

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-456/85036(DRS); 50-457/85035(DRS)

Docket Nos. 50-456; 50-457

Licenses No. CPPR-132; CPPR-133

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

Facility Name: Braidwood Station, Units 1 and 2

Inspection At: Braidwood Site, Braidwood, Illinois

Inspection Conducted: July 22-25, 1985

Inspectors: *R. Mendez*  
R. Mendez

8/20/85  
Date

*Z. Falevits*  
Z. Falevits

8/23/85  
Date

Approved By: *C. C. Williams*  
C. C. Williams, Chief  
Plant Systems Section

8/26/85  
Date

Inspection Summary

Inspection on July 22-25, 1985 (Reports No. 50-456/85036(DRS);  
50-457/85035(DRS))

Areas Inspected: Routine unannounced inspection of licensee actions on previous inspection findings; 50.55(e) reports; independent design verification; electrical terminations; control of measuring and test equipment; DC distribution panel breakers; and diesel-generator relay settings. The inspection involved a total of 66 inspector-hours by two NRC inspectors.

Results: Of the areas inspected, one violation was identified (failure to control the cleaning and preservation of electrical equipment, Paragraph 5.b).

## DETAILS

### 1. Persons Contacted

#### Commonwealth Edison Company (CECo)

- \*T. Quaka, QA Superintendent
- \*L. M. Kline, Project Licensing Supervisor
- \*J. F. Phelan, Project Field Engineering Supervisor
- \*D. Lambert, Project Field Engineer
- \*P. L. Barnes, Licensing Engineer
- \*D. C. Cecchett, Licensing Engineer
- \*J. Giesecker, Project Construction Engineer
- L. Tapella, Project Construction Engineer
- T. Ronkoske, Project Construction Engineer
- N. Tomis, Project OAD Supervisor
- K. Faber, Project OAD
- \*E. Metzel, QA Supervisor

#### L. K. Comstock Company (LKC)

- \*R. Seltman, QA Manager
- \*I. Dewald, QC Manager

\*Denotes those attending the July 25, 1985 exit meeting.

### 2. Action on Previously Identified Items

- a. (Closed) Open Item (456/81011-01; 457/81011-01): This item concerned L. K. Comstock Procedure 4.3.9 dated May 28, 1981, "Cable Termination Installation." The procedure did not address electrical cable separation requirements to be observed during the "training in" of cables into equipment during termination, nor did it address torquing requirements for cable terminations.

The inspector reviewed L. K. Comstock Procedure 4.3.9, dated November 20, 1981. Section 3, Page 1a, states "cables 'trained' within electrical equipment shall maintain a 6" separation between the different divisions/types of cables." Review of the latest revision of L. K. Comstock Procedure 4.3.9 dated May 1, 1984, also contained the 6" separation requirement for cables inside electrical equipment, (Section 3.1.1).

With respect to torquing requirements for cable terminations, review of L. K. Comstock Procedure 4.3.9, dated May 1, 1984, Paragraph 3.1.14 states that "terminations requiring bolted connections such as switch-gear, MCC and motors, shall be in accordance with manufacturer's requirements. Where specific requirements exist, electrical connections shall be tightened as directed by CECo...". The Licensee's

Station Nuclear Engineering Department's policy concerning bolted electrical terminations is delineated in a memorandum, dated January 8, 1982, and states that (1) bolted electrical connections shall be tightened in a good workmanship manner; and (2) compression of the lock or star washer is an indication that the connection is adequately tight and secure to provide a good electrical connection.

The inspector inspected various panels and junction boxes relative to the above issues. No deficiencies have been identified with respect to these items.

- b. (Closed) Unresolved Item (456/83010-02; 457/83010-02): This item addressed the lack of adequate separation between instrument sensing lines for flow transmitters 1FT-414 and 1FT-416. The inspector observed a separation of 13.5" between the lines, when the requirement by specification was 18".

The inspector reviewed the following letters from Westinghouse to CECO, CAW-6103, dated July 22, 1983, CAW-6246, dated August 26, 1983, and CAW-6313, dated October 5, 1983. These letters indicated that Westinghouse had reviewed Byron safety-related instrument lines in containment and provided bases for permitting less than 18" separation of redundant instrument lines to account for postulated structure failures. The letters also note that the accepted industry practice is to separate redundant instrument lines by 18" as noted in Westinghouse interface requirements and ISA Standard SP67-02. This 18" inch separation criteria is intended to protect redundant instrument lines from the postulated effects associated with the failure of the adjacent instrument line, and that all safety-related instrument lines required to shut the plant down or mitigate an accident, must be protected from other postulated plant events such as pipe breaks and missiles. The letter further states that in the case of Byron all instrument lines in question are installed as Seismic Category 1, 1/2 inch piping, not as tubing. That based on the type of piping used, the postulated effects associated with the failure of instrument lines do not have to be considered for the following reasons: (1) NRC SRP 3.6 does not require pipe break to be postulated in ASME code piping less than 1 inch in diameter. (2) Test data available to support the position that a whipping pipe will not break a pipe of the same or smaller size given that the pipes are of the same schedule. This criteria has been accepted by the NRC.

The inspector reviewed the Byron SER Section 3-9, Item 3.5.1.2 titled "Internal Generated Missiles (Inside Containment)" as identified in the requirements of GDC 4 with respect to missile protection which is provided at Byron by any one or a combination of barriers, separation and equipment design. Based on licensee's evaluation of potential missile sources inside containment, the design was found to be in conformance with the requirements of GDC 4 with respects to missile

protection and the guidelines of Regulatory Guide 1.14 concerning reactor coolant pump flywheel integrity. It was therefore found to be acceptable by NRR. Based on the fact that Braidwood is a duplicate design of the Byron plant and that those bases, analyses, and NRC approvals are also applicable to Braidwood, this item is considered closed.

3. Licensee Action on 10 CFR 50.55(e) Reports

- a. (Closed) 10 CFR 50.55(e) (456/81001-EE; 457/81001-EE): "Limitorque Valve actuators with 300V rated terminal blocks instead of 600V blocks". In February 1981, the licensee issued NCR 277 that addressed Limitorque valve operators which were not supplied in accordance with specification requirements (S&L Standards). The deficiencies identified included underrated terminal blocks, underrated internal jumpers and improper termination of the internal jumpers. A supplement to NCR No. 277 was issued requiring that nonconforming terminal blocks be removed and scrapped and that nonconforming internal jumpers be replaced utilizing Rockbestos SIS wiring with ring type insulated lugs. The supplement also references S&L Specification STD-EA-209, which is an instruction for motor terminations. Specification STD-EA-209, also states the methods for motor termination (without terminal blocks) by using an insulated bolted connection. Based on a review of the foregoing, the inspector has determined that this issue has been properly resolved.
  
- b. (Open) 10 CFR 50.55(e) (457/82003-EE): During testing of an emergency diesel generator it was discovered that one of the contacts on a speed sensing relay was fused closed. This caused the field flashing circuit to remain energized after the diesel generator had been stopped. The relay was replaced and the test resumed. Further investigation revealed burning and pitting on the contacts of a back up speed sensing relay and the contacts on the voltage sensing relay in the field flashing circuit. The licensee determined that the contacts did not have adequate DC interrupting capability. On September 3, 1982, the licensee issued their final report on the relay deficiencies. The corrective action consisted of replacing the two speed sensing relays with heavy duty relays and replacing the 120V AC voltage sensing relays (VR) with 125V DC relays and a rectifier circuit. The inspector verified that the VR relays in the diesel generator panels, 2PLO7J and 2PLO8J, had the correct identification number KUP14D15 imprinted on the relay cases. However the VR relays were observed to be rated at 110V DC and not 125V DC as stated in the licensee's final report. The licensee committed to further investigate this matter. Pending further review by the inspector this issue remains open.

4. Functional Areas Inspected

a. Independent Design Review

The inspector reviewed the applicable design documents pertaining to 125V DC ESF Distribution Center Bus 111 (1DC05E) and 125V DC ESF Distribution Center Bus 112 (1DC06E). Drawings 20E-1-4250A, B, D and F and 20E-1-4251A, B, D and F were reviewed for design accuracy and conformance to applicable standards and FSAR commitments. Braidwood FSAR Section 8.3.1.4.1.2 defines power cables as ones which provide electrical energy for motive power or heating to all 6600V AC, 4000V AC, 4600V AC, 208V AC, 250V AC and 125V DC loads... Generally No. 6 AWG cables and larger conductors are included in this category. Control cables are defined as those 125V AC and 125V DC circuits responsible for the automatic or initiation of auxiliary electrical functions... and are cables which supply electrical energy from distribution panels to 120V AC and 125V DC instrumentation control and alarm circuits. Generally all 600V (insulated class) cables feeding 120V AC or 125V DC distribution circuits sized with No. 14 or No. 10 AWG conductors are considered control cables.

The inspector noted that cables which are utilized to serve an identical function at the Byron as well as the Braidwood project, have been classified as power cables at the Braidwood project, while at the Byron project they have been classified as control cables. The following such examples were noted:

<u>BYRON</u>		<u>BRAIDWOOD</u>	
<u>Drawing No.</u>	<u>Cable No./Seg.</u>	<u>Drawing No.</u>	<u>Cable No./Seg.</u>
6E-1-4250A	1DC244 (1C2E)	20E-1-4250A	1DC057 (1P2E)
6E-1-4250D	1DC242 (1C2E)	20E-1-4250D	1DC239 (1P2E)
6E-1-4251A	1DC245 (1C2E)	20E-1-4251A	1DC240 (1P2E)
6E-1-4251D	1DC243 (1C2E)	20E-1-4251D	1DC062 (1P2E)

An additional issue to be examined pertains to the design basis and the classification of instrumentation, control, and power cables by the licensee to ascertain conformance with FSAR cable categorization requirements as defined in Section 8.3.1.4.1.2. For example, 125V DC ESF Distribution Center Bus 111 as shown on Drawing 20E-1-4250D, Circuit No. 5 contains a 70A breaker which feeds 125V DC fuse panel ESF Division 11 (1DC10J) utilizing a 2-1/c cable No. 1DC095 which was classified as 1C1E (control cable Division 1E). While circuit No. 20 contains a 20A breaker, which feeds 6.9KV switchgear bus 157 (1AP03EA) utilizing a 2/C cable



No. IDC141 which was classified as 1P1E (power cable Division 1E). These cable assignments appear to be contrary to FSAR cable definitions and classifications Section 8.3.1.4.1.2. This program area requires further review and evaluation. This is considered to be an open item pending further review (456/85036-01; 457/85035-01).

b. Review of Electrical Terminations

The inspector visually inspected Diesel Generator 1B (1DG01KB) engine skid vendor supplied junction boxes to determine whether field installed equipment conforms to the applicable design documents and is in compliance with FSAR commitments. The following deficiencies were noted during this inspection:

- (1) Diesel Generator junction box 1DG01KB-P horizontally mounted on engine skid and shown on electrical Drawing 20E-1-4099B, Revision G, was noted to contain (a) nine large bolts scattered inside junction box, (b) excessive amount of debris found inside box, (c) portion of a broken terminal block, and (d) junction box nameplate was missing.
- (2) Diesel Generator junction box 1DG01KB-R vertically mounted on engine skid and shown on electrical Drawing 20E-1-4099D, Revision F, contained (a) approximately 12 screws scattered inside box, (b) terminal designations 141 and 280 thru 288 have been engraved on the copper shorting bar rather than on a nameplate strip, (c) the drawing represented 10 electrical devices (such as pressure switches and temperature switches) as physically located outside the junction box; however, these devices were observed to be located inside the junction box, (d) debris and dust were found inside the box, (e) a Namco limit switch found laying on top of box, no identification tag was noted, (f) junction box identification nameplate was missing, and (g) drawing indicated a conductor terminated at point 280 and no conductor at point 141, however, a conductor was terminated at terminal 141, but no conductor was terminated at point 280. The licensee indicated that the problem noted in 2(g) above was due to the fact that FCR-24365 dated January 30, 1984 was not yet incorporated in the field.
- (3) Diesel Generator junction box 1DG01KB-G vertically mounted on engine skid and shown on Drawings 20E-1-4099C, Revision F, contained (a) starting air solenoid 63SR-1 and 63SR-2 shown on the drawing as mounted outside the junction box; however, they were observed to be mounted inside the box and (b) junction box identification nameplate missing.
- (4) Diesel Generator junction box 1DG01DB-G mounted on engine skid and shown on Drawing 20E-1-4099A, Revision C, contained (a) approximately 20 large bolts scattered inside the junction box, (b) one large nail, (c) debris, dust and rust, and (d) junction box identification nameplate was missing.

Based on the housekeeping finding outlined above, the inspector informed the licensee that lack of housekeeping inside safety-related electrical junction boxes was an example of a violation to the requirements of 10 CFR 50, Appendix B, Criterion XIII (456/85036-02; 457/85035-02). The licensee initiated immediate action to clean the junction boxes.

c. Calibration and Control of Electrical Test and Measuring Equipment

The calibration and control of Operational Analysis Department (OAD) electrical measuring and test equipment (M&TE) was reviewed for conformance with procedure requirements including calibration frequency, recall system, calibration status marking and out of calibration controls. The licensee's frequency for the calibration of M&TE is performed on a yearly basis (or less). The following test equipment calibration and dates of calibration were reviewed:

<u>Test Equipment</u>	<u>I.D. Number</u>	<u>From</u>	<u>To</u>
AC Voltmeter	050067T	05/78	02/85
AC Voltmeter	050075T	06/79	06/85
AC Ammeter	051080T	01/80	02/85
AC Ammeter	051069T	05/78	05/85
AC Ammeter	051070T	03/79	03/85
AC Ammeter	051071T	06/78	06/85
AC Ammeter	051072T	06/78	06/85
AC Ammeter	051078T	07/79	10/84
AC Ammeter	051079T	06/79	08/84

The calibration frequency of the above equipment was verified to be tested yearly in conformance with procedures. The calibration accuracy requirements were met and the as-left calibration documented. Calibration sheets identified the technicians and the primary standards were documented. During review of the calibration records, two instruments ID Numbers 051071T and 051080T were found to be out of tolerance when received for re-calibration. The licensee has in place a procedure titled, "OAD Test Instrument Discrepancy," which provides guidelines for the evaluation of test data taken with certified test and measurement equipment found to be out of tolerance at the time of re-calibration. Instrument Number 051080T was determined not to have been used on any safety-related equipment and no further action was taken. Instrument Number 051071T had been damaged and therefore no as-found test data was available. The licensee reviewed all relay calibrations and construction tests performed during the year of the ammeter's previous calibration period. Test records indicated that corrective action was taken to recalibrate the tested equipment in question.

No violations or deviations were identified in the review of this program area.

d. 125V DC Distribution Panels

The inspector observed breaker ratings and equipment load descriptions on the Division 1 and 2 125V DC ESF distribution panels. The breaker ratings and load descriptions are designated on the internal-external wiring Diagrams 20E-1-4250A, 20E-1-4250D, 20E-1-4251A and 20-E-1-4251D. The following equipment feeds were found to have the correct breaker size at the distribution panels:

125V DC ESF Bus 111 Equipment Feeds

Instrument Bus 111 Inverter 1IP05E  
4160V Switchgear Bus 141 (1AP05E) Cubicle 5  
480V Auxiliary Building ESF Bus 131X Compartment 1AP10EA  
480V ESF Bus 1317 Compartment 1  
Reactor Trip Switchgear 1RD05E Cabinet 2  
Main Control Board Section 1PM11J  
Diesel Generator Control Panel 1PL07J  
Instrument Bus 113 Inverter 1PL07E  
4160V Switchgear Bus 141 Cubicle 5  
125V DC Fuse Panel ESF Division II  
Diesel Generator 1A Control Panel 1PL07J  
Auxiliary Safeguards Cabinet A 1PA27J  
Main Control Board HVAC OPM02J  
Diesel Generator 1A Control Panel  
480V Switchgear Bus 131X Compartment 1 (1AP10EA)  
480V Switchgear Bus 131Z Compartment 1 (1AP99EA)  
Local Control Panel 1HS-AF121  
ESF Sequencing and Actuation Cabinet A 1PA13J  
Remote Sheet-Down Control Panel 1PL04J  
Annunciator Input Cabinet 1PA31J

125V DC ESF Bus 112 Equipment Feeds

Instrument Bus 112 Inverter 1IP06E  
4160V ESF Switchgear 142 Cubicle 5  
Diesel Generator 1B Control Panel 1PL08J  
480V ESF Switchgear 132X Auxiliary Compartment  
480V ESF Bus 132Z Auxiliary Compartment  
Main Control Board Section 1PM11J  
Diesel Generator 1B Control Panel 1PL08J  
Remote Shut-Down Panel 1PL05J  
Instrument Bus 114 Inverter 1PL08E  
125V DC Gauge Panel 1DC11J ESF Division 12  
4160V Switchgear Bus 142 Cubicle 5  
Diesel Generator 1B Control Panel 1PL08J  
Annunciator Input Cabinet 1PA32J  
Local Control Panel 1HS-AF122  
480V ESF Switchgear Bus 132X Compartment 1  
480V Switchgear Bus 132Z Compartment 1



ESF Sequence and Actuation Cabinet B  
Main Control Panel OPM02J  
Auxiliary Safeguards Cabinet A 1PL27J

No violations or deviations were identified in the review of this program area.

e. Diesel Generator Relay

The inspectors reviewed records and observed protective relay settings pertaining to diesel generators 1A and 1B. The calibration and relay tap setting data were obtained from Relay Setting Order (RSO) sheets issued by the licensee's System Planning Department and Station Electrical Engineering Department. Records indicated that proper calibration and tap settings of the relays were made. In addition, the inspector verified that the following protective relays were set in accordance with the recorded test results:

Diesel Generator 1A-Panel 1PL07J

Generator Overcurrent (Device No. PR12-451)  
Generator Reverse Power (Device No. PR1-432)  
Generator Voltage (Device No. PR6-427)  
Generator Frequency (Device No. PR3-481)  
Generator Neutral Ground (Device No. PR7-459G)  
Generator Loss of Field (Device No. PR2-440)

Diesel Generator 1B - Panel 1PL08J

Generator Voltage (Device No. PR6-427)  
Generator Loss of Field (Device No. PR2-440)  
Generator Neutral Ground (Device No. PR7-459G)  
Generator Reserve Power (Device No. PR1-432)

No violations or deviations were identified in the review of this program area.

5. Open Item

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. An open item disclosed during the inspection is discussed in Paragraph 4.a.

6. Exit Interview

The inspector met with the licensee and contractor representatives (denoted in Paragraph 1) on July 25, 1985. The inspectors summarized the scope and findings of the inspection. The inspectors also discussed the likely informational content of the inspectors during the inspection. The licensee did not identify any such documents/processes as proprietary. The licensee acknowledged the statements by the inspectors with respect to open unresolved items.