

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-456/88005(DRS); 50-457/88006(DRS)

Docket Nos. 50-456; 50-457

Licenses No. NPF-72; No. NPF-75

Licensee: Commonwealth Edison Company
Post Office Box 767
Chicago, IL 60690

Facility Name: Braidwood Station, Units 1 and 2

Inspection At: Braidwood Site and Glen Ellyn, Illinois

Inspection Conducted: February 29 through May 4, 1988

Inspector: A. S. Gautam *A. S. Gautam*
Regional Inspector, Region III

5/13/88
Date

Also participating in the inspection and contributing to the report were:

M. Kopp, RIII
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Plant Systems Section, Region III

5/27/88
Date

Inspection Summary

Inspection on February 29 through May 4, 1988 (Reports No. 50-456/88005(DRS); No. 50-457/88006(DRS))

Areas Inspected: Special, announced safety inspection of the environmental qualification (EQ) of electric equipment within the scope of 10 CFR 50.49. The inspection included licensee action on SER/TER commitments; EQ program compliance to 10 CFR 50.49; adequacy of EQ documentation; and a plant physical inspection of EQ equipment (Modules No. 30703 and No. 25576).

Results: The licensee has not adequately implemented their program to meet the requirements of 10 CFR 50.49. Deficiencies in the areas inspected are summarized below:

POTENTIALLY ENFORCEABLE UNRESOLVED ITEMS

<u>Item No.</u>	<u>Description</u>	<u>Report Section</u>
50-456/88005-01(DRS) 50-457/88006-01(DRS)	Inadequate documentation for the EQ of Johnson Control supplied HVAC components.	2
50-456/88005-02(DRS) 50-457/88006-02(DRS)	Sealing, torquing and lubrication (maintenance) deficiencies resulting in unqualified EQ equipment.	4c (1)(2)(3)(4) (5)(6)(7)(8) (9)(10)
50-456/88005-04(DRS) 50-457/88006-04(DRS)	Inadequate documentation for the EQ of Bunker Ramo instrumentation penetrations.	5a
50-456/88005-09(DRS) 50-457/88006-09(DRS)	Missing weep holes and drip shields in 10 CFR 50.49 designated junction boxes.	6a
50-456/88005-10(DRS) 50-457/88006-10(DRS)	Inadequate documentation to qualify GECO pressure switches.	6b
50-456/88005-11(DRS) 50-457/88006-11(DRS)	Inadequate documentation to qualify mixed greases in Limitorque actuator main gear cases.	6c

OPEN ITEMS

<u>Item No.</u>	<u>Description</u>	<u>Report Section</u>
50-456/88005-03(DRS) 50-457/88006-03(DRS)	Inadequate quality assurance and training program in regard to EQ.	4e(1)(2)
50-456/88005-05(DRS) 50-457/88006-05(DRS)	Revision of EQ file for Joy/Reliance Fan Motors to include EQ Calculation.	5b
50-456/88005-06(DRS) 50-457/88006-06(DRS)	Revision of EQ file for Target Rock Solenoid valves to include EQ calculation.	5c

<u>Item No.</u>	<u>Description</u>	<u>Report Section</u>
50-456/88005-07(DRS) 50-457/88006-07(DRS)	Revision of EQ file for ITT Barton Model 752 Transmitters to include missing EQ documentation.	5d
50-456/88005-08(DRS) 50-457/88006-08(DRS)	Revision of EQ file for General Atomic Radiation monitor to include EQ documentation.	5e
50-456/88005-12(DRS) 50-457/88006-12(DRS)	Deficient Raychem Splice found on General Atomic high range radiation monitor.	6d

DETAILS

1. Persons Contacted

a. Commonwealth Edison Company (CECo)

C. Reed, Senior Vice President
L. DelGeorge, Assistant Vice President, Licensing and Plant Support
M. Wallace, Manager, Projects and Construction
B. Shelton, Manager, Power Engineering
K. L. Graesser, General Manager, Power Operations
*D. Elias, Superintendent, Power Engineering
*E. R. Wendorf, Assistant Superintendent, Project Construction
+R. Querio, Station Manager
*G. Fitzpatrick, Station Manager
*K. Kofron, Superintendent, Production
*D. O'Brien, Superintendent, Services
M. Lohmann, Construction Superintendent, Project Startup
*G. Masters, Assistant Superintendent, Operations
*D. Paquette, Assistant Superintendent, Maintenance
*P. Cretens, Assistant Superintendent, Work Planning
*L. Davis, Assistant Superintendent, Technical Services
+*P. Barnes, Regulatory Assurance Supervisor
*R. Lemke, Technical Staff Supervisor
J. Gosnell, QC Supervisor
R. Kyrouac, QA Supervisor
S. Hedden, Master Instrument Mechanic
J. Smith, Master Electrician
J. Huffman, Master Mechanic
*D. Kapinus, Assistant Technical Staff Supervisor
*L. Woldridge, Technical Staff Parts & EQ Group Leader
*J. Roth, Station EQ Coordinator, Technical Staff
B. Rosenmeier, Technical Staff, Parts & EQ
R. Grams, PSD - Engineering
C. Moerke, General Design Engineer, Power Engineering
*W. Groszko, Configuration Management, Power Engineering
*E. Adams, BW/BY EQ Coordinator
F. Lentine, Supervisor, Licensing
+*S. Hunsader, Administrator, Licensing
*T. W. Simpkin, Regulatory Assurance
*D. Kruger, Technical Staff, Byron EQ Coordinator
*W. B. McCue, Operating ENGG, BWR
R. D. Branson, Byron, Master Electrician
*J. Snyder, Electrical Maintenance

b. Consultants - Sargent and Lundy (S&L)

*S. M. Malak, EQ Coordinator, Project Management Division
*M. M. Hassaballa, Supervisor
*A. Mohiudidin, Senior Component Engineer
*D. P. Galanis, Electrical Engineer

- *A. Alsammaroc, EQ Engineer
- *S. Akhtar, EQ Engineer
- *R. Hoke, EQ Engineer
- *A. Behera, Consultant
- *H. Heidarisaafa, EQ Engineer
- *B. Pandit, EQ Engineer
- *R. John, EQ Engineer
- *D. Drankhan, EQ Engineer
- S. Malak, PMED
- B. Kornbreck, EPED
- M. Banogon, Control & Instrumentation Division (CID)
- C. B. Kornoker, Electrical Engineer
- *W. Poirier, Project Manager, Westinghouse

c. Nuclear Regulatory Commission (NRC)

- A. B. Davis, Regional Administrator, RIII
- C. J. Paperiello, Deputy Regional Administrator, RIII
- H. J. Miller, Director, DRS
- E. G. Greenman, Director, DRP
- *J. J. Harrison, Chief, Engineering Branch, DRS
- W. L. Forney, Chief, Projects Branch 1, DRP
- *R. N. Gardner, Chief, Plant Systems Section, DRS
- *U. Potapovs, Chief, Vendors Program Branch, NRR
- J. M. Hinds, Chief, Projects Section 1A, DRP
- *T. Tongue, Senior Resident Inspector, Braidwood

*Denotes those attending the interim site exit meetings on March 4, 1988.

+Denotes those attending the exit interview on May 4, 1988, at the conclusion of the inspection.

2. Allegation Follow-up (RIII-86-A-0131)

During July and August 1986, an unidentified allegeder contacted the NRC regarding concerns with components supplied by Westinghouse to Johnson Controls, Inc. (JCI) for installation at Byron and Braidwood, Units 1 and 2. The allegeder stated that W-2 and OT-2 switches, AR relays, and EZC indicating lights were not properly environmentally qualified to the requirements of 10 CFR 50.49, Paragraph (f). As a result of this allegation, an inspection was performed at Johnson Controls by inspectors of the NRC Vendor Branch (Inspection Report No. 99901072/86001) who concluded that the HVAC systems provided by JCI at Byron and Braidwood were located in mild environments and were not required to meet 10 CFR 50.49. As a followup, Region III was requested by the NRC Vendor Branch to confirm whether the HVAC equipment supplied by Johnson Controls per JCI specification F/L 2783, was in fact located in a mild environment.

During this current inspection, the NRC inspectors confirmed that the Westinghouse W-2 switches in question were located in mild environments, and therefore were not within the scope of 10 CFR 50.49. The inspector also observed, however, that the Westinghouse OT-2 switches, EZC indicating lights, and the AR relays in question were located in harsh

environments. The licensee could not provide evidence that the Westinghouse components installed by JCI were similar or identical to the components tested by JCI. Subsequent to these NRC findings, the licensee presented an engineering analysis to evaluate the Westinghouse OT-2 switches, E2C lights and AR relays, for use in various HVAC panels at Braidwood Station. This analysis concluded that (1) the subject components were installed in a relatively mild environment - radiation harsh only; (2) the only failure mode of concern was loss of dielectric strength of the insulating parts and the loss of mechanical properties of the moving parts and; (3) there was a 400% margin in the design electrical stress for these components.

A checklist for comparison of Westinghouse E2C lights, AR 440 relays, AR 660 relays and OT-2A switches had been used by the site to walkdown the Johnson Controls provided components. The checklist permitted comparison of the installed components to the tested devices. Some color discrepancies were noted. Westinghouse indicated that they were attributable to pigmentation and did not represent a materials change. Discrepancies in the data printed on the E2C Light and AR 440 relays were also noted during the licensee's walkdown. The licensee attributed these discrepancies to differences in the color of light lenses and the job number, respectively.

The licensee has committed to confirming their conclusions by destructive testing. Eight Johnson Control provided components (2 OT-2 switches, 2 E2C lights, 2 AR-440 relays and 2 AR 660 relays) have been removed from the Johnson Controls panels and hand carried to Westinghouse for diagnostic examination. This examination is intended to identify the materials in the components and confirm their qualification. Pending NRC review of the results of this examination, this is considered a Potentially Enforceable/Unresolved Item (No. 50-456/88005-01(DRS); (No. 50-457/88006-01(DRS))).

3. Licensee Action on SER/TER Commitments

The NRC inspection team evaluated the implementation of the licensee's EQ corrective action commitments discussed in Braidwood SSER 2 included in the Braidwood FSAR. SSER 2 noted that the scope of the staff review for Braidwood Unit 1 was limited to an evaluation of those 10 CFR 50.49 designated electrical components that were different from equipment installed in Byron Unit 1. Since the licensee did not identify any 10 CFR 50.49 equipment installed in Braidwood Unit 1 as different from 10 CFR 50.49 equipment installed at Byron Unit 1, the staff's review of the EQ program for Byron Unit 1 was considered applicable to Braidwood, Unit 1.

The majority of the deficiencies identified in the SER addressed documentation, similarity, aging, qualified life, and replacement schedules. All open items identified in the NRC June 21-23, 1983 audit were addressed by the licensee in their July through October 1986 responses to the NRC staff. The licensee's proposed resolutions to these items were found acceptable by the NRC, as stated in Section 3.11 of the Braidwood SSER 2. The primary objective of the current Region III EQ Audit in this area was to verify that appropriate analyses and necessary documentation to support the licensee's proposed and accepted resolutions were contained in the

licensee's EQ files, and that appropriate modifications or replacements of equipment had been implemented.

During this review, the NRC inspection team reviewed EQ documentation and examined equipment in the plant relevant to prior discrepancies identified in the SERs, including replacement of equipment having qualification deficiencies.

No violations of NRC requirements in regard to the SER commitments were identified.

4. EQ Program Compliance to 10 CFR 50.49

The inspectors reviewed selected areas of the licensee's EQ Program to verify compliance to 10 CFR 50.49. The licensee's EQ program was found to identify methods of equipment qualification; provide for evaluation and maintenance of EQ documentation in an auditable form; provide for upgrading of replacement equipment; and incorporate controls for plant modifications. Based on their review, the inspectors determined that the licensee had established an EQ program to address the requirements of 10 CFR 50.49. The licensee's methods for establishing and maintaining the environmental qualification of electrical equipment were reviewed in the following areas:

a. EQ Program Procedures

The inspectors examined the adequacy of the licensee's policies and procedures for establishing and maintaining the environmental qualification of equipment within the scope of 10 CFR 50.49. The licensee's EQ program was reviewed for procurement of qualified equipment; maintenance of qualified equipment; modifications to the plant that could affect qualified equipment; updating of the EQ master list; and review and approval of EQ documentation. Procedures reviewed included the following documents.

BWAP 370-1, Revision 2, "Station Lubrication Program"

BWAP 500-5, Revision 0, "EQ Program"

BWAP 1600-1, Revision 13, "Maintenance Work Request Procedure"

BWAP 1610-1, Revision 0, "Modification Requests"

BWAP 800-2, Revision 1, "Control of Requests for Purchase"

BWAP 800-1, Revision 4, "Classification of Parts, Safety-Related
Components"

BWAP 800-3, Revision 0, "Technical Evaluation of Components and
Parts"

BWIP 2400-111, Revision 0, "EQ Requirements for Plant Instrumentation"

BWHP 4006-009, Revision 1, (NAMCO)

BWHP 4006-017, Revision 4, (LIMITORQUE)

BWMP 3305-044, Revision 0, (LIMITORQUE)

Specific areas reviewed in these procedures included requirements for review and acceptance of the EQ files, responsibilities of key individuals and departments, EQ definitions, maintenance and surveillance.

No violations of NRC requirements were identified.

b. 10 CFR 50.49 Master Equipment List (MEL) of EQ Equipment

10 CFR 50.49, Paragraph (d), requires licensees to prepare a list of electrical equipment important to safety, and within the scope of the rule. The NRC inspectors reviewed the licensee's MEL for compliance to 10 CFR 50.49. Areas reviewed included adequacy of the MEL, technical justifications for removal of items from the MEL, and licensee reviews of the MEL changes due to field modifications. The inspectors verified the completeness/adequacy of the list in terms of equipment needed during accident conditions through review of piping and instrumentation drawings (P&IDS), emergency procedures, technical specifications, and FSARs.

No violations of NRC requirements were identified.

c. EQ Maintenance and Surveillance Program

The inspector reviewed specific maintenance, replacement, surveillance tests and inspections necessary to preserve the environmental qualification of EQ components identified on the MEL. EQ requirements in the licensee's maintenance procedures and EQ files were reviewed against maintenance records of selected equipment to verify performance of maintenance and surveillance activities at prescribed intervals. Several deficiencies were identified in regard to gasket ('O' ring) inspection, lubrication, and torquing of EQ components. Subsequent to the NRC findings, the licensee performed an onsite review (OSR) of EQ equipment requiring maintenance and surveillance. The OSR resulted in several additional deficiencies being identified by licensee. Details of all findings are noted below.

(1) Target Rock Solenoid Valves, EQ Binder EQ-BB-HE10A

EQ-BB-HE10A, Tab E, requires replacement of the RTV silicone rubber gasket every time the valve cover is removed. The licensee could not provide evidence that the cover gasket was replaced on solenoid valve 1CV-8114 after the cover was removed during completion of Work Request A99999, dated January 31, 1987.

(2) Rosemount Pressure Transmitters, EQ Binder EQ-BB-061

EQ-BB-061, Tab E, requires inspection and cleaning of mating surfaces, lubrication of 'O' rings, and torquing of the housing cover each time the cover is removed. The licensee could not provide evidence that these activities were performed for pressure transmitters 1PT-MS-042, 1PT-MS-043, 1PT-MS-004 during calibration in May 1986 or prior to Unit 1 criticality in May 1987.

(3) Westinghouse Motors, EQ Binder EQDP-AE-2

EQDP-AE-2 states that motor qualification presumes that recommended maintenance procedures are followed. An engineering study performed by Mobil Oil Company requires motor bearing oil to be replaced every twelve months. EQDP-AE-2 allows changing motor bearing oil every second refueling outage (every three years or more). For example pump motor 1RHOIPA bearing oil was replaced on March 20, 1987, while the next oil replacement is scheduled for November 30, 1989. The licensee did not have adequate justification for not meeting the vendor (Mobil Oil) requirements.

(4) Limitorque Valves, EQ Binder EQ-BB-027

EQ-BB-027, Tab E, requires the main gear case lubricant to be inspected in accordance with Limitorque Lubrication Inspection Procedure, LC-8. Procedure LC-8 specifies lubricant inspection every 18 months until operation history indicates otherwise. EQ-BB-027, Tab E, as revised on October 17, 1986, however, also contains conflicting requirements that allow lubricant inspection to be performed at every second refueling outage (every three years or more). The licensee could not provide operating history data or engineering justification for extending the lubricant inspection frequency from 18 months to three years.

For example the EQ General Surveillance System (GSRV) for Limitorque Valve 1CS-001A-L05 indicated that the last inspection date of the main gear case lubricant was October 14, 1986, and that the next due date was November 30, 1989. In addition, the inspectors observed that the last lubricant inspection actually occurred on January 1, 1986 and not on October 14, 1986 as recorded in the EQ GSRV program. These discrepancies in EQ scheduling could have resulted in a lubricant inspection frequency of over three (3) years and eleven (11) months for Limitorque valve 1CS-001A-L05.

(5) Valcor Valves, EQ Binder EQ-BB-064

Braidwood EQ maintenance instructions required installation of new 'O' rings whenever the housing cover of the solenoid valve is removed. The OSR identified 'O' rings as not having been replaced on Units 1 and 2 Valcor valves PS-228A and B, PS-229A and B, PS-230A and B, 1RC 014C and D, and 2RC014A, B, C, and D.

The licensee has subsequently replaced the 'O' rings on reactor head vent valves 1RC014C and D, and 2RC014A, B, C and D. The licensee also provided evidence that the remaining primary process sampling valves do not require sealing from moisture intrusion based on the postulated accident environment at the valve location.

(6) Incore Thermocouple Reference Junction Box, EQ Binder EQDF ESE-44A

Braidwood EQ maintenance instructions require replacement of the enclosure 'O' ring each time the cover of the junction box is opened. The OSR identified that the 'O' ring was not replaced when the cover was removed on Junction Box 2IT-01J, during performance of Work Request A99999, dated February 5, 1988. The licensee has subsequently installed a new 'O' ring in the junction box.

(7) NAMCO Limit Switch ISI-001B-A-Z5

The licensee was unable to verify that the Limit Switch cover had been torqued as required by EQ maintenance instructions. The licensee subsequently torqued the cover, as required, per Nuclear Work Request A20704.

(8) Limitorque Operators, Unit 1

The licensee could not provide evidence that EQ installation requirements for torquing of mounting bolts and valve actuator housings had been met. Subsequent to this finding, the licensee initiated Nuclear Work Request A20661 to torque the mounting bolts on approximately (86) Limitorque operators.

(9) Westinghouse Pump Motors, EQ Binder EQDP-AE-2

The OSR identified unqualified Mobil DTE Heavy Medium oil being used for motor bearing lubrication. The qualified lubricant is Mobil DTE Medium oil, as required by the EQ maintenance documentation. The licensee subsequently replaced the Heavy Medium oil in Westinghouse Motors with Medium oil.

(10) Reliance and Westinghouse Fan Motors, EQ Binders EQ-BB-008

EQ-BB-008 specifies Chevron SRI-2 as the qualified motor bearing lubricant. The OSR, however, identified the use of Mobilux EP in lieu of the Chevron SRI-2 for these motors. The licensee has subsequently replaced Mobilux EP with Chevron SRI-2, per Nuclear Work Requests A20738, A20739, and A20771.

Each of the findings described in Section 4c (1) through (10) is considered a potential violation of 10 CFR 50.49, in that the components were not qualified for their installed conditions. Pending further NRC review, these concerns are considered part of one Potentially Enforceable Unresolved Item (No. 456/88005-02(DRS); No. 457/88006-02(DRS)).

d. Plant Procurement of 10 CFR 50.49 Designated Equipment

Licensee procedures were found to adequately address procurement of appropriate replacement equipment. Procurement procedures and documents were found to adequately address appropriate quality and regulatory requirements regarding the environmental qualification

of equipment within the scope of 10 CFR 50.49. Checklists were observed to have been used to provide evidence of reviews and approvals.

No violations of NRC requirements were identified.

e. Quality Assurance (QA) and Training Program

- (1) During review of licensee quality assurance activities, the inspectors determined that the licensee had implemented a program to monitor the quality of EQ activities through surveillance, audits, and reviews of the records and files for plant modifications and equipment procurement. NRC inspectors reviewed the licensee's QA audits including QA Audit Nos. 06-80-15 and 06-87-15 conducted in May 1986 and May 1987, and found the methodology acceptable. The inspectors were, however, concerned that in view of the NRC findings identified during this EQ inspection the scope of the licensee's quality assurance activities may not be adequate.
- (2) The NRC inspectors also reviewed the licensee's staff training program and associated records relative to the performance of EQ activities. The training records indicated that the licensee had implemented a formal EQ training program for newly hired personnel; however, there was no evidence that other appropriate staff (management, operations and maintenance) responsible for EQ activities had received this training. In addition, the inspectors were concerned that the deficiencies identified in the implementation of maintenance activities (as noted in Section 4c of this report) were a result of inadequate training of appropriate personnel. The licensee has agreed to incorporate EQ training into an ongoing training program for appropriate plant personnel.

Pending further review of the licensee's QA and training activities in regard to EQ this is considered an Open Item (No. 456/88005-03(DRS); No. 50-457/88006-03(DRS)).

5. Detailed Review of Qualification Files

The licensee qualified their EQ equipment to the requirements of NUREG 0588, Category I (10 CFR 50.49, Paragraph K). The inspectors reviewed over 40 equipment qualification files for evidence of the environmental qualification of equipment within the scope of 10 CFR 50.49, and evidence of equipment qualification to NUREG 0588, Category I. Files addressed the description of the equipment; similarity analysis of tested equipment to that installed in the plant; allowed mounting methods and orientation; qualification of interfaces (conduit, housing, seal, etc.); evaluation of aging effects on equipment; description of test sequence and methodology; environmental conditions for the equipment during an accident; qualification for submergence of applicable equipment; resolution of test anomalies; and maintenance/surveillance criteria for the preservation of the qualified status of equipment.

The inspectors selectively reviewed the above areas, as applicable, including special reviews for the required duration of operability of equipment; licensee evaluation of tested materials and configurations relative to actual plant installations; adequacy of test conditions; aging calculations for qualified life and replacement intervals; effects of decreases in insulation resistance on equipment performance; adequacy of demonstrated accuracy of equipment and interfaces during an accident; and licensee evaluations of discrepancies identified in IE Notices and Bulletins.

EQ files were reviewed for electrical cables, cable splices, terminations, terminal blocks, electric motors, solenoid valves, electrical penetrations, seals, lubricants, transmitters, temperature elements, radiation monitors, control and position switches, switchgear, control panels and miscellaneous electrical devices. The inspectors identified several deficiencies in the adequacy of the test documentation. Details are noted below.

a. Bunker Ramo Electrical Penetration Assemblies, File EQ-BB-058

The inspectors reviewed the following reports contained in the EQ file for the qualification of low voltage Bunker Ramo electrical assemblies to the requirements of NUREG 0588, Category I.

- ° Amphenol Report 123-2220, "Design Qualification Report for Electrical Penetration Assemblies," Revision 4, October 10, 1979.
- ° Amphenol Report 123-2159, "Qualification Test Procedure for Nuclear Power Generating Station Electrical Penetration Assemblies," June 1, 1979.

The licensee confirmed that 10 CFR 50.49 designated Bunker Ramo penetrations were used in Braidwood Unit 2 for instrumentation circuits inside the containment.

The Amphenol test report 123-2220 addressed a generic qualification of several models of Bunker Ramo penetrations but did not test a penetration identical to that installed at Braidwood. During the EQ file review, the inspectors observed that significantly low insulation resistance (IR) readings were recorded during the LOCA test on the instrumentation penetrations. Of (81) measurements taken only (14) were at the design minimum value of 106 ohms or higher. The licensee identified these low readings as "anomalies," and claimed that the suspected anomalies were due to terminal blocks used in the tested configuration. The licensee also stated that these anomalies had been corrected by installing qualified splices instead of terminal blocks in the plant. The inspectors, however, noted that the licensee had not confirmed through additional testing whether the low IR values had in fact been corrected by the installed qualified splices.

NUREG 0588, Category I, Section 2.1(3)(a), requires equipment to be qualified by test to demonstrate its operability under harsh conditions. NUREG 0588, Category I, Section 2.2(a) requires that

the failure criteria be established prior to testing. The inspectors concluded that the licensee had not performed a test to qualify the instrument penetrations in their installed configurations (with the splices). The inspectors also noted that the Bunker Ramo test was inadequate in that no failure criterion had been established for the LOCA portion of the testing. The inspectors concluded that the penetrations were unqualified based on inadequate documentation.

Subsequent to this NRC finding, the licensee identified four suspect Bunker Ramo instrument penetrations (2S105E, 2S106E, 2S107E and 2S108E) installed at Braidwood Unit 2. None were reported in Unit 1. The specific instruments associated with these circuits provide necessary inputs to the Reactor Protection System (RPS) and Engineering Safety Features (ESF) actuation systems. Some instruments also provide post accident monitoring functions.

The affected instruments are required to mitigate a LOCA, main feedwater line break, and a main steam line break in the resulting harsh environments. Parameters measured by the instruments for RPS and ESF actuation include hot leg and cold leg temperature, reactor coolant loop hot leg wide range temperature, reactor coolant loop flow, steam generator loop steam flow, steam generator narrow and wide range level, pressurizer pressure, pressurizer level, hot leg wide range pressure, reactor coolant pump bearing water flow, source and intermediate range neutron detection, and power range neutron detection.

The inspectors informed the licensee of the need to follow the requirements of Generic Letter 88-07 and submit an operability analysis, or retest the suspect penetrations, or replace the penetrations. On March 5, 1988, the licensee submitted an operability analysis to the NRC. Subsequent to the RIII findings, NRR assumed the lead responsibility for reviewing the qualification of the Bunker Ramo penetrations. Pending further NRC review this is a Potentially Enforceable Unresolved Item (No. 456/88005-04(DRS); No. 457/88006-04(DRS)).

b. Joy/Reliance Fan Motors, Model 500826-2047, EQ Binder EQ-BB-009

The EQ file stated that the motor bearings were qualified for 40 years. The Reliance report, NUC-12, dated October 30, 1978 (in the licensee's EQ file), however, stated that according to the Antifriction Bearing Manufacturers Association (AFBMA) Standard No. 9, bearings of motors cannot have a specific qualified life. In addition, Reliance Electric (vendor) recommended that the bearings be treated as a replaceable element. The licensee was requested to provide documentation to support their claim that the motor bearing were qualified for 40 years.

Subsequent to this concern, the licensee provided a calculation supporting a motor bearing life of 40 years. The calculation, Sargent and Lundy document CQD-010212 dated August 31, 1978 is to be added to the EQ file. Pending review of revised files, this is considered an Open Item (No. 456/88005-05(DRS); No. 457/88006-05(DRS)).

c. Target Rock Solenoid Valves Model 79AB-010, EQ Binder EQ-BB-HE10A

Review of this file indicated that the qualified life calculations for the solenoid valves were based on a normal maximum temperature of 122°F. The valves, however, are located in a zone where the maximum temperature is expected to reach 130°F. Subsequent to this concern, the licensee produced a calculation by Sargent and Lundy (transmittal COD-037264, dated September 9, 1987) which used the correct temperature data basis and adjusted the qualification life. The licensee indicated that the calculation is still awaiting final approval. The maintenance data sheet in the EQ binders will also be changed to reflect the correct qualified life and replacement schedule. Pending further review, this is considered an Open Item (No. 456/88005-06(DRS); No. 457/88006-06(DRS)).

d. ITT Barton Model 752 Transmitters, EQ Binder EQDP-ESE-4A

The inspectors noted that the "auditable link" document for the qualification of the Barton transmitters provided by Westinghouse was not included in the EQ file. The licensee committed to incorporate this document into the next revision of EQ Binder EQDP-ESE-4A.

The inspectors also noted that no thermal aging analysis or radiation analysis had been provided in the binder - merely a statement that the five year qualified life would be verified. The licensee stated that the radiation analysis is provided in Westinghouse WCAP-8587, and that this document has been reviewed and accepted by the NRC. The licensee agreed to include the aging analysis in the qualification binder when it is revised. Pending NRC review of licensee corrective action of both the above issues, this is an Open Item (No. 456/88005-07(DRS); No. 457/88006-07(DRS)).

e. General Atomic Area Radiation Monitors EQ Binder, EQ-BB-060

The inspectors observed that no documentation had been provided for the qualification of the Tefzel insulation (Tab C), in that the referenced reports (Okonite and Clinton) were not in the binder. The inspector concluded that the similarity between the detector wiring and tested wiring had not been established. The licensee stated that the referenced documents would be included in the next revision of the binder to establish similarity. Sufficient interim information was provided by the licensee to mitigate any immediate safety concerns.

The inspectors also observed that no qualification documentation had been provided in the binder for the penetration connector interface, in that the the connector has not been properly identified or analyzed. The licensee stated that since the subject device did not have to be functional during LOCA or post LOCA conditions, the qualification of the connector was not of concern, and that the adequacy of the cable assembly and the connector would be verified during calibration for normal operation. The licensee agreed that the connector will be identified in the next revision of the binder.

Pending further review of licensee corrective action of both of the above issues, this is an Open Item (No. 456/88005-08(DRS); No. 457/88006-08(DRS)).

6. Plant Physical Inspection

The NRC inspectors selected over 50 items on the MEL for examination in the plant. The EQ file of each item had been reviewed, and information regarding the location, manufacturer, model/serial number, mounting, orientation, environment, and interfaces had been noted. The inspectors examined the selected items in the field, as accessible, and examined each item to confirm if it conformed to its environmental qualification. Specific areas reviewed included traceability of installed items to EQ files, ambient environmental conditions, qualification of interfaces (connectors, wires, seals, insulation, lubricants, etc.), evidence of significant temperature rise from process, drainage, mounting methods, physical conditions, and housekeeping. Certain significant deficiencies were identified in regard to EQ equipment not being qualified by test or analysis for their installed configuration. Details are noted below:

a. Marathon 1600 NUC Terminal Blocks

The Marathon terminal blocks were addressed by the licensee as qualified to the requirements of NUREG 0588, Category I. These blocks are used in control circuits inside the containment. During the EQ test conducted at Wyle, terminal blocks located directly beneath the top-entry conduits were observed to experience higher leakage currents (300 MA) than the block not directly below the top conduit entry (30 MA). In order to address this deficiency, the licensee required drip shields and weep holes to be provided for all Marathon terminal blocks located directly below top entry conduits and in a steam environment.

Subsequent to NRC inspector findings in the area of maintenance and surveillance (see Section 4c of this report), the licensee conducted an onsite review (OSR) of EQ equipment. During this review, the licensee examined all (40) EQ designated junction boxes inside the containment. Of the boxes inspected (16) weep holes and (8) drip shields were found missing.

The inspectors determined that the lack of weep holes and drip shields compromised the EQ of the circuits in the boxes, in that spray and/or moisture intrusion into the boxes would cause the circuits to fail. The licensee has subsequently performed corrective action and reported that no other junction boxes were affected.

Pending further review, this is a Potentially Enforceable Unresolved Item (No. 456/88005-09(DRS); No. 457/88006-09(DRS)).

b. GECO Pressure Switches

EQ binders BB-025, 56 and 57 specify Whitman General Pressure switches, Models 86819, 88739, 88743, 88946, 86915, 88736 as qualified for use in the Borg Warner Actuators. During the OSR, the licensee identified

the use of a pressure switch, Model J505, made by GECO and installed in conjunction with several EQ valves in the plant. Subsequent to this finding, the licensee reported that they did not have sufficient data to qualify the J505 GECO switch for its EQ application in the plant.

The licensee identified the use of several of these switches in conjunction with the feedwater isolation valves, containment purge isolation valves, and steam generator power operated relief valves. The licensee has subsequently replaced the switches for the feedwater isolation valves, and has submitted an adequate operability analysis for the switches associated with the containment purge and steam generator power operated valves. The remaining switches will be replaced or qualified by the next outage. Pending further review, this is considered a Potentially Enforceable Unresolved Item (No. 456/88005-10(DRS); No. 457/88006-10(DRS)).

c. Mixed Lubricants in Limitorque Operators

During review of the licensee's maintenance activities (see Section 4c of this report), the NRC inspectors identified deficiencies in the frequency of lubricant surveillance/replacement in EQ actuators, motors and fans. Subsequent to these NRC findings, the licensee performed an onsite review to examine the installed lubricants to determine if any degradation had occurred since they were last replaced. Based on this review, the licensee reported mixed proportions of a Calcium based and a Lithium base lubricant in several EQ actuators. The mixed proportions were reported to range from 2% Lithium /98% Calcium to 50% Lithium/50% Calcium based lubricants in different actuators. These lubricants are stated by the licensee to be Exxon Nebula EP-0, Exxon Nebula EP-1 (Calcium complex base) and Sun EP-50 (Lead Lithium base). The licensee, however, could not present adequate test data or analysis based on the test data to demonstrate that the mixed greases were qualified for the postulated ambient plus accident environments. Region III subsequently informed the licensee that the affected 10 CFR 50.49 designated valve actuators were unqualified based on inadequate documentation.

The licensee performed the following corrective actions:

- (1) Sampling of (222) potentially affected 10 CFR 50.49 designated Limitorque actuators. Sampling included drawing samples from the Limitorque main gear cases as accessible. These samples were then reported to be reviewed visually for quality (dirt, water, metal filings) and for consistency. If visual inconsistencies were found, the lubricant was reported to be replaced.
- (2) All drawn samples then underwent a chemical analysis so as to identify any mixed greases. Any sample having a mixture of over 1:50 Lithium to Calcium was subjected to a penetration test. Any lubricant having a mixture of 1:50 or less Lithium to Calcium was declared acceptable by the licensee.
- (3) The proposed penetration test was conducted with an acceptance

range of ± 30 points above or below an acceptance median of 325 points for Exxon Nebula EP-1 and 370 points for Exxon Nebula EP-0. Any sample having a Calcium/Lithium mixture with a Lithium contaminant of over 5% will be rejected, and the affected valve will be regreased prior to plant startup. Samples having a contaminant of 2 to 5% will be replaced in Unit 2 prior to criticality. Samples having a contaminant of 2 to 5% in Unit 1 will also be subsequently replaced during the next outage. Samples having a containment of up to 2% is being considered acceptable by the licensee.

Subsequent to the Region III findings, NRR assumed the lead in reviewing the qualification and operability of the affected Limitorque operators in regard to mixed lubricants. Pending further NRC review, this is a Potentially Enforceable Unresolved Item (No. 456/88005-11(DRS); No. 457/88006-11(DRS)).

d. General Atomic Radiation Monitor

During examination of the General Atomic high range radiation monitor assembly, a split (crack) was noted on one Raychem heat shrink tube insulating a coaxial connector. The inspectors were concerned that this deficiency would increase leakage currents and affect the accuracy of the monitor.

The licensee's response stated that this was an isolated deficiency and that NWR A20577 had been written for replacement of the tubing. They also agreed to check both high range monitors for any other such deficiency. Pending further review of licensee action in this area, this is considered an Open Item (No. 456/88005-12(DRS); No. 457/88006-12(DRS)).

e. Tobar Pressure Transmitters

Tobar transmitter 2PT-403 was found in the field to have one loose cover bolt. This pressure transmitter was calibrated on February 25, 1988. Subsequent to the finding, the licensee took corrective action and confirmed that the cover screw was tightened as required per NWR A20549 on March 3, 1988.

The inspectors also noted that the nameplate on Tobar Transmitter 2PT-407 indicated Model No. 32PA1212/94002/1.A2, while the SCEW sheet indicated 76PH24-333/94002. The licensee responded that both models were identical, even though the model (76PH2) shown on the SCEW sheets was that of a Veritrak transmitter and the model (No. 32PA1) shown on the nameplate of 2PT-407 was that of a Tobar transmitter. Apparently after Veritrak was acquired by Tobar, this model was re-designated as model No. 32PA1 (by Tobar). The licensee agreed to revise the SCEW sheets to eliminate this concern.

No further concerns were identified.

f. Limitorque Actuator 2CC-9438

During examination of this actuator in the field, the inspectors noted that a shipping cap was installed in the grease relief valve. The licensee apparently had not looked for shipping caps installed inside the grease relief valves during previous inspections. Another inspection was performed by the licensee for all Limitorque operators inside the containment and the licensee identified no additional shipping caps installed inside the grease relief valves. The licensee subsequently issued a maintenance work order to remove the cap.

No further concerns were identified.

g. Bunker Ramo Electrical Penetration Assembly

Two 3-lb coffee cans filled with a white granular substance were found inside the penetration junction box assembly for penetration 2IC19E. The licensee was not able to provide information on the purpose of these cans or identify the substance. The cans have subsequently been removed. No further concerns were identified.

h. ASCO NP Series Solenoid Valves

During the plant walkdown of ASCO valve 2IA066-FSV (plant identification number), it was noted that an associated valve was tagged 1A0V-IA066, while it should have been tagged 2A0V-IA066. The licensee subsequently corrected the tag. No further concerns were identified.

7. Open Items

Open items are matters which have been discussed with the licensee, which will be reviewed further by the inspector, and which involve some action on the part of the NRC or licensee or both. Open Items disclosed during this inspection are discussed in Paragraphs 4e, 5b, 5c, 5d, 5e, and 6d.

8. Potentially Enforceable/Unresolved Items

An unresolved item is a matter about which more information is required in order to ascertain whether it is an acceptable item, an open item, a deviation, or a violation. Potentially Enforceable/Unresolved Items are discussed in Paragraphs 2, 4c(1)(2)(3)(4)(5)(6)(7)(8)(9)(10), 5a, 6a, 6b, and 6c.

9. Exit interview

The Region III inspectors met with the licensee's representatives (denoted under Paragraph 1) during an interim exit on March 4, 1988, and discussed their findings at the conclusion of the inspection on May 4, 1988. The inspectors discussed the likely content of the inspection report with regard to document or processes reviewed by the inspectors. The licensee did not identify any such documents or processes as proprietary.