

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

Region I

Report No. 50-317/80-10
50-318/80-09
Docket No. 50-317
50-318
License No. DPR-53 Priority -- Category C
DPR-69

Licensee: Baltimore Gas and Electric Company
P. O. Box 1475
Baltimore, Maryland 21203

Facility Name: Calvert Cliffs Nuclear Power Plant Units 1 and 2

Inspection at: Baltimore, Maryland

Inspection conducted: June 18-20, 1980

Inspectors: A. E. Finkel
A. E. Finkel, Reactor Inspector

July 8, 1980
date signed

date signed

date signed

Approved by: S. D. Ebnetter
S. D. Ebnetter, Chief, Engineering Support
Section #2, RC&ES Branch

7/14/80
date signed

Inspection Summary:

Inspection on June 18-20, 1980 (Report No. 50-317/80-10 and 50-318/80-09)
Areas Inspected: Routine, announced inspection of qualification data for the electrical equipment inside containment associated with the Chemical and Volume Control System, Condensate and Feed Water System, and Containment Air, Recirculation and Cooling System as defined in the licensee's response to IE Bulletin 79-01B dated May 23, 1980. The inspection involved 21 hours on site by one Regional based NRC inspector.
Results: No items of noncompliance or deviation were identified.

DETAILS

1. Persons Contacted

Baltimore Gas and Electric Company

- *R. F. Ash, Chief Nuclear Engineer
- *D. R. Holland, Supervisor Engineering
- *R. H. Kent, Manager Electric Engineering Department
- *A. Marion, Senior Engineering Technician
- *S. A. Rittenhouse, Chief Electrical Engineer
- *K. H. Sebra, Principal Engineer
- *L. A. Sundquist, Supervisor Engineering Quality Assurance

* denotes those present at the exit interview.

2. IE Bulletin 79-01B - Qualification Data Verification

The inspector on June 18-20, 1980 performed a verification inspection of the qualification documentation of the components of the following listed systems. The inspection was performed in accordance with the inspection instructions entitled "Inspection Requirements for Verifying Reactor Licensee Responses to IE Bulletin No. 79-01B."

3. Chemical Volume Control System

The inspector reviewed the qualification data associated with the following in containment solenoid valves:

<u>Plant ID Number</u>	<u>Mfg</u>	<u>Type</u>
ISV517	ASCO	NP8316A75E
ISV518	ASCO	WPHTX8320A21V
ISV519	ASCO	WPHTX8320A21V
ISV506	ASCO	WPHTV8320A21V
ISV515	ASCO	WPHTX8320A21V
ISV516	ASCO	WPHTX8320A21V

a. ISV517 Solenoid Valve - ASCO No. NP8316A75E

The ASCO Solenoid Valve met the following requirements as documented in the listed documentation ASCO AQS-21678/TR Revision A, Isomedix Inc., report covering August 1977 through January 1978, and ASCO Certificate of Conformance dated November 16, 1979. See Table 1A.

The above reference reports identified seven (7) samples selected to represent six generic families of solenoid valves. The selected samples were subjected to sequential exposure of elevated temperature, radiation, wear aging, seismic simulation, vibration, accident radiation, and a loss of coolant accident (LOCA) simulation which lasted 30 days. The solenoid valves were energized and de-energized at high and low pressure/temperature during the test phases (except radiation) and leakage from the solenoid valves was monitored.

The following test data was reviewed by the inspector during the review of the above referenced licensee reports:

Radiation - 50×10^6 rads

Accident Radiation - Additional accumulated dose of 150×10^6 at a dose rate of less than 1 megarad/hour was given to this family.

LOCA - The licensee used as a guide IEEE 323-1974 Figure 1A. The curve in Figure IA-1 represents the data points that the test conformed to. The times are approximate with no intent to reproduce the actual curve.

Thermal Aging - 268°F for 12 days. Cycled (de-energized and energized every 6 hours). The test simulated a 4.4 year life @ 140°F (10% margin added to the 4 year design life).

Test sample No. 8 malfunctioned after 8 days. The valve developed excessive seat leakage both in the energized/de-energized states. At the end of the test it was determined that the valve had dirt in the system. It appeared that the iron pipe used in the cylinder port as piping and a piece of iron pipe used to simulate an accumulator introduced the dirt into this system.

Wear Aging - The solenoid valve samples were electrically cycled 40,000 times at maximum operating pressure differential. Baseline and functional tests conducted during this test phase of the test indicates that all of the seven samples which comprise the generic families appear to pass the functional requirements as defined in paragraphs 9.4.2.3.4 and 9.4.2.4.2 and Figure 9.1 of ASCO Qualification Specification AQS-21678 Revision B Appendix A.

The following items are under evaluation by the licensee:

Automatic Switch Company letter of May 2, 1980 to the licensee states for item 10NP8316A75V that the energized and de-energized times is 125 msec. Test Report No. AQS21678/TR Revision A does not define the time requirements of the item.

Insulation resistance measurements were recorded before thermal aging but not after this test. The data sheets did not record any further results for this test.

Thermal aging of this item is based on a four year life, with replacement of coils and elastomeric components.

b. ISV518, 19, 15, 16 and 506 Solenoid Valves ASCO No. WPHTX832021V

The ISV series of solenoid valves part no. WPHTX832021V appears to not be qualified in the area of radiation. (Reference Table 1B). The value of 10E+6 Rads in the qualification column indicates that the data in the qualification report did not comply with the requirement of 100E+6 Rads.

Simulated LOCA test of solenoid valves and limit switch by Norrod Engineering Department, Masoneilan International, Inc., dated April 19, 1973 identifies the following items and environments.

Solenoid Valve

ASCO Model WPHTX8320A21V S/N 96578A
 ASCO Model WPHTX8300B01YF S/N 96577A

Limit Switch

Namco Model No. SL3
 Namco Model No. EA-740-500-00

In reviewing the qualification documentation associated with the above components the inspector identified the following areas that require continued licensee action.

Pressure and Temperature curves are required to support analysis - Eastern Controls Report.

Test duration needs clarification.

Verification by serial number that components were subjected to a synergistic test programmed to be verified.

The above items are under evaluation by the licensee.

4. Compressed Air System

The solenoid valve ISV2085, ASCO part no. NP8320A195V meets the same requirements as listed in Table IA of the Chemical and Volume Control System.

5. Condensate and Feed Water System

The components for this system were level transmitters manufactured by Fischer and Porter part no. 13D2495KBAACB. The ID numbers for the components are identified in Table IC.

The inspector reviewed the following test reports associated with the type testing of this transmitter design.

a. Ameron Report No. 1550a dated March 23, 1972

Fischer and Porter letter of March 6, 1975 stated that the use of Amercoat 66 paint is used on cast iron bases and covers of their generic family of transmitters.

The Ameron test report no. 1550a qualified their Amercoat 66 paint over cast iron to the following requirements:

Temperature - 340⁰F
 Pressure - 100 psig
 Radiation - 6.0X10⁹R
 Chemical Solution - Immersed

b. Fischer and Porter Report 2204-51-B-006 dated December 1968

Fischer and Porter tested their generic designs to the following environments:

Temperature	320 ⁰ F = 1 hour
	293 ⁰ F = 1.75 hours
	228 ⁰ F = 22 hours
	150 ⁰ F = post 22 hours
PSIA	90 = 1 hour
	60 = 1.75 hours
	20 = 22 hours

Specific components tested to the above environment were as follows:

10B2491	10B2495	13D2493
10B2494	10B2496	

The above components were electronic differential pressure transmitters modified. (Modified as follows - sealing and high temperature electronic components with Amercoat 66 used on the external surfaces.) Fischer and Porter informed the licensee that the 13D2495 component used at the Calvert Cliffs site are the same as the 13D2493 component that was qualified.

c. Franklin Institute Report F-C2815 dated May 1970 Entitled "Qualification Tests of Differential Pressure Transmitter Under Nuclear Irradiation"

The object of this test was to verify proper function of transmitters when subjected to irradiation from a Co-60 source.

Three electronic force balance transmitter units consisting of (1) an oscillator-amplifier module, (2) a detector coil assembly, and (3) a force motor. These three transmitter types are used on F&P pressure transmitter modules 10B2490, 50EP1000, 50EN1000, and 50ER1000. The measuring elements were not tested as part of this test.

The three electronic force balance transmitters were exposed to a Cobalt 60 irradiation as follows:

Unit 1	53 hrs	accumulated dose of 5.7×10^6
*Unit 2	48 hrs	accumulated dose of 4.2×10^6
Unit 3	53 hrs	accumulated dose of 2.5×10^6

*Unit 2 (a detector coil assembly) was removed from the test after 48 hours and a complete pressure transmitter Model 10B2495 with top cover removed was irradiated with the above source for 5 hours for an accumulated dose of 0.85 megarads. This level of irradiation does not meet the licensee requirements of 1×10^6 as required by their qualification requirement.

The FIRL report of May 1970 F-C2815 does not reference the serial numbers of the transmitters tested and the F&P report 2204-51-B-006 dated December 1968 do not identify the serial numbers of the component tested. The licensee is to verify that the components tested in the above referenced reports are of the same serial number. The licensee also is investigating why the qualification test of the 13D2495 level transmitter did not comply with the specification requirements. Reference Table IC.

6. Containment Air Recirculation and Cooling System

Joy, manufacturer of the containment fan, used a 480 Volt 75 HP Reliance motor part No. X324356A6W and a 480 Volt 125 HP Reliance motor part No. X323727A1AW as the fan power source. The containment fan component was qualified to the requirement as listed in Table ID. The inspector questions the American Air Filter Co. test report dated April 7, 1973 in the area of motor cycles and synergistic testing.

- a. Motor Cycles - The qualification specification Bechtel No. 6750-M-204 and Technical File #6750-1520 Form CC-100, Category III for motor during LOCA conditions requires that 12 hour cycles be required during the test, but the test was reduced to 3 to 4 hours per cycle. During a site review of the qualification data Item 159 in Audit Action Schedule of Licensee dated August 1975 identified this as an unresolved item by the NRC.

The licensee closed this item 159, by the following statement "the 12 hour per cycle was in error and that 3 to 4 hour per cycle was all that was required." Reference FSAR Sections 6.5.4.f and 6.5.3.c, also Section 14.16. The licensee is required to provide the justification for the change approval.

- b. Synergistic testing and the environments of Table ID are to be verified by the licensee.

7. Continental Wire and Cable Company

The Continental Wire and Cable Company qualified the following type of cables to the environment identified in Table IE.

- a. Cable A - 7 conductor #12 (7) copper, CC-115 silicone rubber insulation, glass braid over silicone, glass finished with a flame and abrasion resistant finish CC-1233, mylar binder tape, overall asbestos braid, asbestos finished with CC-1120 flame and abrasion resistant finish.
- b. Cable B - 2 conductor #16 (7) copper, CC-2115 silicone rubber insulation, glass braid over silicone, glass braid finished with a flame and abrasion resistant finish CC-1233, 2 conductor cabled with impregnated asbestos fillers, mylar binder tape, overall asbestos braid, asbestos finished with CC-1120 flame and heat resistant finish.

The qualification of these cables is documented in Franklin Institute Research Laboratories (FIRL) report F-C2935 entitled "Test of Electrical Cables Under Simulated Post-Accident Reactor Containment Service," dated October 1970. This report is considered to be proprietary by the vendor.

Areas that require clarification by the licensee are as follows:

Radiation - As identified in Table IE the radiation requirement is $100E+6$ while the cable was tested to $10E+6$. Reference Industrial Reactor Laboratories, Inc. letter dated October 7, 1970.

Chemical Spray - Table IE requires a chemical spray of 1.1% B/A. FIRL report F-C2935 dated October 1970 does not identify any chemical spray test.

Both of the above items are being evaluated by the licensee.

8. Anaconda Wire and Cable Co.

The following samples of Anaconda cable were qualified as identified in the requirements of Table IF.

Sample 1 - 7 Conductor cable, No. 14AWG
7 strand Anaconda; ME299
Insulation. Individual conductors MH8100 Conductor
Covering and MH8100 Belt overall.

Sample 2 - Power Cable Single conductor
AWG No. 7 wire size stranded, ME299 Insulation,
MH8100 Belt.

The qualification of the above samples was performed by FIRL and documented in their report F-C2525 dated October 1969. The qualification program included irradiation of the samples with a Cobalt 60 source, a steam and chemical spray environment and testing the insulation of the samples at various points in the test cycle. During the autoclave steam test, Table 2F, the test samples had 480V applied. Radiation dose rate for the two sample cables was 490 MRAD from a Cobalt 60 source.

The % of B/A as listed in Table IF has to be verified by the licensee.

9. Licensee Event Report (LER)

As defined in item 6 of IE Bulletin 79-01B, "the licensee is required to submit an LER for any Class IE electrical equipment item which has been determined as not being capable of meeting environmental qualification requirements for service intended." The components identified in this report as being investigated or to be verified by the licensee will be required to meet item 6 of IE Bulletin 79-01B if the information in the qualification documentation can not be verified.

10. Safety Evaluation Report

The acceptability of qualification documentation identified in this report will be documented in the Safety Evaluation Report (SER) that is to be written for this licensee. The SER is planned to be issued for this site by February 1981.

11. Exit Interview

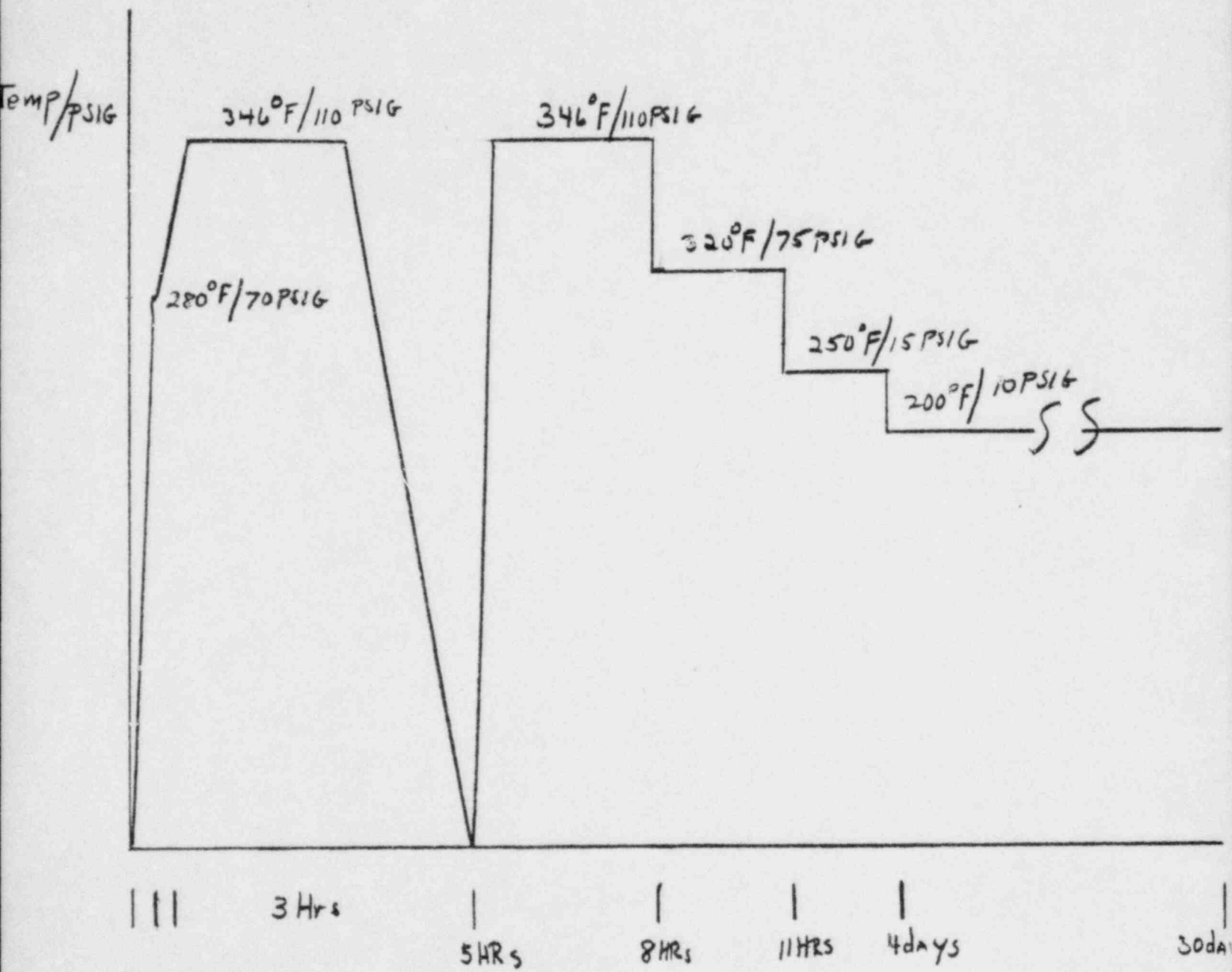
At the conclusion of the inspection on June 20, 1980, a meeting was held at the Baltimore, Maryland corporate office with representatives of the licensee. Attendees at this meeting included personnel whose names are indicated by notation (*) in paragraph 1. The inspector summarized the results of the inspection as described in this report.

Equipment Description	Environment Parameter	Requirements	Qualification	Qualification Methods
1SV517 NP8316A75E	Operating Time	NA	NA	Sequential Test
	Temperature	276 ⁰ F	280 ⁰ F	
	Pressure (psig)	50	70	
	Humidity (%)	100	100	
	Chemical Spray	1.1% B/A	0.3% B/A	
	Radiation	100E+6	150E+6	
	Aging		4.4 years	

Operating Requirements: Cold Shutdown

ASCO Solenoid Valve 1SV517

Table IA



ASCO Solenoid Valve 1SV517

TEMPERATURE/PRESSURE CURVE

FIGURE IA-I

Equipment Description	Environment Parameter	Requirements	Qualification	Qualification Methods
ISV518,519, 515,516 & 506	Operating Time	NA	NA	Synergistic Test
	Temperature	276°F	310°F	
	Pressure (psig)	50	65	
	Humidity (%)	100	w/s	
	Chemical Spray	1.1% B/A	6% B/A	
	Radiation	10E+6	10E+6	
	Aging			

Operating Requirements: LOCA, HELB, Cold Shutdown ISV518
ISV519

LOCA/HELB ISV515
LOCA/HELB ISV516
LOCA/HELB ISV506

ASCO Solenoid Valves Qualification Data

Table IB

Equipment Description	Environment Parameter	Requirements	Qualification	Qualification Methods
ID No.	Operating Time	NA	NA	Sequential Test
ILT1113A,B,C,D	Temperature	276 ⁰ F	320 ⁰ F	
ILT1123A,B,C,D	Pressure (psig)	50	90	
	Humidity (%)	100	100	
	Chemical Spray	1.1% B/A	NA	
	Radiation	100E+6	0.82E+6	
	Aging			

Operating Requirements: During LOCA and Hot Standby

Fischer and Porter Level Transmitters
Qualification Data

Table IC

Equipment Description	Environment Parameter	Requirements	Qualification	Qualification Methods
ID IMB105,102 & 405-75HP 480 volt motor Reliance Electric Co. Part No. X324356A6AW	Operating Time	NA	NA	
	Temperature	276°F	300°F	
	Pressure (psig)	50	80	
	Humidity (%)	100	100	
	Chemical Spray	1.1% B/A	Caustic	
	Radiation	100E+6	10E+8	
	Aging			

Operating Requirements: LOCA, Hot Standby, Cold Shutdown

Joy Containment Fan Motor
(Qualification Data)

Table ID

Equipment Description	Environment Parameter	Requirements	Qualification	Qualification Methods
Cable CBLXXX Continental	Operating Time	NA	NA	Sequential Test
	Temperature	276 ⁰ F	340 ⁰ F	
	Pressure (psig)	50	100	
	Humidity (%)	100	100	
	Chemical Spray	1.1% B/A	B/A	
	Radiation	100E+6	10E+6	
	Aging			

Operating Requirements: During LOCA, HELB, Hot Standby and Cold Shutdown

Continental Wire/Cable
Qualification Data

Table IE

Equipment Description	Environment Parameter	Requirements	Qualification	Qualification Methods
Anaconda: Cable sizes, Nos. 14 and 7 AWG	Operating Time	NA	NA	Sequential Test
	Temperature	276 ^o F	346 ^o F	
	Pressure (psig)	50	113	
	Humidity (%)	100	w/s	
	Chemical Spray	1.1% B/A	B/A	
	Radiation	100E+6	200E+6	
	Aging			

Operating Requirement: During LOCA, HELB, Hot Standby, Cold Shutdown

Anaconda Cable Qualification Data

Table IF

Autoclave Steam Test of Power and Control
Cables Irradiated to 24 MRAD

<u>Total Elapsed Time (Min)</u>	<u>Autoclave Environment</u>		<u>Current in Pair of Conductors Sample 1 (Amps)</u>	<u>Current in Cable of Sample 2 (Amps)</u>	<u>Remarks</u>
	<u>Pressure (psig)</u>	<u>Temp (°F)</u>			
0	0	80	37.7	5.0	
5	14.0	230	37.5	5.0	
10	35.0	288	37.4	5.0	Boric Acid Spray Started
20	50.0	294	36.6	4.5	
30	50.0	295	36.4	4.5	
60	49.0	296	36.0	4.4	
120	49.8	296	35.0	4.3	
125	39.6	283	--	--	Steam & Boric Acid Spray Turned off
140	29.0	272	35.6	4.5	
160	2.0	257	36.0	4.5	
180	0	248			

Anaconda Cable Test Data

Table 2F