomplete because no test reports had been received at that date, with the exception of the NAMCO Position Switch. The NAMCO test report did not address thermal aging for 40 years nor did it address flooding. However, operability during LOCA conditions and radiation exposure was addressed.

III. QUALIFICATION STATUS AT SUPPLEMENT 1

A. Terminal Blocks: the manufacturer was determined to be GE and the model number was found to be EB-25. The blocks are made of wood-fluor phenolic.

Justification of interim operation was to be done prior to fuel load and qualification completed by June 1982, or as soon thereafter as possible.

B. Micro-Switch (LSQ-101) A 3 page test report was received but radiation and thermal aging was not performed. The qualified life was unknown.

Justification of interim operation was to be done prior to fuel load and qualification completed by June 1982, or as soon thereafter as possible.

C. Solenoid Valves (Model HTX) The test report for these valves was being acquired. The HTX valves contain Viton seals and discs. A qualified life of 41 years was calculated using an activation energy of 1.11 eV and data from a test report for model NP valves. The HTX valves are very similar to the NP valves differing only in the seal material, the disc holder material and the core guide material. Pending completion of the evaluations the valves were considered justified for interim operation to June 1982. The equipment will be qualified by June 1982, or as soon thereafter as possible.

D. NAMCO Position Switch (Model EA 740)

A literature search provided a higher activation energy of 0.958 eV which is greater than the previously used value of 0.50 eV. This increased the qualified life to about 1 year.

The flood level was revised from 130' 10" to 125' 4" which indicates only one valve would be exposed to flooding. The evaluation concerning flooding will be completed prior to fuel load.

The equipment will be qualified prior to June 1982 or as soon thereafter as possible.

IV. QUALIFICATION STATUS UPDATE

A. Terminal Blocks

This sub-component is being evaluated under the Electrical Interface package. The terminal blocks are justified for interim operation and will be qualified by June 1982 or as soon thereafter as possible.

B. Micro-Switch (LSQ-101)

It has been determined that there are no qualified micro switch replacements for this switch. The Class 1E circuits which are attached to this switch will be swapped over to the NAMCO EA-740 switches which are already installed on 32 of the 61 valves. The remaining valves will also be fitted with NAMCO EA-740 switches. Qualification of the NAMCO EA-740 is addressed in section D below. Modifications will be made prior to fuel load.

C. SOLENOID VALVES (model HTX)

ASCO test report AQS21678/TR and Supplement 1 has been submitted demonstrating qualification for seven tested valves with a spectrum of materials which envelope the Grand Gulf design (see Attachment 2). Ageing at 268°F for 12 days has demonstrated on 8.2 year qualified life. Radiation exposure of 200 MR, wear ageing of 40,000 cycles and 30 days LOCA exposure at maximum values of 300°F and 110 psig exceed qualification requirements. (Profile comparisons are in backup files as Attachments 4A, 4B, 4C, 5A, 5B, 5C). In addition to the above, recent NRC information notices indicate that operability can not be assured if radiation levels exceed 20 megarads and Viton materials are used. This has been reviewed with the following findings:

1. All air operated valves (in containment) at Grand Gulf are isolation valves which de-energize to perform their safety function, with function times within seconds or minutes of a LOCA. A 1 hour function time has conservatively been assumed.

2. Only 12 valves are predicted to receive an accident dose in excess of 20 megarads over the 100 day accident. As indicated in item 1 above, these valves have function times less than 1 hour. Attachment 3 demonstrates that the predicted accident dose 1 hour into the Accident is less than or equal to 13.6 MR.

Flooding potential has been reviewed and it has been determined that two drywell isolation valves (P45 F003 and P45 F009) are subject to flooding. Attachment 4 is a failure mode and effects analysis which showns that the valves will perform their safety related function prior to the flooding condition. The failure modes identified will not cause the valve to change position.

D. NAMCO POSITION SWITCHES (MODEL EA740)

Aging data is insufficient to determine an acceptable qualified life, however, LOCA testing for 30 days at maximum values of 80 psig and 346°F along with radiation exposure of 204 megarads compares very favorably with required accident profiles.

NAMCO Switches will be sealed as discussed in the electrical interface evaluation, therefore a momentary submergency of 10 seconds will not cause a circuit malfunction.

V. QUALIFICATION STATUS WITH REGARD TO INTERIM OPERATION STATUS

Based upon the above discussion and conclusions the components of the Bettis Air Operated Valves, which includes ASCO Model HTX Solenoid Valves, NAMCO Model EA-740 Position Switch and GE Model EB-25 Terminal Blocks, are justified for interim operation until June 1982.

VI. FOLLOW-UP PROGRAM

The conversion from Micro Switch LSQ-101 to NAMCO EA-740 needs to be completed prior to fuel load.

The evaluation of the NAMCO position switch needs to be completed by June 1982 or as soon thereafter which should include additional testing to obtain a longer qualified life.

The ASCO solenoids should only require a periodic maintenance program for Viton parts replacement be developed and that the evaluation be completed by June 1982 or as soon thereafter as possible.

Component Valves with Hiller Pneumatic actuators

Manufacturer Wm. Powell

Specification 9645-M-242.0

EXHIBIT F

Attachment 1a

Sheet 1 of 2

(In Aux. Bldg)

The Hiller Pneumatic Actuators are attached to the following Wm. Powell valves:

System	Valve Plant I.D.	Service*	Hiller Model No.	Location Room
Nuclear Boiler	B21 F113	3	12SA-A015	1A305
RHR	E12 F203	3	10SA-A044	1A111
RWCU	G33 F235	3	16SA-A014	1A305
Filt. Demin.	G36 F101	2	10SA-A024	1A204
	G36 F108	3	10SA-A024	1A111
	G36 F109	3	10SA-A024	1A111
Filt. Demin.(FPCC)	G46 F253	3	10SA-A021	1A111
Condensate & Refueling Water Storage and Transfer	P11 F047	3	16SA-A008	1A222
	P11 F061	3	16SA-A008	1A222
	P11 F066	3	16SA-A008	1A201
	P11 F067	3	16SA-A008	1A201
	P11 F062	3	14SA-A010	1A201
	P11 F075	2	12SA-A015	1A319
	P11 F064	3	16SA-A008	1A201
	P11 F065	3	16SA-A-08	1A201
Makeup Water	P21 F024	3	10SA-A018	1A301
Standby Service Water	P41 F239	1	10SA-A015	1A215
	P41 F240	1	10SA-A015	1A215
Drainage System	P45 F062	2	12SA-A014	1A111
	P45 F068	2	12SA-A014	1A111
	P45 F099	2	10SA-A015	1A215
	P45 F159	2	14SA-A004	1A111
	P45 F160	2	14SA-A004	1A111
	P45 F161	2	14SA-A004	1A111
	P45 F163	2	10SA-A014	1A111
	P45 F158	2	14SA-A004	1A111
Service Air	P52 F160A	3	10SA-A016	1A401
	P52 F105	2	10SA-A012	1A319
	P52 F221A	3	10SA-A016	1A403
Instrument Air	P53 F001	2	10SA-A012	1A319
	P53 F026A	3	10SA-A015	1A403
Suppression Pool Cleanup	P60 F001	1	20SA-A009	1A220
	P60 F009	2	20SA-A011	1A205
	P60 F010	2	20SA-A011	1A205
	P60 F021	1	20SA-A009	1A220
	P60 F003	3	20SA-A010	1A320
	P60 F004	3	20SA-A010	1A320
	P60 F007	3	20SA-A010	1A301
	P60 F008	3	20SA-A010	1A301

Component Valves with Hiller Pneumatic actuators

Manufacturer Wm. Powell

Specification 9645-M-242.0

EXHIBIT F
Attachment 1a

(Continued)

System	Valve Plant I.D.	Service*	Hiller Model No.	Location Room
Fire Protection	P64 F282A	3	16SA-A007	1A222
	P64 F282B	3	16SA-A012	1A222
	P64 F283A	3	16SA-A007	1A211
	P64 F283B	3	16SA-A007	1A211
	P64 F332A	3	Later	1A201
Domestic Water	P66 F029A	3	10SA-A014	1A302
Plant Chilled Water	P71 F304	2	14SA-A008	1A302
	P71 F306	2	14SA-A010	1A302
	P71 F300	3	10SA-A015	1A322
	P71 F302	2	10SA-A015	1A302
	P71 F148	2	10SA-A018	1A319
	P71 F150	2	10SA-A018	1A319

* Service Code: 1 - System Isolation
2 - Containment Isolation
3 - Auxiliary Bldg. Isolation

Component Valves with Hiller Pneumatic actuators

Manufacturer Wm. Powell

Specification 0645-M-242.0

EXHIBIT F
Attachment 1b

Sheet 1 of 1

(drywell)

The Hiller Pneumatic Actuators are attached to the following Wm. Powell valves:

System	Valve Plant ID	Service	Hiller Model No.	(Room)
Floor and	P45F003	D-Well Iso.	10SA-A017	1A112
Equipment Drains	P45F009		10SA-A017	1A112

Component Valves with Pneumatic Hiller Actuators | Manufacturer Wm. Powell | Specification 9645-M-242.0

EXHIBIT F
Attachment 1c

Sheet 1 of 1

(In Containment)

The Hiller pneumatic actuators are attached to the following Wm. Powell valves:

System	Valve Plant ID	Service*	Hiller Model No.	Location (Room)
Floor and Equipment Drains	P45F061	2	12SA-A013	A110
	P45F067	2	12SA-A013	A110
	P45F004	3	10SA-A017	A110
	P45F010	3	10SA-A017	A110
	P45F098	2	10SA-A017	A110
Plant Chilled Water	P71F149	2	10SA-A022	A313
Filter-DEMW (RWCU)	G36F106	2	10SA-A023	A313
Combustible Gas Control	E61F020	3	12SA-A019	A509

*Service Code
1 - System Isolation
2 - Containment Isolation
3 - Drywell Isolation

The following Wm. Powell Valves are subject to wetting:

Valve	Flood (5 Sec.)	Froth (5 Sec.)	Spray (12 Days)
P45F061	Yes	No	Yes
P45F067	Yes	No	Yes
P45F004	Yes	No	Yes
P45F010	Yes	No	Yes
P45F098	Yes	No	Yes
P71F149	No	Yes	Yes
G36F106	No	Yes	Yes
E61F020	No	No	Yes

Exhibit F Attachment 1d

Position Switches Namco 9645-M-242.0

Namco EA740 Remote Position Switches are Mounted on the Following Air Actuated Valves:

System	Plant ID No.	Room No.	Actuator Type	Cate-gory	Wet-ting	Service
Floor and Equipment Drain	P45 F003	1A112	Air	a	I	Drywell Isolation
	P49 F009	1A112	Air	a	1	
Filt. Demin. (RWCU)	G36 F106	1A313	Air	a	1&3	Containment Isolation
Floor & Equip. Drain	P45 F004	1A110	Air	a	1&3	Drywell Isolation
	P45 F010	1A110		a	1&3	
	P45 F061	1A110		a	1&3	Containment Isolation
	P45 F067	1A110		a	1&3	
	P45 F098	1A110		a	1&3	
Residual Heat Removal	E12 F066B	1A105		b		
	E12 F066C	1A118		b		
	E12 F203	1A111	Air	a	NA	Aux. Bldg. Isolation
Filter Demin. (RWCU)	G36 F101	1A225	Air	a	NA	Containment Isolation
	G36 F108	1A111	Air	a	NA	Aux. Bldg. Isolation
	G36 F109	1A111		a		
Filter Demin (FPCC)	G46 F253	1A111	Air	a	NA	Aux. Bldg. Isolation
Floor & Equip. Drains	P45 F062	1A111	Air	a	NA	Containment Isolation
	P45 F068	1A111		a		
	P45 F099	1A215		a		
	P45 F158	1A111		a		
	P45 F159	1A111		a		
	P45 F160	1A111		a		
	P45 F161	1A111		a		
	P45 F163	1A111		a		
Suppression Pool Cleanup	P60 F001	1A220	Air	a	NA	System Isolation
	P60 F003	1A320		a		Aux. Bldg. Isolation
	P60 F004	1A320		a		
	P60 F007	1A301		a		
	P60 F008	1A301		a		
	P60 F009	1A205		a		Containment Isolation
	P60 F010	1A205		a		
	P60 F021	1A220		a		System Isolation
Domestic Water	P66 F029A	1A302	Air	a	NA	Aux. Bldg. Isolation

*Wetting Code=1 - Flood
2 - Froth
3 - Spray

ATTACHMENT 2
COMPARISON OF TEST VALVES TO HTX VALVES

Valve ID	Function	Disc & Seals	Disc Holder	Coil
NP 8344	Tested	Ethylene Propylene	Stainless Steel	Class H
NP 8320	Tested	Ethylene Propylene	Stainless Steel	Class H
NP 8316	Tested	Ethylene Propylene	Stainless Steel	Class H
NP 8321	Tested	Ethylene Propylene	Stainless Steel	Class H
NP 8323	Tested	Ethylene Propylene	Stainless Steel	Class H
XFT 83165	Tested	Viton-A	Viton A	Class H
NP 8344	Tested	Viton-A	Viton A	Class H
HTX 8320 A20V	In Plant	Viton-A	Stainless Steel	Class H

ATTACHMENT 3

VALVE	LOCATION	BETA & GAMMA ACCIDENT DOSE (MEGARADS)*	GAMMA NORMAL DOSE (MEGARADS)
1P45-F003	1A112 (Drywell)	13.6	1.8
1P45-F009	1A112 (Drywell)	13.6	1.8
1P45-F061	1A110 (Ctmt Bldg)	2.6	0.0035
1P45-F067	1A110 (Ctmt Bldg)	2.6	0.0035
1P45-F004	1A110 (Ctmt Bldg)	2.6	0.0035
1P45-F010	1A110 (Ctmt Bldg)	2.6	0.0035
1P45-F098	1A110 (Ctmt Bldg)	2.6	0.0035
1P71-F149	1A313 (Ctmt Bldg)	2.6	0.000035
1G36-F106	1A313 (Ctmt Bldg)	2.6	0.000035
1E61-F020	1A509 (Ctmt Bldg)	2.6	0.0035
1B21-F113	1A305 (Aux Bldg)	6.08	0.18
1G33-F235	1A305 (Aux Bldg)	6.08	0.18

*based on 1 hour operability

M-242

Attachment 4

FAILURE MODES AND EFFECTS ANALYSIS
FOR EXEMPTION FOR FLOODING
DRYWELL ISOLATION VALVES

FUNCTION:

The following air actuated valves provide drywell to containment isolation:

Valve	System
1P45-F003	Floor and equipment drain system
1P45-F009	Floor and equipment drain system

FAILURE MODES:

The following electrical failure modes could occur due to the flooding conditions:

1. Short the device output
2. Open the device output
3. Short the device output to ground

FAILURE EFFECTS:

These isolation valves receive an "auto close" signal upon a loss of coolant accident (LOCA), and remain closed. The effects of the above failure modes would not cause the actuation of these valves to the open position. Only a LOCA, not a high energy line break, will flood these valves.

Drywell isolation is required to prevent bypass of the suppression pool during post-LOCA blowdown. Flooding of the drywell is a consequence of the subsequent drywell negative pressure transient. At this point, and for the remainder of the accident, the drywell isolation function of these valves is not required. Therefore, these valves do not require qualification for flooding However, they must be evaluated for the other harsh parameters inside containment. The following evaluation already submitted to the NRC on July 1, 1981, and September 1, 1981, are applicable to these valves:

Spec.	Manufacturer	Component
9645-M-242.0	ASCO	HTX 8320 A20V Solenoid Valves
	MICRO Switch	LSQ-101 Limit Switches
	NAMCO	EA740 Limit Switches
	GE	Terminal Blocks

CONCLUSION:

Based on the above discussion, it can be concluded that the failure of these valves in any mode described above would not adversely affect plant safety.

M-242

SUPPLEMENT 2

I. EQUIPMENT DESCRIPTION

Specification Number: M-242/M-251.0

Component: Valves- Limitorque D.C. Motor Actuated (Outside Ctmt.) See Attachment 1

Manufacturer:

1. Class B Insulation D.C. Motor - H.K. Porter/Reliance
2. 4 Train Limit and Torque Switches - Limitorque
3. Hook-up Wiring - Flamtrol
4. Terminal Blocks - Marothon 300, Buchanon 0222/0524, GE-EBS (Qualification addressed in Electrical interface review

Model Number: Series SMB

II. QUALIFICATION STATUS AT ORIGINAL SUBMITTAL

Incomplete due to fact that no test reports were available.

III. QUALIFICATION STATUS AT SUPPLEMENT ONE

There was no change in qualification status at the time supplement one was released.

IV. QUALIFICATION STATUS UPDATE

Discussions with the manufacturer revealed that the only difference between the DC Actuator and the AC Actuator is the DC or the AC motor. The limit and torque switches, the hook up wiring, and the Class B motor insulation are all the same. The DC and AC actuators belong to the same generic group of Limitorque series SMB, which have been qualified for outside containment use per Limitorque Test Reports B0058 dated 1/11/80 and B003 dated 6/7/76. The Limitorque Test Report B0003 was performed using C motors, otherwise the same components as used in DC actuators were tested. Both insulation systems are Class B, and identical materials were used in construction. All details of similarity will be documented in the Final Qualification documentation.

The maximum predicted environments to which the DC actuators are subjected is a maximum temperature of 312°F, 100% humidity, 25 psia, and 1.28×10^7 RADS, with a normal maximum service temperature of 105°F. Test conditions include 2×10^7 RADS, 250°F for a period of approximately 22 hours and lower values for 16 days. The bounding temperature for the DC actuator switches outside of containment reaches 312°F, but holds at this temperature for only about 25-30 seconds, and drops sharply to about 220°F, holds there for less than an hour, and ramps to 105°F in less than 100 days. Because the actuators are completely enclosed by metallic enclosures, the actual temperature to which the internal parts will be exposed is expected to be much smaller, as the enclosures will provide a buffer for temperature spikes for the short duration.

The maximum pressure predicted at Grand Gulf is a 25 psia pressure spike for ½ second duration, while the device was tested for over 0.5 hours at 39.7 psia. Based on this, the device is qualified for environmental pressure.

The bottom of the test chamber was filled with water, which would produce a 100% relative humidity for the duration of the test. This meets the bounding requirements for relative humidity.

Thermal aging tests ran for 199.8 hours at 165°F and 0 psig pressure, with 100% humidity. Actuation and test motors cycling ran for 9 days, with a total of 176 cycles. On the basis of report 30058, the DC motor should be considered qualified for the 40 year expected life. The switches have been qualified under AC valve actuators, and being the same except for motors, the switches for DC actuators are qualified. Hook-up wiring has been identified by Limitorque as Raychem Flamtrol. The Raychem Flamtrol Insulation System has been extensively tested and is qualified to IEEE 383-1974 for FIRL Report F-C4033-1 dated January 1975.

V. QUALIFICATION STATUS WITH REGARD TO INTERIM OPERATION

On the basis that the AC motor actuated Limitorque valve is qualified, and this device is constructed of the same materials, this item should be qualified for Interim Operation. The differences in parts between an AC and a DC motor is small, the DC motor containing a few more moving parts, but these parts are all metal. All details of similarity will be established in the final qualification documentation.

VI. FOLLOW UP PROGRAM

The review to qualify Limitorque DC motor actuated valves will be completed by June 1982.

ATTACHMENT 1

Normal dose rate for all rooms listed is 5.3×10^3 RADS (Table B-2)

Room 1A104

Equipment No.	Dosage (from Table B-8)
E51 F019	8.17×10^6 RADS
E51 F046	8.28×10^5 RADS
E51 F022	6.84×10^6 RADS
E51 F013	6.27×10^6 RADS
E51 F031	6.92×10^6 RADS
E51 F045	1.0×10^7 RADS

maximum temperature is 295°F (Figure B-25)
maximum pressure is 25 psia (Figure B-23)

Room 1A101

E51 F010 6.95×10^5 RADS (from Table B-8)

Room 1A121

E51 F059 5.9×10^5 RADS (Table B-8)

Room 1A203

E51 F068 1.28×10^7 RADS (Table B-8)

maximum temperature is 312°F (Figure B-30)
maximum pressure is 18.0 psia (Figure B-28)

M-242/251

SUPPLEMENT 2

I. Equipment Description

SPECIFICATION NO.:	9645-M-257.0/M258.0
COMPONENT:	Butterfly Valves with Bettis Air Actuators
MPL NOS.:	See Attachment 1a, 1b
MANUFACTURER:	Henry Pratt
MODEL NO.:	Solenoid (ASCO NP8321 NP8316)
	Position Switch (Namco EA740)
	Terminal Block (TNR/C inch 8-141)

II. Qualification Status at Time of Original Submittal

Because no test report was submitted this review was considered incomplete.

III. Qualification Status of Supplement 1

None Submitted

IV. Qualification Status Update

A. Terminal Block:

This sub-component is being evaluated under the Electric Interface package. The terminal blocks are justified for interim operation and will be qualified by June 1982 or as soon thereafter as possible.

B. Solenoid Valves (Model NP8321, NP8316)

Asco Test Report AQS21678/TR has been submitted demonstrating qualification for seven tested valves which are of the same type as used at Grand Gulf.

Aging at 268°F for 12 days has demonstrated a 20 year qualified life. Radiation exposure of 200mr, near aging at 40,000 cycles and 30 days LOCA exposure at maximum valves of 300°F and 110 psig exceed qualification requirements (profile comparisons are in backup files as attachments 2A, 2B, 3A, 3B). In addition to the above, recent NRC information notices indicate that operability can not be assured if radiation levels exceed 20 magarads and viton materials are used. This has been reviewed with the following findings:

1. All air operated valves (in containment) at Grand Gulf are isolation valves which de-energize to perform their safety function, with function times within seconds or minutes of a LOCA. A 1 hour function time has conservatively been assumed.

2. Only 9 valves are predicted to receive an accident dose in excess of 20 magarads over the 100 day accident, as

indicated in Item 1 above, these valves have function times less than 1 hour. Attachment 4 demonstrates that the predicted accident dose 1 hours into the accident is less than or equal to 13.6 mr (Attachment 4 in qualification files).

C. Namco Position Switches (Model EA740)

Aging data is insufficient to determine an acceptable qualified life, however LOCA testing for 30 days at maximum values of 80 psig and 346°F along with radiation exposure of 204 magarads compare very favorable with required accident profiles as shown in Attachments 2A, 2B, 3A, 3B (in qualification files).

V. Qualification Status with Regard to Interim Operation Status

Based upon the above discussion and conclusions the components of the Bettis Air Operated Valves which includes Asco models NP8321, and NP8316 solenoid valves, Namco model EA-740 position switch and TWR/Cinch model 8-141 terminal blocks are justified for interim operation until June 1982.

VI. Follow Up Program

The evaluation of the Namco position switch needs to be completed by June 1982 or as soon thereafter as possible.

M-257/258

ASCO Solenoid valves NP8321A6E, NP831655, and NP831654E and NAMCO EA170 position switches are used on the following Bettis actuators on Pratt valves:

System	Valve Plant ID	Service	Bettis Model No.	Location (Room)
Plant Service Water	P44F117	Aux. Iso.	T-316A-SR2	1A101
	P44F118			1A120
	P44F119			1A120
	P44F120		T-420-SR1	1A120
	P44F121			1A120
	P44F122		T-416SR3	1A101
	P44F123			1A101
Aux. Bldg. Vent	T41F006		T-312B-SR3	1A527
	T41F007			1A527
Fuel Handling Area Vent	T42F019		T-412-SR4	1A519
	T42F020			1A519
	T42F003		T-420-SR1	1A606
	T42F004			1A606
Fuel Pool Cooling & Cleanup	G41F019		521C-SR80	1A527
	G41F043		732C-SR80	1A527
	G41F045			1A527
Ctmt. Cooling	M41F007			1A405
	M41F008			1A405
	M41F036			1A405
	M41F037			1A405
	M41F011	Ctmt. Iso.	T-312B-SR3	1A405
	M41F035			1A405
Fuel Handling Area Vent	T42F011	Aux. Iso.	CB520-SR80	1A606
	T42F012			1A606
Combustible Gas Control	E61F009		521C-SR80	1A405
	E61F057			1A405
Condensate & Refueling Water Transfer & Storage	P11F130	Ctmt. Iso.	721C-SR80	1A115
	P11F131			1A115

Component Air actuated butterfly valves

Manufacturer Henry Pratt

Specification 9645-M-257.0
9645-M-258.0

Attachment 1b

Sheet 1 of 1

ASCO Solenoid valves NP8321A6E, NP831655, and NP831654E and NAMCO EA170 position switches are used on the following Bettis actuators on Pratt valves:

System	Wetting*	Valve Plant ID	Service	Bettis Model No.	Location (Room)
Combustible Gas Control	1	E61F007	D-Well Iso.	521C-SR80	1A509
	1	E61F010	CTMT. Iso.	521C-SR80	1A110
	1	E61F056			1A110
Containment Cooling	1	M41F012	CTMT. Iso.	T-312B-SR3	1A110
	1	M41F013	D-Well Iso.		1A110
	NA	M41F015			1A112
	NA	M41F016			1A112
	1	M41F017			1A110
	1	M41F034	CTMT. Iso.		1A110

*Wetting - 1 - Spray (12 Days)
2 - Flood
3 - Froth

SUPPLEMENT 2

NSSS

Equipment Description

A.	Purchase Part Drawing Nos.:	163C1559, 163C1560, 163C1561, 163C1563, 163C1564
B.	Component:	Differential Pressure Transmitters, Gage Pressure Transmitters, and Absolute Pressure Transmitters
C.	Manufacture:	Rosemount, Inc.
D.	Model No.:	1151DP, 1151GP, 1151AP

Qualification Status at Original Submittal (July 1981)

The initial NUREG-0588 review of the Rosemount Model 1151 transmitter was based on the worst case environment for each of the GE Purchase Part Drawing Number (PPD#) associated with the Model 1151's purchased for Grand Gulf by GE.

The end result of using this approach to review qualification status was that none of the Model 1151 transmitters met Category II of NUREG-0588.

The model 1151's did not meet Category II of NUREG-0588 because of the following reasons:

1. Aging was not adequately addressed
2. The impact of design changes made to Model 1152 relative to Model 1151 as they impact radiation tolerance.

Qualification Status at Supplement 1 Submittal (September 1981)

In the supplement 1 submittal, MP&L noted that Model 1151's were not qualified to Category II of NUREG-0588 and that interim operation justification would be provided prior to fuel load.

Qualification Status Update (December 1981)

Since the original submittal and the supplement 1 submittal, an extensive re-evaluation of the Model 1151 transmitters at Grand Gulf has been conducted. The results of this extensive evaluation has produced the following:

1. 19 Model 1151, transmitter MPL's have been replaced with Model 1152 "T0280" transmitters.
2. 1 Model 1151 MPL has been replaced with a Gould Model PD-3018 transmitter.
3. 21 Model 1151 transmitter MPL's were changed from NUREG-0588 Category "A" to Category "B" (Based on Appendix E of NUREG-0588)
4. 1 Model 1151 transmitter MPL (B21-N078) must be replaced prior to fuel load with a Model 1152 "T0280" transmitter.

5. Five (5) grouping of Model 1151 transmitter MPL's was established: 1) pressure integrity only; 2) non-harsh pressure temperature and humidity; 3) function time less than 1.0 hour; 4) exempt; 5) replace prior to fuel load
6. Failure Mode and Effects Analysis have been performed on all Model 1151 transmitters.

A. Group 1 (Pressure Integrity)

For this group, the re-evaluation established the only safety function served by the following Model 1151 transmitter MPL's was to maintain pressure integrity (Category B):

MPL#	PPD#	MPL#	PPD#
B21-N027	163C1560	C34-N017	163C1560
B21-N032	163C1560	C41-N004	163C1563
B21-N044	163C1560	E12-N013	163C1560
B21-N058	163C1564	E12-N026	163C1563
B21-N099	163C1561	E12-N028	163C1563
B33-N011	163C1560	E12-N050	163C1564
B33-N037	163C1560	E12-N051	163C1564
B33-N038	163C1560	E12-N053	163C1563
B33-N040	163C1563	E12-N057	163C1563
C34-N003	163C1560	E12-N058	163C1564
C34-N004	163C1560	E22-N052	163C1563
C34-N008	163C1563	E51-N007	163C1563
C34-N005	163C1563		

For this group of Model 1151 transmitter MPL's, a service life = 10 years was established by performing a detailed aging analysis on the materials

B. Group 2 (Non-Harsh Pressure, Temperature, and Humidity)

The only harsh environment this group of Model 1151 transmitter MPL's were exposed to was radiation. This group of Model 1151 transmitters consists of the following MPL's:

MPL#	PPD#	MPL#	PPD#
E12-N007	163C1561	E32-N054	163C1561
E12-N015	163C1561	E51-N003	163C1561
E22-N005	163C1561	E51-N035	163C1561
E22-N051	163C1564	E51-N050	163C1564
E32-N059	163C1561	E51-N052	163C1564
E32-N061	163C1564	E51-N056	163C1564

For this group of Model 1151 transmitter MPL's, a service life = 5 years was established by performing a detailed aging analysis on the materials. The max predicted radiation exposure for any one of these transmitters is 2.0×10^6 Rads and the tested value is 2.0×10^6 Rads.

C. Group 3 (Function Time Less Than One Hour)

For this group of Model 1151 transmitter MPL's, the function time for the transmitters to perform their safety function is one (1) hour or less. This group of Model 1151 transmitters consists of the following MPL's:

MPL#	PPD#	MPL#	PPD#
B21-N081	163C1561	E31-N088	163C1561
E31-N086	163C1561	E31-N089	163C1561
E31-N087	163C1561		

For this group of Model 1151 transmitter MPL's, a service life = 5 years was established by performing a detailed aging analysis on the materials.

The required LOCA environments for Grand Gulf for a one (1) hour time period are as follows:

1. Pressure = 30 psia, max
2. Temperature = 200°F max
3. Humidity = 100% max
4. Radiation = 1.2×10^6 Rads TID

The test data/analysis demonstrates qualification of the Model 1151 as follows:

1. Pressure: The pressure integrity was established by the following:
   a. Static Stress Analysis
   b. Aging analysis on seal materials
   c. Similarity of Model 1151 to Model 1152 (which was tested at 84.7 psia for one (1) hour)
2. Temperature: Tested at 300°F for four(4) hours
3. Humidity: Similarity of Model 1151 to Model 1152 (which was tested at 100% humidity for 50 hours)
4. Radiation: Tested at 2×10^6 Rads

D. Group 4 (Exempt from NUREG-0588 Review)

For this group of Model 1151 transmitter MPL's, the re-evaluation established that they should be exempted from NUREG-0588 review because they were either exposed to a mild environment, Non-Class 1E, or not required post LOCA/HELB. This group of Model 1151 transmitters consists of the following MPL's:

MPL#	PPD#	Reason Exempted
E21-N003	163C1561	Mild environment
E21-N050	163C1564	Mild environment
E21-N054	163C1563	Non-Class 1E
G41-N011	163C1559	Not required Post LOCA/HELB
G41-N012	163C1559	Not required Post LOCA/HELB
G41-N024	163C1559	Not required Post LOCA/HELB

E. Group 5 (Replace Prior to Fuel Load)

This group consists of only one (1) Model 1151 transmitter MPL (B21-N078; PPD# 163C1564). This Model 1151 transmitter must be replaced because of the following:

1. Function time of 100 days
2. Radiation exposure of 7.2×10^6 Rads; qualified for 2.0×10^6 Rads

The model 1151 transmitter is being replaced with a Rosemount Model 1152 "T0280" transmitter. The Model 1152 "T0280" transmitter has radiation qualification of 12.6×10^6 Rads (Required = 7.2×10^6 Rads). The qualification of the T0280 Model is discussed further in Item F below.

F. Qualification of the 1152 "T0280" Model and the Gould PD-3018 Model is as follows:

1. Gould Model PD-3018

This transmitter is qualified for its application and was reviewed by EQB during Grand Gulf's site audit of October 19-22, 1981.

Rosemount Model 1152 "T0280"

This transmitter has been tested as follows:

Time	Pressure	Temperature	Humidity
1 hour	84.7 psia	316°F	100%
7 hours	70.1 psia	303°F	100%
42 hours	20.7 psia	230°F	100%

Radiation: Test value of 12.6×10^6 Rads
Also see attached Supplement 2 for Model 1152 transmitters

Qualification Status with Regard to Interim Operation Justification

The qualification status update section above establishes the interim operation justification for the Model 1151 transmitters MPL's identified in Group A through F above.

Follow Up Program

The Rosemount Model 1151 transmitters identified in Group B, C, and E above will be replaced as follows:

1. Replaced with Rosemount Model 1152 "T0280" transmitters and qualified to Category 1 of NUREG-0588 by June 1982 or as soon thereafter as possible.

2. Replaced with Rosemount Model 1153B transmitters which are qualified to Category 1 of NUREG-0588 by June 1982 or as soon thereafter as possible.

SUPPLEMENT 2

NSSS

Equipment Description

A. Purchase Part Drawing Nos.: 169C8391, 169C8392, 169C8393, 169C8394, 169C8969
B. Component: Differential Pressure Transmitters, Gage Pressure Transmitters, Absolute Pressure Transmitters
C. Manufacturer: Rosemount, Inc.
D. Model No.: 1152DP, 1152GP, 1152DP "T0280", 1152GP "T0280", 1152AP "T0280"

Qualification Status at Original Submittal (July 1981)

The initial NUREG-0588 review of the Rosemount Model 1152 transmitter was based on the worst case environment for each of the GE Purchase Part Drawing Number (PPD#) associated with the Model 1152's purchased for Grand Gulf by GE.

The end result of using this approach to review qualification status was that none of the Model 1152 transmitters met Category II of NUREG-0588.

The model 1152's did not meet Category II of NUREG-0588 because of the following reasons:

1. Aging was not adequately addressed
2. The impact of design changes made to Model 1152 relative to the T0280 Model which was qualified to different levels.

Qualification Status at Supplement 1 Submittal (September 1981)

In the Supplement 1 submittal, MP&L noted that Model 1152's were not qualified to Category II of NUREG-0588 and that interim operation justification would be provided prior to fuel load.

Qualification Status Update (December 1981)

Since the original submittal and the Supplement 1 submittal, an extensive re-evaluation of the Model 1152 transmitters at Grand Gulf has been conducted. The results of this extensive evaluation has produced the following:

1. The number of Model 1152 transmitter MPL has increased from 19 to 38 as a result of Model 1151 transmitters being replaced by Model 1152 transmitters.

2. 1 Model 1152 transmitter MPL (B21-N095) must be replaced prior to fuel load with a Model 1152 "T0280" transmitter.

3. Five (5) grouping of Model 1152 transmitter MPL was established:

   1) Function time less 24 hours; 2) non-harsh pressure, temperature, and humidity; 3) not qualified to Category II requirements of NUREG-0588; 4) replace prior to fuel load; 5) exempt

4. Failure Mode and Effects Analyses have been performed on all Model 1152 transmitters.

A. Group 1 (Function Time Less Than 24 Hours)

For this group of Model 1152 transmitters, the function time for the transmitters to perform their safety function is 24 hours or less. This group of Model 1152 transmitters consists of the following MPL's:

MPL#	PPD#	MPL#	PPD#
B21-N068	169C8393	E31-N076	169C8391
B33-N014	169C8391	E31-N077	169C8391
B33-N024	169C8391	E31-N083	169C8392
C71-N050	169C8969	E31-N084	169C8392
E22-N054	169C8392	E31-N085	169C8394
E31-N075	169C8391	E51-N051	169C8392
B21-N080	169C8392		

For this group of Model 1152 transmitter MPL's a service life = 10 years was established by performing a detailed aging analyses on the materials.

The required LOCA environments for Grand Gulf for a 24 hours time period are as follows:

Time	Pressure	Temperature	Humidity	Radiation
24 hours	30 psia	200°F	100%	7.2×10^6 Rads

Test data for 24 hours is as follows:

Pressure	Temperature	Humidity	Radiation
84.7 psia	230°F	100%	12.6×10^6 Rads

B. Group 2 (Non-Harsh Pressure, Temperature and Humidity)

For this group of Model 1152 transmitter MPL's, the only harsh environment they are exposed to was radiation. This group of Model 1152 transmitters consists of the following MPL's:

MPL#	PPD#	MPL#	PPD#
E12-N052	169C8392	E32-N051	169C8969
E12-N055	169C8394	E32-N055	169C8394
E12-N056	169C8394	E32-N056	169C8969
E22-N050	169C8394	E51-N053	169C8394
E22-N056	169C8392	E51-N055	169C8394

For this group of Model 1152 transmitter MPL's, a service life = 10 years was established by performing a detailed aging analysis on the materials. The max predicted radiation exposure for any one of these transmitters is 7.2×10^6 Rads and the tested value is 12.6×10^6 Rads.

C. Group 3 (Not Qualified to Category II of NUREG-0588)

For this group of Model 1152 transmitter MPL's, it has been determined they do not meet Category II of NUREG-0588 because they are required to function for 100 days (tested for a 50 hour time period). This group of Model 1152 transmitters consists of the following MPL's:

MPL#	PPD#	MPL#	PPD#
B21-N062	169C8394	B21-N094	169C8969
B21-N067	169C8969	E12-N062	169C8969
B21-N073	169C8392	E32-N050	169C8394
B21-N091	169C8392	E32-N058	169C8394

Interim operation justification is based on the following:

1. Failure Mode and Effects Analysis for the above Model 1152's have been developed which indicate failure will not be detrimental to plant safety.
2. 50 hours of LOCA testing exceeding the first 50 hours of Grand Gulf's LOCA environments.
3. Radiation testing of 12.6×10^6 Rads vs. required of 7.2×10^6 Rads.
4. Aging analysis has established a service life of four (4) years based on detail review of materials.
5. All of the above model 1152's are the 1152"T0280" Models.

D. Group 4 (Replace Prior to Fuel Load)

This group consists of only one (1) Model 1152 "Regular" transmitter MPL (B21-N095; PPD# 169C8391). This Model 1152 transmitter must be replaced because of the following:

1. Function time of 100 days
2. Radiation exposure of 7.2×10^6 Rads; qualified for 5.0×10^6 Rads

This model 1152 "Regular" transmitter is being replaced with a Rosemount Model 1152 "T0280" transmitter. Interim operation justification is based on the five (5) reasons stated above in Item C above (Group 3).

E. Group 5 (Exempt)

For this group of Model 1152 transmitter MPL's, the re-evaluation has established that they should be exempted from NUREG-0588 review because they were either exposed to a mild environment, non-Class 1E, or not used at Grand Gulf. This group of 1152 transmitters consists of the following MPL's:

MPL#	PPD#	Reason Exempted
B21-N097	169C8394	Not installed at Grand Gulf
E21-N051	169C8392	Mild environment
E21-N052	169C8394	Mild environment
E21-N053	169C8394	Mild environment
E31-N080	169C8392	Non-Class 1E (not safety related)
E31-N081	169C8392	Non-Class 1E (not safety related)

Qualification Status With Regard to Interim Operation Justification

The qualification status update section above establishes the interim operation justification for Model 1152 transmitter MPL's identified in Group A through E above.

Follow Up Program

The Rosemount Model 1152 transmitter will be qualified to Category I of NUREG-0588 by test by June 1982 or as soon thereafter as possible.

6.0 ACCIDENT ENVIRONMENTS

6.1 GENERAL

In order to ensure an adequate basis for the review, Grand Gulf FSAR LOCA/HELB pressure, temperature, humidity, and radiation environmental conditions were evaluated. Where required, plant-unique environmental conditions were developed using the Category I criteria of NUREG-0588. The development of these conditions is described below. The post-accident parameters used in the equipment review are provided in Attachment B, Parts III and IV.

6.2 INSIDE CONTAINMENT

6.2.1 RADIATION

Using the guidance of NUREG-0588 and NUREG-0737 (Ref. 1), post-LOCA doses were determined in all areas of the drywell and containment. The fission product release data used in this analysis are based on calculations by General Electric for a 1 MW_t BWR-6 equilibrium core with a total burn-up of 1095 MW_d. These data were adjusted by the maximum design power level of 4025 MW_t to obtain the appropriate fission product inventory for the Grand Gulf core. 1

In the case of the NUREG-0588 analysis for the drywell and containment, two scenarios were chosen. The first scenario involved a large line break in the drywell that maximizes the dose to drywell equipment. The second scenario involved an automatic depressurizaton system (ADS) actuation that maximizes the dose to containment equipment.

The drywell scenario began with a line break that caused an instantaneous release of 100 percent of the noble gases and 50 percent of the core inventory iodines to the drywell free volume (270,138 ft^3). The remaining 1 percent of the particulates were assumed to stay entrained in the reactor coolant. At this same time, plate-out was assumed to begin and continue until the concentration of elemental iodine in the air was reduced by a factor of 100. This occurred 42 minutes into the accident, using a plate-out removal rate of $\lambda = 3.31$ hr.$^{-1}$ This value for the plate-out removal was determined using the equation $\lambda p = KgA/V$ (Ref. 2), with a value of 0.01136 cm^{-1} for the area-to-volume ratio, and a value of 0.081 cm/sec. for Kg (Ref. 2, p. 80).

At 2 hours into the accident, sufficient pressure would build up in the drywell, due to operation of the drywell hydrogen purge compressors, for the first row of vents to clear. At this point, a removal rate of 500 cfm was assumed for all airborne isotopes until the concentration of the longer-lived isotopes in the drywell (e.g., Kr 85) equaled that in the containment. This occurred approximately 72 hours into the accident. After the 72-hour period, the only removal mechanism was decay.

The containment scenario assumed that an event occurs causing simultaneous core damage and ADS actuation. The entire source of 100 percent noble gases, 50 percent iodines, and 1 percent of the particulates was released to the suppression pool. This blowdown was conservatively assumed to occur at time zero. For the liquid source, 50 percent iodines and 1 percent