

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-412/85-15

Docket No. 50-412

License No. CPPR-105

Priority --

Category B

Licensee: Duquesne Light Company

Robinson Plaza Building No. 2

Suite #210, PA, Route 60

Pittsburgh, Pennsylvania 15205

Facility Name: Beaver Valley Power Station, Unit 2

Inspection At: Shippingport, Pennsylvania

Inspection Conducted: July 8-12, 1985

Inspectors:

A. Finkel

A. Finkel, Lead Reactor Engineer

Aug 6, 1985
date

M. Schaeffer

M. Schaeffer, Reactor Engineer

Aug 6, 1985
date

Approved by:

C. Anderson
for C. Anderson, Chief, Plant System Section,
Engineering Branch, DRS

August 6, 1985
date

Inspection Summary: Inspection on July 8-12, 1985 (Report No. 50-412/85-15)

Areas Inspected: Routine, unannounced inspection by two region-based inspectors of status of previous inspection findings in the electrical area. The inspection involved 64 inspector hours onsite by two region-based inspectors.

Results: No violations were identified.

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DETAILS

1.0 Persons Contacted

1.1 Duquesne Light Company

- *R. Coupland, Director, Quality Control
- *C. Davis, Director Quality Assurance
- *D. Denning, Assistant Director Quality Control
- *C. Ewing, Manager Quality Assurance
- *E. Horvaith, Senior Project Engineer
- *J. Hultz, Construction Engineer
- *J. Konkus, Project Engineer
- *C. Majumdar, Assistant Director Quality Control
- *R. Swiderski, Startup Manager
- *R. Wallaner, Compliance Engineer

1.2 Stone and Webster Engineering Corporation

- *W. Baranowski, Engineer
- *A. Dasenbrock, Senior Construction Manager
- *H. Durkin, Superintendent of Engineering
- *H. Foley, Site Production Manager
- *R. Wittschen, Licensing Engineer

1.3 United States Nuclear Regulatory Commission

- *S. Ebnetter, Director of Reactor Safety

*Denotes those present at exit meeting.

2.0 Facility Tour

The inspectors observed work activities in progress, completed work and plant status in several areas of the plant during a general inspection of Unit 2. The NRC inspectors toured the following areas; inspection of the diesel generators, 4160 volt switchgear equipment and rooms, safety related cable raceways throughout Unit 2, the control room and various 480 volt Motor Control Centers (MCC's). In addition, the inspectors interviewed craft and supervisory personnel encountered in the work areas.

No violations were identified.

3.0 Licensee Actions on Previous Inspection Findings

(Closed) Unresolved Item 83-14-01, Qualification of 4160 volt Emergency Bus Switchgear wiring. The internal wiring, wiring handling and wiring bundling tie downs (anchors) were not uniform throughout the switchgear cubicles of the 4160 volt Emergency Bus Switchgear 2AE and 2DF.

During a review of the equipment manufacturer's engineering data records, Brown-Boveri (BB), the licensee verified that the configuration differences (cable layout) between the equipment used during seismic testing and the installed equipment at this site was minimal and that the configuration of the prototype equipment cabling testing performed by Brown Boveri represented a typical assembly of wiring and associated components. The licensee verified that the wiring configurations observed in the equipment installed at Unit 2 represents the vendors (BB) published manufacturing standards.

A review of the seismic data and various equipment configurations that were presented to the NRC supported the licensee's analysis and conclusion on this subject.

This item is considered closed.

(Closed) Unresolved Item 83-14-02 Use of adhesive anchors for wire harness restraints. During inspection of the 4160 volt Emergency Bus Switchgear, 2AE and 2DF, numerous locations were found within the cubicles where the plastic anchors were broken loose from the cabinet surface and/or floating without having been glued to the cabinet surface.

The two concerns of the NRC that were to be addressed by the licensee was the seismic qualification status of the equipment wiring with loose ABCSM plastic anchors, and the flammability of the adhesive backing of the ABCSM plastic units.

The licensee's analysis and test data indicated that the plastic anchors referred to as ABCSM's, have been determined by tests, not to self-ignite at temperatures as high as 500°F. (Reference Panduit Corporation Test Data). The circuits involving the use of the ABCSM's are relay and control and instrumentation which are normally low energy wiring (120VAC and 125VDC MAX) and therefore are not considered to be capable of initiating combustion before the designed fault circuits would clear the fault.

The licensee has also established that the ABCSM's are not designed to aid in supporting the cables for a seismic event, therefore not being glued to the equipment has no effect on the seismic testing of this equipment. The seismic supports for cables in this equipment are the ones that are bolted to the cabinet surfaces. To eliminate this ABCSM problem in new or replacement equipment the licensee has precluded the use of this type of ABCSM tie down in future equipment purchased by specification changes.

This item is considered closed.

(Closed) Unresolved Item 84-08-02, Use of nylon tie wraps to temporarily support coils of cable has caused indentation of cable jackets.

The licensee has changed their initial criteria for allowable cable jacket denting of 80% to a more conservative criteria of 50% indentation. Dented cable jackets not meeting the 50% criteria can be repaired using the methods specified in 2BVS-931, titled "Specification for Electrical Installation."

Field Construction Procedure (FCP) 431 has been modified to indicate typical supports for partial pulled cable. (References page 121 and 122, attachment 3.23 of FCP 431).

Quality control inspection procedure (IP-8.4.2) titled, "Surveillance Inspection of Temporarily Coiled Cable," dated July 2, 1985 has been issued to reflect the new inspection attributes for verifying acceptable cable coiling methods.

Discussions with the quality and construction craft personnel indicated that they were knowledgeable of the FCP and IP changes on this subject. During inspection of the Unit 2 site the inspectors noted the use of cable support mounts being used throughout the construction site.

Testing of cables during the startup program has not indicated that cable denting has caused any cable failures to date. The licensee stated that if cable failures occur, cable denting would be one of the attributes considered during the failure analysis of the cable.

This item is considered closed.

(Closed) Unresolved Item 83-03-01, Cable length data recorded on the cable pull cards is cut length data and not terminated length data. The pull card data is entered into the computer program and this data produces the "as-built" configuration for this site. The cut length data does not provide the "as-built" configuration for this site and there is no requirement for verification of the cable length after termination.

The licensee has taken the following action and documented the results of their verification in site audits and surveillance reports. After February 1985 the installation instructions were changed to require the recording of cable footage markers on cable termination tickets. Specifically, the following actions have been taken.

- Project Construction and QC procedures have been modified to (1) require the recording of terminated cable length data for installed power cables (H, K and L) on cable termination tickets, and (2) required quality control verification of this attribute for QA Category 1 installations. The revised procedures, which went into effect February 1, 1985, included

- (1) 2BVS-931, "Electrical Installation Specification",
- (2) 2BVM-88, "Cable Schedule Information System,"
- (3) FCP-405, "Handling Cable Pull, Raceway, and Termination Tickets," and
- (4) IP8.5.2, "Inspection for Cable Pulling."

--For electrical cables installed prior to February 1985, Stone and Webster performed a review to determine which cables the recording of terminated lengths was necessary. These cables have been identified and engineering field action request (EFAR) No. 403 was issued by Stone and Webster on February 8, 1985, to have construction and quality control personnel inspect and record as installed cable lengths.

After verifying that the above actions had occurred, the inspector considers this item to be closed.

(Closed) Unresolved Item 84-19-01, Cable denting involves 1) support of coiled electrical cables supported by a plastic tie wrap strap, 2) cables exiting horizontal cable trays having vertical drops of 20 feet or more with the weight of the cable(s) resting on the last rung of the cable tray and 3) and indentation in the cable jacket which appears to have occurred as the result of the cable weight acting on the insulation at the point of contact between cable insulation and conduit bushing.

The licensee has taken the following action to resolve the items discussed in this unresolved item.

--Field Construction Procedure (FCP) 431; Revision 20, "Cable Pulling," has been revised to require a) mechanical protection of cables which are exposed near designated walkway and construction access and egress areas, and b) padding material under cables which go over sharp or hard edges that could cause significant cable jacket indentation.

--The Okonite Company in their letter of April 19, 1985 stated that, "Okonite is not aware of any cable industry standard (ICEA, NEMA, ANSI) which sets limits or test methods on crush force capability of cable, nor how their test results are related to actual installation conditions." They also stated, "Our discussions of UL 44 and crush testing they (UL 44) impose on any jacketed cable construction was not meant to imply the appropriateness of their test methods and criteria on jacketed cable constructions we normally supply to power generating stations."

The licensee has identified in FCP 431, Revision 20, unacceptable indentations criteria. This procedure is being used by quality control personnel in their plant walkdown which is covering such areas as

unsupported cable lengths and cable indentations. The walkdown is approximately 20 percent complete with no significant cable indentation reported to date.

The inspector discussed the attributes of the procedures and requirements of this task with various inspection personnel. They were knowledgeable of the requirements and understood the concern as identified by the NRC. The plant walkdown inspection was being performed by quality control personnel during this inspection period.

This item is considered closed.

(Closed) Unresolved Item 84-17-01, Future procurement of Class IE electrical equipment to reflect the design changes that are necessary to comply with the licensee's FSAR requirements.

The licensee was to have updated by June 28, 1985 all existing class IE electrical equipment specifications to incorporate detailed vendor wiring workmanship acceptance criteria. This task was delayed by the licensee due to funding problems.

The licensee has scheduled necessary specification revisions to be completed by the end of 1986, and any replacement or new equipment purchased by Stone & Webster will include appropriate vendor workmanship and wiring criteria in Class IE purchase orders.

To insure that Stone and Webster's purchase orders have the required workmanship criteria until the specifications are changed, S&W purchasing group has the required criteria posted in each designated folder to ensure that it is implemented. The above instructions will be enforced at the Boston Office of S&W until the required specifications update has been completed.

The method that is presently being employed by the S&W Boston Purchasing Group was transmitted to the site on July 12, 1985. Based on this documentation the inspector closed the item.

(Open) Unresolved Item 85-05-05, Separation of Electrical Panel Internal Wiring. FSAR Volume 1, Section 1.8 specifies the licensee's commitment to Regulatory Guide 1.75, Revision 2. Further, Paragraph 8.3.1.4 of the FSAR, issued October 1983 (Amendment 3) states, "Wiring within control switchboards and instrumentation cabinets has been specified to meet the requirements of IEEE Standard 384-1974." IEEE 384, Paragraph 5.6.2, Internal Separation, requires a 6 inch minimum separation to be used unless barriers are installed.

To resolve the above problems, Stone & Webster Engineering Corporation has evaluated the equipment with the potential for color separation criteria violations and modified their Electrical Installation Specification 2BVS-931 which now defines the criteria to be in compliance with FSAR commitments.

The inspector reviewed 2BVS-931, Appendix M, pages 9 and 10 which incorporated the engineering changes previously discussed. In addition, the inspector verified that the following procedures were modified to reflect the engineering changes to 2BVS-931:

- FCP-432; Field Construction Procedure for Electrical Terminations, dated April 30, 1985
- IP-8.5.4; Acceptance Inspection of Equipment Internal Wiring and component modifications, dated June 28, 1985,
- IP-8.1.9; Completion Inspection for Electrical Equipment, dated June 11, 1985
- TCO-8Q-1, Training Course outline video tape

Construction and DLC Site Quality Control have been retrained to perform their function in internal equipment color separation requirements.

The inspector discussed the referenced documents with various craft and SQC personnel and positive feedback was evident by their responses. Rework is scheduled to be accomplished by the end of 1985.

This item remains open pending NRC verification of installed and SQC inspection of the cabling in electrical equipment.

(Open) Unresolved Item 83-12-03 Unsupported Cable Length

This item is a backfit effort which applies to vertical cable inside raceway and horizontal cable outside of raceway.

Electrical Installation Specification 2BVS-931 originally contained control measures which limited the length of unsupported cable to three (3) feet. Based on this original requirement, DLC/SQC has written numerous nonconformance reports citing violations of the cable installation specification requirement limiting the unsupported cable length to three (3) feet.

Engineering disposition on the N&D's revised the specification by changing the term "unsupported" to "unprotected" and defining the unprotected length as that distance between raceways and not the actual length of the cable.

The inspector verified that the revised Electrical Installation Specification 2BVS-931 describing unsupported cable length criteria is clearly stated and translated in Inspection Procedure IP-10.2.3; titled "Backfit Inspection Program - Unsupported Cable Length", dated May 29, 1985.

The Stone & Webster Site Engineering Group (SEG) has completed a walkdown to identify sloped and vertical tray conditions. DLC/SQC is currently inspecting unsupported cable lengths in free air using the criteria

provided by IP-10.2.3. Approximately 20% has been SQC inspected and approximately 79% has been identified as unacceptable. The unacceptable unsupported cable lengths identified by SQC are being documented on the "Unsupported Cable Report" Form in accordance with SQC 4.6.2, and shall be dispositioned by engineering. Weekly "Unsupported Length Backfit Status" reports are generated by DLC/SQC noting:

- Inspections Required
- Inspections Completed
- Inspections Remaining
- Percentage Complete

As of July 2, 1985 the inspector verified, using the above report, that there have been 525 UCR's written of which 60 have been closed. Discussions with the licensee indicate inspection completion shall be accomplished in approximately 40 weeks.

This item remains open pending NRC review of the dispositioned UCR's, the corrective actions taken, and subsequent SQC verification and closure of the UCR's generated.

(Closed) Unresolved Item 85-07-10 Switchboard Wire Traceability

Several reels of orange, purple, and green SIS switchboard wire procured from rockbestos were found not to contain identification markings on the insulation of the wire. The inspector verified that there was only one vendor supplying SIS wire to this site however; since the wire had no markings, the concern was traceability once the wire left its respective reel.

The inspector reviewed the revised Pre-Engineered Material listing number 414, revision 6, dated May 30, 1985 which currently states in section 1.c, "Each length of completed wire shall be permanently marked by a surface printing throughout entire length. The marking shall include the following:

1. The Voltage Rating
2. Conductor Size
3. Manufacturer Name
4. Insulation Type
5. Manufacturer Identification

The marking shall be at intervals not exceeding 24 inches."

The inspector, during a previous inspection (85-07), verified that Class 1E SIS wire is procured from one (1) vendor for this site. Differences in material from Specification Requirements would be identified by the licensee's receiving inspection program.

This item is considered closed.

(Open) Unresolved Item 85-07-08 Cable Sidewall Pressure

This item resulted when SWEC could not provide the inspector of how cable sidewall pressure data, from the various cable manufactures, was factored into the maximum allowable cable pull tension number printed on the cable pull tickets. The inspector determined that cable sidewall pressure was not implicitly factored into the tension calculation.

SWEC has generated Engineering Design and Coordination Report E&DCR-2P4712C, dated June 17, 1985, which revises the Electrical Installation Specification 2BVS-931 to include Appendix P titled "Cable Pulling Tensions". The contents of this Appendix contain, 1) the instructions for filling out the Cable Pull Tension Form (CPTF), 2) sample CPTF, which includes sidewall pressure values, and 3); six (6) tables which describe the maximum cable pull lengths between pull points for the various service classes of cable used at the site. In addition, prior to pulling cable, a CPTF is prepared by SWEC construction and DLC/SQC independently, then compares the calculated values with the requirements.

The licensee has revised the associated FCP's and IP's, and training has been accomplished. Using the criteria of 2BVS-931, engineering has approximately 10 raceway sections to evaluate to the above specification.

This item remains open pending NRC review of the engineering evaluation and disposition of approximately 10 raceway sections referenced above and verification that cable specifications sidewall pressure requirements have not been exceeded.

4.0 Emergency Diesel Generator Inspection

4.1 Background

On May 14, 1985, at the Calvert Cliffs 1 and 2 Nuclear Power Plant, Emergency Diesel Generator (EDG) #11 was damaged when an interpolar connecting strap on the rotor broke free at one end, rubbed and abraded the stator winding insulation prior to its complete separation by fracture. One stator winding's insulation was substantially penetrated. The EDG was unloaded and undergoing overspeed testing at the time of the failure. No excitation was applied to the generator so no flashover occurred.

The interpolar connecting straps are part of the "amortisseur" or damper winding which connects the pole cores of the rotor. The straps are made of copper and are attached by TIG welding. The winding, which serves as a speed and voltage stabilizer, is supplied with the generator only when specially ordered. It is most useful when the generator is required to run in parallel with other machines to dampen speed changes or if the generator is required to carry single-phase loads that can cause the three phases to become unbalanced.

The generator that failed is a Fairbanks Morse, Type TGZDJ, Single Bearing, Drip-proof, Synchronous Alternator with a 966-30 size frame. Rated output is 4063 KVA, 3250 KW at 4160 volts.

Subsequent to the generator failure at Calvert Cliffs, the vendor identified three (3) other nuclear facilities that have the interpolar connecting strap design.

4.2 Findings

The inspectors reviewed 2BVS-230, "Emergency Diesel Generator Sets" procurement specification to determine if the licensee procured similar generators. Since design similarities existed between the generator that failed and the ones procured, the inspectors requested that the covers be removed from EGS*EG1-2 and EGS*EG2-2 for inspection.

The inspectors examination revealed that the two (2) emergency diesel generators do not have the interpolar connecting straps that are of concern.

No violations were identified.

5.0 Exit Meeting

The inspectors met with licensee and contractor representatives (denoted in paragraph 1) at the conclusion of the inspection on July 12, 1985. The inspector summarized the scope and findings of the inspection as described in this report.

The inspector discussed the licensee's decision to not perform quality control inspection during the start-up test phase of the Unit 2 program as directed in Mr. J. Carey's letter of August 21, 1984. The Quality Assurance Procedure DC-11, Revision 4, July 20, 1984, paragraph 11.5.1 was discussed and the apparent conflict in direction of Mr. J. Carey's letter and the QA Procedure DC-11. The inspector stated his concerns and informed the licensee that further inspections would be conducted in this area.

At no time during the inspection was written material provided to the licensee by the inspector.