



Metropolitan Edison Company
Post Office Box 542
Reading Pennsylvania 19603
215 929-3601

June 7, 1979
GQL 0482

Mr. B. H. Grier, Director
U. S. Nuclear Regulatory Commission
Region I
631 Park Avenue
King of Prussia, Pennsylvania 19406

Dear Sir:

Three Mile Island Nuclear Station Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
Response to IE Bulletin 79-01

On February 8, 1979, you issued the subject IE Bulletin. This Bulletin required the Licensees of all Power Reactor Facilities with an Operating License (except the 11 SEP Plants) to take several actions. In response to this request, Met-Ed has done the following:

1. Completed the re-review program described in IE Circular 78-08. Met-Ed's completion of this program is documented in TMI-1 Inspection Report 50-289/79-01 dated January 29, 1979 (See Attachment #1), Pages 4 and 5).
2. Determined that the use of Stem-Mounted Limit Switches on safety-related systems inside containment does not include the model numbers identified in IE Bulletin 79-01 as being unqualified.
3. Compiled written evidence of the qualification of electrical equipment required to function under accident conditions (See Attachment #2).
4. Determined that no items have been identified as not meeting qualification requirements for the service intended.

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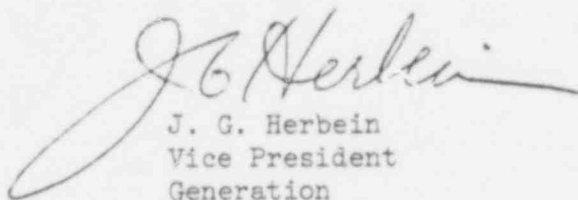
B. H. GRIER

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June 7, 1979
GQL 0482

We believe that this response, as well as our actions taken concerning IE Circular 78-08, and our responses to IE Bulletins 77-05, 77-05A, 77-06, 77-07, 78-02 and 78-04 adequately address the concerns regarding the environmental qualification of electric components used in safety related systems.

Sincerely,



J. G. Herbein
Vice President
Generation

JGH:RAL:mrn

Attachments

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

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79-044-02-1000 UNITED STATES
 NUCLEAR REGULATORY COMMISSION
 REGION I
 631 PARK AVENUE
 KING OF PRUSSIA, PENNSYLVANIA 19405
 1979 JUN 31 10:26

Docket Nos. 50-289
50-320

29 JAN 1979

Metropolitan Edison Company
ATTN: Mr. J. G. Herstein
Vice President - Generation
P. O. Box 542
Reading, Pennsylvania 19640

Gentlemen:

Subject: Combined Inspection 50-289/79-01; 50-320/79-01

This refers to the inspection conducted by Mr. D. Haverkamp of this office on January 8-11, 1979 at your corporate office and at Three Mile Island Nuclear Station, Units 1 and 2, Middletown, Pennsylvania of activities authorized by NRC License Nos. DPR-50; DPR-73 and to the discussions of our findings held by Mr. Haverkamp with Messrs. G. Troffer and G. Kunder at the conclusion of the inspection.

Areas examined during this inspection are described in the Office of Inspection and Enforcement Inspection Report which is enclosed with this letter. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspector.

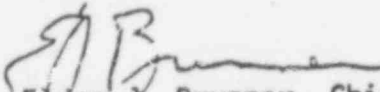
Within the scope of this inspection, no items of noncompliance were observed.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter and the enclosed inspection report will be placed in the NRC's Public Document Room. If this report contains any information that you (or your contractor) believe to be proprietary, it is necessary that you make a written application within 20 days to this office to withhold such information from public disclosure. Any such application must be accompanied by an affidavit executed by the owner of the information, which identifies the document or part sought to be withheld, and which contains a statement of reasons which addresses with specificity the items which will be considered by the Commission as listed in subparagraph (b) (4) of Section 2.790. The information sought to be withheld shall be incorporated as far as possible into a separate part of the affidavit. If we do not hear from you in this regard within the specified period, the report will be placed in the Public Document Room.

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No reply to this letter is required; however, if you should have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,


Eldon J. Brunner, Chief
Reactor Operations and Nuclear
Support Branch

Enclosure: Office of Inspection and Enforcement Combined Inspection
Report Numbers 50-289/79-01; 50-320/79-01

cc w/encl:

E. G. Wallace, Licensing Manager
J. J. Barton, Project Manager
R. C. Arnold, Vice President - Generation
L. L. Lawyer, Manager - Generation Operations - Nuclear
S. P. Miller, Superintendent
J. L. Seelinger, Unit 1 Superintendent
J. B. Logan, Unit 2 Superintendent
G. A. Kunder, Unit 2 Superintendent - Technical Support
I. R. Finfrock, Jr.
Mr. R. Conrad
G. F. Trowbridge, Esquire
Miss Mary V. Southard, Chairman, Citizens for a Safe Environment
(Without Report)

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

Region I

Report No. 50-289/79-01
50-320/79-01

Docket No. 50-289
50-320

License No. DPR-50
DPR-73

Priority --

Category C
C

Licensee: Metropolitan Edison Company

P. O. Box 542

Reading, Pennsylvania 19640

Facility Name: Three Mile Island Nuclear Station, Units 1 and 2

Inspection at: Middletown, Pennsylvania and Reading, Pennsylvania

Inspection conducted: January 8-11, 1979

Inspectors: *D. R. Haverkamp*
D. R. Haverkamp, Reactor inspector

1-26-79
date signed

date signed

date signed

Approved by: *R. R. Keimig*
R. R. Keimig, Chief, Reactor Projects Section
No. 1, RO & NS Branch

1/26/79
date signed

Inspection Summary:

Inspection on January 8-11, 1979 (Combined Report Nos. 50-289/79-01; 50-320/79-01)

Areas Inspected: Routine, unannounced inspection by a regional based inspector of plant operations including shift logs and records and facility tour during normal hours (Unit 2); plant operations during backshift (Unit 2); selected licensee events and periodic reports (Unit 2); and, licensee followup to IE Circular 78-08 and previous inspection findings (Units 1 and 2). The inspection involved 4 inspector-hours onsite for Unit 1, 16 inspector-hours onsite for Unit 2, and 8 inspector-hours at the corporate office by one NRC regional based inspector.

Results: No items of noncompliance were identified.

DETAILS

1. Persons Contacted

Metropolitan Edison Company - Three Mile Island

Mr. R. Barley, Unit 1 Lead Mechanical Engineer
*Mr. M. Bezilla, Unit 2 PORC Secretary
Mr. C. Hartman, Unit 1 Lead Electrical Engineer
Mr. K. Hoyt, Unit 2 Shift Foreman
*Mr. G. Kunder, Unit 2 Superintendent - Technical Support
Mr. J. Logan, Unit 2 Superintendent
Mr. F. Scheimann, Jr., Unit 2 Shift Foreman
Mr. M. Shatto, Unit 1 PORC Secretary
Mr. B. Smith, Shift Supervisor
Mr. W. Zewe, Shift Supervisor

Metropolitan Edison Company - Corporate Office

**Mr. R. Harding, Unit 2 Lead Licensing Engineer
**Mr. G. Troffer, Manager - Generation Quality Assurance

The inspector also interviewed several other licensee employees during the inspection. They included control room operators, licensing and engineering staff personnel, and general office personnel.

*denotes those present at the exit interview onsite on January 10, 1978.

**denotes those present at the exit interview at the corporate office on January 11, 1979.

2. Licensee Action on Previous Inspection Findings (Units 1 and 2)

(Closed) Inspector Followup Item 289/78-13-01: LER 78-08/1T
Corrective Action. - The plant continues to operate with a low water level in the OTSGs when at low power levels. Various options which would allow flooded OTSG nozzle startup operations are being considered by the licensee. However, such operation will not be performed without NRC/NRR approval. The inspector had no further questions concerning this item.

(Closed) Unresolved Item 289/78-19-02: LER 78-24/IT Corrective Action. Temporary Change Notices 78-261 through 78-267 have been issued to incorporate revised heatup/cooldown limits in applicable operating procedures. TSCR #88, dated January 4, 1979, has been submitted to NRC/NRR to revise applicable Technical Specifications. The inspector had no further questions concerning this item.

(Closed) Unresolved Item 289/78-19-03: LER 78-25/IT Corrective Actions. TCN 78-269 was issued to SAP 1002 to ensure proper selection and testing of backup E.S. equipment, when taking emergency safeguards components out-of-service. Permanent revision of SAP 1002 is in progress. The inspector had no further questions concerning this item.

(Closed) Unresolved Item 289/78-19-05: Licensee Review of IE Circular 78-16. IEC 78-16 has been reviewed by PORC and Generation Engineering - Electrical Section. The plant has some Limitorque valves of the type described, however, manual operation is infrequent. Present procedural guidance for valve operation and maintenance is considered adequate. Vendor comments concerning proper valve operation were sent to the training department for discussion in the operator requalification program. The inspector had no further questions concerning this item.

(Closed) Unresolved Item 320/78-29-06: Licensee Review of IE Circular 78-08. Licensee review of environmental qualification of safety-related electrical equipment has been completed, as described in paragraph 3 of this report. The inspector had no further questions concerning this item.

(Closed) Noncompliance 320/78-32-04 and Unresolved Item 320/78-32-05: Administrative Controls for Jumpers and Lifted Leads. A licensee audit of jumpers and lifted leads has been completed. No further examples of improper administrative control of these items were noted by the inspector. SAP 1013 does not require revision to require more stringent controls or to include specific controls for gagging devices at this time. The inspector had no further questions concerning these items.

(Closed) Unresolved Item 320/78-36-08: Environmental Qualification Testing of NAMCO - Type SMLSS. NAMCO-type stem mounted limit switches, used for position indication of R.B. purge supply and exhaust valves, were tested for environmental qualification, as described in paragraph 3 of this report. The inspector had no further questions concerning this item.

3. IE Circular 78-08 Followup (Units 1 and 2)

The inspector reviewed the licensee's followup actions regarding IE Circular 78-08, "Environmental Qualification of Safety-Related Electrical Equipment at Nuclear Power Plants," dated May 31, 1978. The review included discussions with licensee personnel and review of the following selected records at the corporate office.

- Generation Division Service Requests 780260, 780261, 780292, and 780302 (used to assign responsibility for review of IE Circular 78-08 and referenced material)
- Electrical Connector Penetration Concern Summary (Licensee drafted)
- Union of Concerned Scientists Summary (Licensee drafted)
- Summary of IE Circular 78-08 Review (Licensee drafted)
- Metropolitan Edison Company (MEC) memorandum serial GEM 5258, dated November 13, 1978 (list of electrical components located inside containment which are required to function following a LOCA in line break at TMI-1)
- Burns and Roe, Inc. letter to MEC serial 4301-GP, dated November 9, 1978 (TMI-2 electrical equipment environmental qualification)
- MEC memorandum serial GOM 5162, dated November 8, 1978 (verification of no failures of electrical components located inside containment at TMI-1 and TMI-2 as a result of adverse environmental conditions)
- MEC memorandum serial GEM 5147, dated November 7, 1978 (description of engineering review and verification that installed safety-related electrical equipment at TMI-1 is environmentally qualified)

- GPU/Burns and Roe documentation sent to MEC (Review of TMI-2 safety-related electrical equipment in relation to IE Circular 78-08 concerns)
- Specification 2555-100, Containment Purge Isolation Butterfly Valves
- MEC memorandum serial GQM 5619, dated December 5, 1978 (Field verification of electrical components installed at TMI-1)
- Selected documentation of TMI-2 component changes/modifications to provide environmentally qualified electrical equipment
- Selected environmental qualification test report data for electrical components installed at TMI-1 and TMI-2

The inspection purpose, scope and acceptance criteria regarding licensee followup to IEC 78-08 were as described in OIE Inspection Report No. 50-320/78-29, paragraph 8.

Findings were acceptable, except as described below.

- Field verification of electrical components installed at TMI-1 has not yet been completed. MEC memorandum GQM 5619 states that such verification is to be performed by MEC QC personnel during the 1979 refueling outage commencing in mid-February. The QC surveillance report is scheduled to be published by April 1, 1979. This item is unresolved, pending NRC review of the TMI-1 field verification (289/79-01-01).

4. Review of Plant Operations (Unit 2)

a. Shift Logs and Operating Records

The inspector reviewed the following logs and records.

- Shift Foremen Log, Control Room Log Book, Control Room Operator's Log Sheets, Primary Auxiliary Operator's Log-Tour Readings, Primary Auxiliary Operator's Log-Liquid Waste Disposal Panels, Secondary Auxiliary Operator's Log Sheets, and Auxiliary Operator Log Sheets-Out-Building Tour, dated October 16 - December 31, 1978.

Summary of Environmental Qualification
Data for Electrical Components Used
Inside Containment at TMI-1

I. Description of the Accident Environment

As discussed in Chapter 14 of the TMI-1 PSAR, the DBA Environmental conditions are as follows:

- A) DBA Pressure: 51 PSIG
- B) DBA Temperature: 275°F
- C) DBA Relative Humidity: 100%

In addition, Reactor Building Spray consists of a Boric Acid, NaOH and sodium thiosulfate solution with a pH between 9 and 10.

II. Component Description

- A) Cable Splices - A review of TMI-1 has determined that there are no in-line cable splices made on safety-related circuits inside containment. Cable splices made at the penetrations and at the electrical components were qualified as part of the Kerite cable qualification test. This test is described in greater detail in Section H below.

- B) Terminal Blocks (GE Type CR 151)

- 1) Test Environment:
 - Temperature: 340°F
 - Pressure: 103 PSIG
 - Relative Humidity: 100%

- 2) Test Methods:

The test was conducted with two adjacent terminals of the terminal block connected to an IR rack with #16 AWG wire passing through two sealed ports in the pressure vessel (see Test Circuit Diagram: Attachment A)

The insulation resistance was measured between the two terminals with 500V DC power supply at ambient condition. The terminal blocks were then subjected to the LOCA condition. The insulation resistance was recorded at least once a day. After completion of the ten day test, the cover was removed and the vessel was left open for 36 hours before final insulation resistance measurements were recorded.

The results of this test showed that the insulation resistance remained at a sufficient level to assure the continued function of electrical equipment without circuit overload.

It should be noted that while this test was evaluated for unprotected terminal blocks, the terminal blocks provided are mounted in vented boxes, thus making the test more conservative than the actual field application of the equipment. Because the TMI-1 Terminal Blocks are located inside vented boxes, they will not be subjected to a chemical spray environment.

- 3) Reference Document: Letter Re: Electrical Terminal testing dated 10/10/78 from J. F. Shirk (GE) to R. C. Noil (Met-Ed)

An engineering review of all safety-related electrical circuits inside containment has revealed that the only place terminal blocks are utilized is at the electrical penetrations. These are the terminal blocks discussed above. In some instances terminal blocks are used at the electrical components themselves (Such as motor operators for valves). A review of the electrical circuits for safety-related motor-operated valves has determined that the only terminal block connections are the power lead connections. The control circuits have been connected directly to the limit/torque switches. Both of these connections are similar to the connections made to the prototype Limitorque valve operator which has successfully passed an accident environment test. (This is discussed further in the section concerning Motor Operators).

C) Limit Switches

An engineering review of TMI-1 safety-related valves inside containment has revealed that there are no air-operated valves and, therefore, no stem-mounted limit switches. TMI-1 uses Limitorque motor operators for all safety-related valves inside containment. The limit switches installed on the Limitorque operator are internal and have been qualified for an accident environment. (This is discussed further in the section concerning Motor Operators).

Qualification Environment, Test Methods and Reference Document section are not applicable for this item.

D) Electrical Connectors

An engineering review has revealed that the only connectors inside containment at TMI-1 for safety-related circuits are the neutron detectors. Of these, the connectors at the penetration are an integral part of the penetration and were qualified when the penetration was qualified. (This is discussed in more detail in the section concerning penetrations). The connectors at the neutron detectors are encapsulated by Raychem Thermofit heat-shrink tubing. This tubing has passed environmental qualification tests as describe below:

1) Qualification Environments:

Temperature: 351°F
Relative Humidity: 100%
Pressure: 70 PSIG
Boric Acid Spray

2) Test Methods:

The specimens were exposed to a seven-day combined thermal and radiation aging period at 302°F and 5×10^7 rads gamma radiation dose. During this time the specimens were electrically energized. The thermal and radiation period was followed by a simultaneous exposure to steam, chemical spray and gamma radiation. The test continued for 30 days duration. The result of this test indicated that none of the cable splices failed.

3) Reference Document: Franklin Institute Research Lab
Final Report F-C 4033-3

E) Electrical Penetrations: (G.E. Type F01)

1) Test Conditions

Temperature: 340°F
Pressure: 63 PSIG
Relative Humidity: 100%

2) Test Methods:

The test lasted for 69 hours and involved the simultaneous application of the temperature, pressure and humidity listed above. Penetration leakage and insulation resistance were measured throughout the testing. The capability of a penetration assembly to withstand the design basis accident environment and maintain operable cables and containment integrity was successfully demonstrated. There was no failure of the electrical connectors which are an integral part of the penetration.

3) Reference Document: General Electric - Qualification Test for
F01 Electrical Penetration Assembly - 4/30/71

F) Instrumentation Cabling (Anaconda - silicone rubber insulated with a silicone rubber jacket)

1) Qualification Environment

Temperature: 340°F
Pressure: 100 PSIG
Relative Humidity: 100%
Boric Acid Spray

2) Test Conditions:

Testing began by increasing the temperature to 151^oF, and increasing the relative humidity to 100%. These conditions were maintained for (6) hours. Following this 6 hour period, the steam pressure was increased to 100 PSIG, increasing the temperature to approximately 340^oF. Throughout the test, the specimens were electrically energized. The test lasted for a total of 28 hours. No difficulties were encountered. Insulation resistance and leakage current measurements did not reveal any breakdown of insulation. It is concluded that the cables performed satisfactorily under the conditions simulated.

3) Reference Document:

- a) Franklin Institute Research Laboratory Final Report F-C2935 (Proprietary Information).
- b) 10/24/78 letter from Paul Cardello (Anaconda) to R. C. Noll (Metropolitan Edison Co.)

Note: All safety-related instrumentation cable inside containment at TMI-1 is run in conduit, and therefore will not be exposed to boric acid spray.

G) Temperature Limitations on Solenoid Valves:

An engineering evaluation has determined that TMI-1 does not utilize any air-operated safety-related valves inside containment, and, therefore, does not have any pilot solenoids which are affected by temperature limitations. Qualification Environment, Test Methods and Reference Test Report Sections are not applicable for this item.

H) Power Cabling(Kerite)

- 1/C No. 6, 4½ ft. long
- 1/C No. 6, 6 ft. long with 1 splice
- 1/C No. 6, 14 ft. long with 1 splice
- 2/C No. 12, 18 ft. long
- 2/C No. 12, 6 ft. long with 1 splice

1) Test Environment

Temperature: 320^oF
Pressure: 82 PSIG
Relative Humidity: 100%
Boric Acid Spray (pH = 9.5)

2) Test Method:

Cable samples were irradiated to 1×10^8 rads. Following the irradiation, the specimens were simultaneously subjected to the environmental conditions listed above. Throughout the test, the specimens remained electrically energized. The test lasted for 7.5 days. This test demonstrated that the cables and splices will perform adequately under DBA conditions.

3) Reference Document:

Franklin Institute Research Laboratories
Final Report F-C2737 and F-C2770

I) Motor Operators (Limitorque - Model SMB-O)

1) Qualification Environment:

Temperature: 329°
Pressure: 90 PSIG
Relative Humidity: 100%
Boric Acid Spray

2) Test Methods:

Prior to beginning the actual test, the Limitorque Operator was slowly brought up to a temperature of 140°F at atmospheric pressure. This was done in order to simulate the long term ambient conditions prior to an accident. The test was begun by simultaneously subjecting the specimen to the environmental conditions mentioned above. The Limitorque Valve Operator continued to operate throughout and after the environmental test. The test lasted for seven days. At the end of the seven day environmental exposure, the Limitorque Operator closed the valve stem normally. The terminal blocks to which the power leads were connected were qualified when the operators were qualified.

3) Reference Document:

Franklin Institute Research Laboratories
Final Report #F-C2232-01

J) Electrical Transmitters (Rosemount Alkaline Pressure Transmitter 11526P9A92PB)

1) Qualification Environment

Temperature: 300°F
Pressure: 80 PSIG
Relative Humidity: 100%
Boric Acid Spray (pH = 10.5)

2) Test Methods:

The specimens were simultaneously subjected to the environmental conditions described above. The results substantiate that the design is capable of withstanding the combined LOCA environment of radiation and steam temperature-pressure.

3) Reference Document:

Franklin Institute Research Laboratories
Final Report #F-C44-23-6
B&W Qualification Report for Pressure Transmitter
Rosemount Model 11526P9A92PB

Rosemount Model 1152 - Pressure Transmitter

1) Qualification Environment

Temperature: 316⁰F
Pressure: 70 PSIG
Relative Humidity: 100%

2) Test Conditions:

The specimens were first subjected to radiation (5×10^6 rads) and seismic tests. Then the specimen was simultaneously subjected to the environmental conditions mentioned above. The test lasted for 50 hours. All qualification tests for radiation seismic vibration and steam-pressure were passed by the 1152DP test transmitter.

3) Reference Document:

B & W Qualification Tests for Rosemount Pressure Transmitter
Model 1152

Foxboro Pressure Transmitter

1) Qualification Environment

Temperature: 286⁰F
Pressure: 60 PSIG
Humidity: 100%

2) Test Methods:

The specimens were simultaneously subjected to the environmental conditions listed above. The test lasted for 24 hours. The results of the test demonstrated that all of the protective system components meet or exceed the minimum performance requirements.

3) Reference Document:

B & W Topical Report 10003 Rev. 4 4/75

K) Reactor Building Ventillation Fans and Motors

1) Qualification Environment

Temperature: 473°F
Pressure: 15 PSIG
Relative Humidity: 100%
Boric Acid Spray

2) Test Method

The fan motors were first subjected to the 473°F environment, then were simultaneously subjected to the remaining parameters listed above. The test lasted for seven days. The test report concludes that the subject fan units are of such design and quality as to meet all environmental operating and emergency conditions for Nuclear Containment Service.

3) Reference Document:

Joy Manufacturing Co.
Environmental Test of Fans for Reactor Containment Building
Ventillation and Cooling Systems

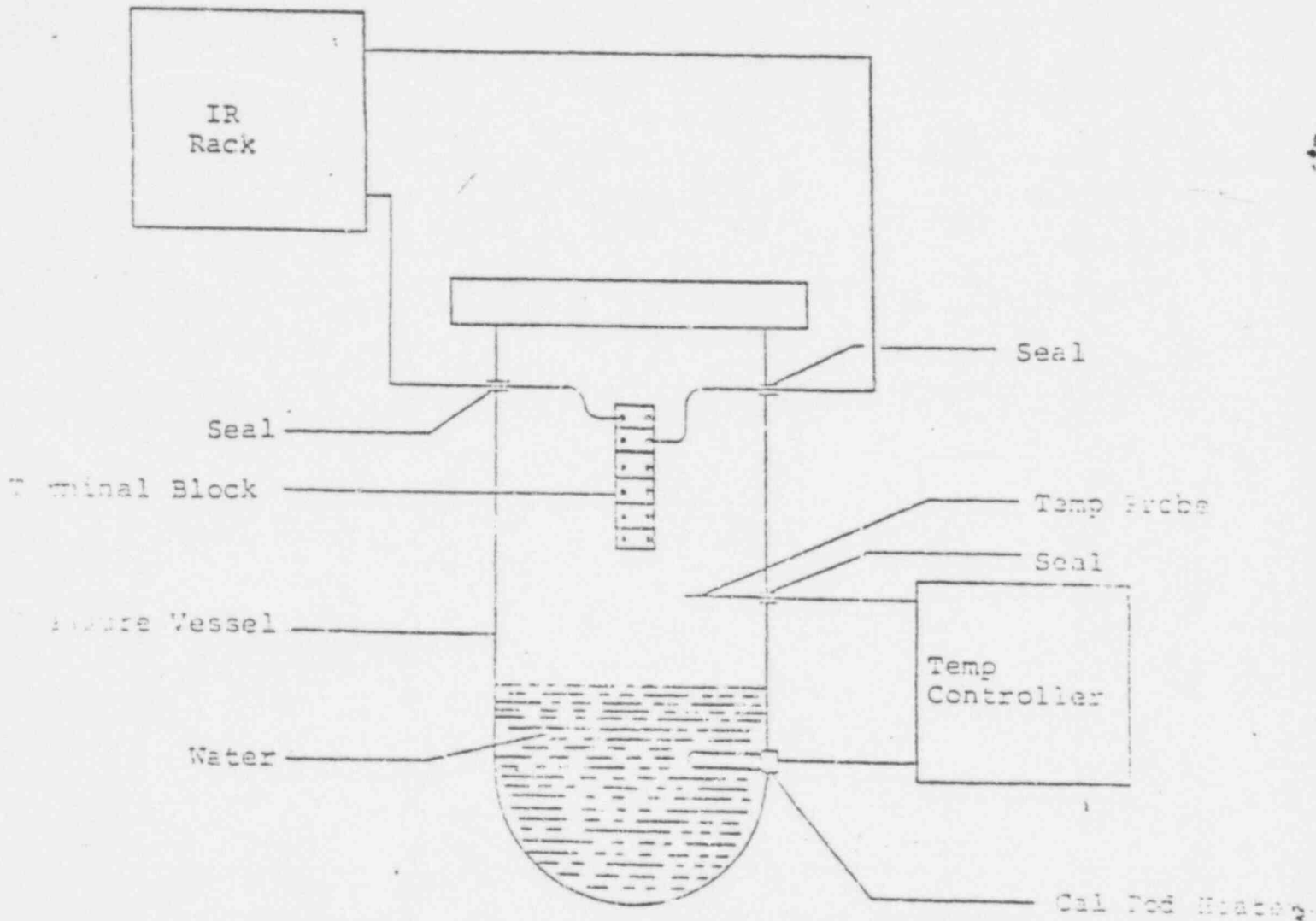
Fan: Joy P/N 500722-43 Model 60-30-1200/600
General Electric Motor, Joy P/N 500812-327

III. Conclusion:

A comparison of the analyzed DBA conditions listed in Section I with the qualification environments listed for the various safety-related components in Section II reveals that all of the safety-related electrical components located inside containment on TMI-1 are qualified to environmental parameters which meet or exceed the analyzed DBA conditions. We, therefore, conclude that the safety-related electrical components at TMI-1 have been subjected to environmental test conditions which meet or exceed the TMI-1 DBA environmental condition. Following this exposure, the TMI-1 components have performed satisfactorily, thus demonstrating their environmental qualification.

NOTE: All of the documents referenced in this submittal were made available to the Region NRC I & E Inspector during his inspection of the Licensees' Response to IE circular 78-08. This inspection was done at the Metropolitan Edison Corporate Offices during January, 1979.

TEST CIRCUIT DIAGRAM



CFR
1/31/78

POOR ORIGINAL