

U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Report No. 50-412/82-11

Docket No. 50-412

License No. CPPR-105 Priority -- Category A

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: September 1 - October 1, 1982

Inspectors: *G. Walton*
G. Walton, Senior Resident Inspector

10/25/82
date

Approved By: *L. Tripp*
L. Tripp, Chief, Reactor Projects
Section No. 2A, Projects Branch No. 2

10/25/82
date

Inspection Summary:

Inspection on September 1 - October 1, 1982 (Report No. 50-412/82-11)

Areas Inspected: Routine, unannounced inspection by one resident inspector of HVAC supports, electrical conduits, containment penetrations, nonconformance and disposition reports, field construction procedures, quality control training, IE Bulletins and Circulars, construction deficiency reports and daily site tours. The inspection involved 148 hours onsite by one resident inspector.

Results: Of the nine areas inspected, one item of noncompliance was identified: Failure to restrict the drawing tolerances within the engineering calculations boundary, failure to perform engineering calculations and failure to establish as-built conditions on HVAC supports (Details Section 4).

DETAILS

1. Persons Contacted

Duquesne Light Company (DLC)

- *P. Cadena, Senior Project Engineer
- R. Coupland, Director, QC
- *H. Crooks, Assistant Director, QC
- *F. Curl, Senior Construction Specialist
- *C. Ewing, QA Manager
- *R. Fedin, Compliance Engineer
- *G. Kaloz, QC Engineer
- C. Majumdar, Senior QC Engineer
- *J. Markovich, Compliance Engineer
- P. Orr, Deputy Project Manager
- R. Swiderski, Manager of Nuclear Construction

Stone and Webster (S&W)

- *S. Adams, Superintendent of Construction
- *C. Bishop, Resident Manager
- *R. Faust, Site Structural Engineer
- *A. McIntyre, Head, Site Engineering Office

*Present at exit meeting held October 1, 1982.

2. Construction Site Walk-Through Inspection

Numerous tours of the construction site were made to observe work activities in progress, completed work and plant status of the construction site. The presence of quality control inspectors and quality control records were observed. No violations were identified.

3. Licensee Actions on Previous Findings

(Closed) Circular 77-04 "Lock Assemblies" and Unresolved Item 82-09-02 "Actions Taken on Circular"

The inspector reviewed the response from Stone and Webster to Duquesne Light Company contained in a memorandum dated September 9, 1982. The requirements for assuring adequate doors and locking devices are specified. The inspector had no further questions and this matter is resolved.

(Closed) Bulletin 8C-19 "Failures of Mercury-Wetted Matrix Relays in Reactor Protective Systems of Operating Nuclear Power Plants Designed by Combustion Engineering"

The inspector reviewed the licensee's response to I&E Bulletin 80-19 to ascertain its effect on Beaver Valley Unit 2. The licensee has determined

that Beaver Valley uses Westinghouse's design dry-contact relays and does not use mercury-wetted relays in the Reactor Protection System. This item is considered closed.

(Closed) Bulletin 80-20, "Failures of Westinghouse Type W-2 Spring Return to Neutral Control Switches"

The inspector reviewed the licensee's response to I&E Bulletin 80-20 to ascertain its effect on Beaver Valley Unit 2. The licensee has investigated and determined that no Westinghouse type W-2 switches are being supplied with equipment for use onsite. This item is considered closed.

(Closed) CDR 77-00-03, "Replacement of Contact Cartridges for Westinghouse AR Relays"

(Closed) Bulletin 77-02, "Potential Failure Mechanism in Certain Westinghouse Relays With Latch Attachments"

Beaver Valley Unit 2 was provided with solid state protection system relays equipped with AR latching type relays having a modified contact cartridge. The factory modification installation is documented by Westinghouse Quality Release Supplement QR-26735-1 and shown on the train assembly drawing 1058E78 Revision E. Duquesne Light Site Quality Control (SQC) inspected the affected cabinets and racks to assure the latch attachments were marked "NARCR" and the marking placed on the correct relays. In addition, SQC verified there was no damage to components during cartridge verification and that the orientation (open or closed position) and wiring of the contacts are as shown on drawing 1082H85 Revision D and 2375A67. All inspections were found satisfactory. The inspector has no further questions on this matter.

(Closed) CDR 82-00-01, "Defective Integrated Circuits In Brown-Boveri Overcurrent Relays"

The licensee has established that the defective relays were in the 4KV switchgears, purchase order 2BV-304, and the diesel generator relay panels, purchase order 2BV-731.

A total of twenty (20) relays found with defective chips were removed from the 4 KV switchgear and returned to Brown-Boveri for modifications. They were modified, returned, inspected, installed, and reinspected after installation and found acceptable. The diesel generator relay panels were corrected at the vendor's shop. Two relays in these panels were modified by Brown-Boveri. Inspection report number VS-2BV029 documents inspections performed by the Vendor Surveillance Section of Quality Control. The inspector has no further questions on this matter.

(Closed) CDR 82-00-05, "Misapplication of Torquing Equipment on the Emergency Diesel Generator's Shaft Spider Assemblies"

Beloit Power Systems reported that the Emergency Diesel Generator sets, assembled with Colt Industries diesel engines and frame IX generators may have loose studs and nuts on the shaft spider assembly because of misapplication of torquing equipment. Each generator is equipped with 14 fasteners and, upon inspection at the jobsite, it was determined that most fasteners were incorrectly torqued at the factory. All fasteners were retorqued to a specified value of 5,000 ft.-lbs. This item is considered closed.

(Closed) Noncompliance 82-07-02, "Bulges in Containment Liner"

The inspector reviewed the licensee evaluation of the ten bulges found that exceeded tolerances located on the inside surface of the containment liner. The licensee has completed the following action:

- (1) A 100 percent visual examination of all accessible areas.
- (2) Layout sketch and photographic evidence was made for each bulge for future reference purposes.
- (3) Engineering calculations were performed on each area to evaluate the acceptability and safety implications. The maximum containment design loadings, as specified in the PSAR, were used. It has been determined that the liner will properly function as a leaktight membrane and will function under design conditions with no detrimental effects on safety. This item is considered resolved.

4. Review of Support Attachments for HVAC Systems

4.1 Installation Review for DSA 353

The inspector reviewed the heating, ventilating, and air conditioning (HVAC) support installation being performed in the Cable Vault area, at elevation 760', for support number DSA 353 shown on drawing 12241-BZ-516D-72-1C. The inspector noted that three of the six drilled anchor holes had encountered rebar in the concrete and could not be completed. The other three holes were marked "good." A measurement of the hole depth for the acceptable holes revealed depths of 7½", 7½", and 8¼". The details for the bolt holes, shown on drawing 516D-16-4A, specify a ¾" x 7" Hilti kwik bolt. FCP 103 shows a maximum hole depth for a ¾" x 7" bolt to be 6½ inches. When questioned about the hole depth, the foreman and installer stated that it was their intent to use the next longer bolt because, with the minimum embed specified as 5½ inches, and an attachment material thickness of ¾ inch plus nut and washer thickness of ¾ inch, it would be impossible to make the connection and still have 1-3 threads exposed as required. Therefore, they had elected to drill deeper without prior approval or requesting a drawing change.

The inspector questioned the craftsman regarding how new holes would be relocated and drilled for those that had encountered rebar. The craftsman stated that the drawing gave tolerances for each hole, therefore, a larger plate could be used and the holes could be relocated. In this case, the plates would overlap each other if moved the maximum distance that the tolerances would allow. It appeared that the holes could come within three inches of each other, based on a hole to edge of plate dimension of $1\frac{1}{2}$ inches. FCP 103 specifies a minimum hole spacing of eight inches for a $\frac{3}{4}$ " diameter Hilti bolt embedment. The largest of hole spacings shown on BZ-516D-72 revealed hole spacings of approximately $4\frac{3}{8}$ inches. A calculation had been performed by Stone and Webster Engineering for hole spacings of $4\frac{3}{8}$ inches and found the spacing acceptable.

The inspector questioned engineering on whether the calculations had allowed for the drawing tolerances as specified and was advised that the calculations did not consider any tolerances. If the field used the tolerances specified in the drawing and moved the holes closer together, then the calculations would not be valid.

The inspector noted that the drawing referenced "Detail F" as the connection method. Detail F shows the connection to be made by welding to steel plate embedment without Hilti bolts. However, the holes were drilled for installation of Hilti bolts.

4.2 Review of Other HVAC Supports

The inspection was then expanded to include other HVAC supports already installed. The following conditions were found:

The drawing shows support DSA 207 installed by welding to a steel embed. The inspector found the actual installation to be with Hilti bolts. The inspector also noted that two bolt holes were approximately three inches apart which violates the minimum hole separation of eight inches specified in FCP 103. No calculations had been performed on this condition since engineering had assumed the connection would be installed by welding as shown on the drawings.

4.3 Comparison of Design Procedures with Installation Practices

EMTR 612 titled "Design Procedure For Base Plates Utilizing Drilled-in-Concrete Anchor Bolts" is the document used for calculating anchor bolt installation acceptance. A review of this document found that certain criteria were specified and assumed when performing the calculations for each support. The criteria contained in EMTR 612 are listed below together with the inspectors findings and concerns.

4.3.1 Base plate shall be square or rectangular with not less than four anchor holes.

On support number DAS 123 (Control Building), a plate is installed with a support attached for the HVAC system with only two Hilti quik anchor bolts.

4.3.2 For a base plate in the x-y plane, the anchor bolts shall be symmetrical about the x-axis and y-axis.

Drawing BZ-516D-16-4A "Seismic Duct Support" contains "Detail F" for attaching supports to the wall using Hilti bolts. The hole spacings are shown as 8 inch minimum to 10 inch maximum. The 2 inch tolerance is shown for each hole. This allows the field to move the holes as necessary when the Hilti bolts are installed. This allows the holes to be asymmetrical. The asymmetrical condition was observed on duct support DSA 207.

4.3.3 The centroid of the attached support member shall coincide with the centroid of the anchor bolt pattern.

The tolerances described above for relocating holes in the field without engineering approval would allow violation of this requirement. The drawings and instructions reviewed by the inspector do not show restrictions to assure consistency with the above requirements.

4.3.4 The inspector reviewed a memorandum contained in the Engineering Technical Guidance 2.8.1 which states "Baseplates designed by EMTR 612 are limited by drilled-in-concrete anchor pullout capacity rather than plate binding stress. This is true except in the unusual case of a gap larger than 1/8 inch under the plate at one or more bolts. This situation can be corrected by shimming."

Stone and Webster Engineering has verbally stated that this is a requirement; however, as of October 1, 1982, it had not been specified in implementing procedures. The field construction procedures, inspection procedures, and drawings do not show the above as a requirement and no inspections are performed to determine the distance from the plate to the concrete wall.

4.4 Drawing Discrepancies

The inspector then reviewed several drawings for installation of seismic duct supports and found the following conditions.

- 4.4.1 Note 2 on BZ-516D-72-1C references BZ-516D-11-13A for details. This appears to be incorrect since the applicable details are shown on BZ-516D-11-14, 15, and 16.
- 4.4.2 BZ-516D-72-1C specifies "Detail F" for two of the connections to the wall. However, Detail F shows the connection welded to an embedded plate. The drawing depicts a connection using Hilti bolts. It is not clear which method is to be or was used.
- 4.4.3 BZ-516D-16-14A "Detail F" specifies a 3/4 inch plate fastened to the wall using 3/4 inch x 7 inch long Hilti's with a minimum embed of 5½ inches after tightening. The drawing also shows 1 inch of grout under the plate with a nut and washer thickness of 3/4 inch. To obtain an embed depth of 5½ inches, the Hilti bolt would have to be about 8 inches long plus allowances for 1-3 threads exposed after installation. However, the drawing specifies a 7 inch long bolt. The inspector was also advised that when a certain length bolt is specified, the quality control inspection would only verify that a 7 inch bolt is installed. It appears the specified embedment depth might not be achieved.
- 4.4.4 BZ-539C-71-2 specifies "Detail C" and "Detail D" for connections to the ceiling and references BZ-516D-13A and 14A for these details. Drawings 13A and 14A specify welded connections to embedded plates. The connections were actually made using Hilti bolt connections. Drawing RZ-539A-6A, Note 16, states, "Method of fastening duct supports to concrete will be shown on BZ-539C drawing series unless due to difficulty in erection (rebar interference, etc.), then any of the other methods shown on BZ-516D series may be used."

As stated previously, connections were found by the inspector where the drawing shows the attachment by welding, but installation was with Hilti bolts. As a result of this note on the drawing, its construction has not been going back to engineering and requesting approval. Hence, supports were installed by the Hilti bolt method with bolt spacing of 3 inches with no engineering calculations performed to justify acceptance of conditions exceeding the minimum bolt spacing stated in FCP 103. Further, the as-built condition is not shown on the drawings as required.

- 4.4.5 Drawing BZ-539C-71-2 for support DSA 207 shows the base connection to be an angle welded to an embedded plate. From visual observation, it was found that on the attachments for two support legs, one base is a ½ inch thick angle and the other one is a ½ inch plate.

4.5 Inspection Procedure

The inspector reviewed IP 9.6 and noted that it does not include instructions for inspection of grout and shims under the base plate. As described in engineering documents, those items (grout and shims) are not to be considered part of the final embedment depth. Therefore, the inspection requirements should be specified. It was noted that the training film on this subject does adequately address the inspection method.

4.6 Violation

10 CFR 50, Appendix B, Criterion III, Design Control, requires that measures be established to assure that applicable design bases, as defined in 10 CFR 50.2 and as specified in the license application, are correctly translated into specifications, drawings, procedures, and instructions. Also design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design.

The inspector found three items which violate the above criterion as follows:

- 4.6.1 The drawing tolerances allow movement of the bolt hole locations when installing Hilti bolts such that they exceed the supporting design calculations performed for Hilti bolt loadings.
- 4.6.2 The drawings have been interpreted to allow switching methods of support connections (welding to Hilti) and, as a result, Hilti bolt connections were made with hole spacings closer than the specification allows with no appropriate supporting design calculations being performed.
- 4.6.3 The drawings have been interpreted to allow switching methods of supports connections without engineering approval. As a result, the drawings do not show the as-built condition.

These three items have been combined as one violation (82-11-01).

4.7 Summary of NRC Questions and Concerns

In addition to the violation cited above, the inspector raised additional concerns and questions with regard to the HVAC area as listed below. These items are unresolved (412/82-11-02).

- 4.7.1 Holes are being drilled deeper in concrete than allowed by FCP 103. The NRC concern is that craft workers knowingly violate FCP requirements. If the requirement is important enough to put in the procedure, it should be followed.
- 4.7.2 Craft personnel apparently switch bolt lengths from that specified on the drawing. If the wrong bolt is specified on the drawing, the drawing should be changed. Craft personnel should not have the authority to deviate from drawing requirements.
- 4.7.3 As described in the details of Section 4.4, several inconsistencies and conflicting instructions were found on the drawings which leads to confusion during installation. What type of review and changes are being made to eliminate these discrepancies?
- 4.7.4 The drawings specify bolt lengths and minimum embedment depth which cannot be accomplished. How is the minimum embedment depth assured?
- 4.7.5 Plate versus angle installation at base. Are the supporting calculations performed with the knowledge that both plates and angles are being used? Are such substitutes allowed by engineering practices?
- 4.7.6 Inspection Procedure 9.6 needs to include instructions for inspection of grout and shims under base plates installed with Hilti bolts.
- 4.7.7 How is the requirement for control of gaps between base plates and concrete to less than 1/8 inch to be implemented?
- 4.7.8 Are base plates installed with two Hilti anchor bolts acceptable?
- 4.7.9 Do the types of problems identified above and in the Notice of Violation also apply to electrical and piping supports?

5. Review of Nonconformance and Disposition (N&D) Report

The inspector reviewed the below listed twenty N&D reports to ascertain compliance with applicable requirements.

6520	6531	6545	6550
6526	6532	6546	6552
6527	6536	6547	6553
6528	6542	6548	6554
6529	6543	6549	6558

The listed N&D reports had been dispositioned and received acceptance by appropriate organizations. No violations were identified during this review.

6. Electrical Conduit Installation

The inspector audited the conduit connection to the concrete wall (connector 2CL957WA2), support number 179 V-2 located in the cable tunnel, elevation 717. This support was connected by bolting into the concrete, within 2½ inches of electrical penetration 2WS484N02. The inspector discussed the spacing separation with the quality control inspector working in the area. The inspector produced the applicable drawing which showed that N&D 1683 had been written to cover the above separation. For acceptance, engineering had performed a calculation based on the spacing of 2½ inches. The calculation shows the spacing acceptable. The inspector had no further questions on this matter. No violations were identified.

7. Inspection of Acimet Bolting

Based on a review of a 10 CFR 50.55(e) report from another nuclear facility, the inspector had advised Duquesne Light Company of a problem with bolting material supplied by Acimet Manufacturing Company and asked if Acimet had supplied any bolting to Beaver Valley, Unit 2. The licensee determined that eight orders were placed with Acimet, 2BV-54912, 54936, 55220, 56175, 56369, 56579, 56984, and 57021.

The licensee inspected the bolting material for the following listed problems identified in the 10 CFR 50.55(e) report:

- Improper machining of nuts
- Failure to hardmark studs
- Over-machining of studs

Purchase orders 2BV-54936 and 55220 apply to washers and smooth round rods not affected by the problem. For purchase order 54912 - 2¼ and 1½ inch nuts to be used on pipe restraints, no problem was found at receipt inspection and some of the material has been installed with no problems. Of the uninstalled nuts, fifteen 2¼ inch size and five of the 1½ inch were inspected. All were found acceptable. No problems were found at receipt for purchase order 56175, and all material has been installed and inspected with no identified problems. For purchase order 56369, no problem was found at receipt and field inspection on a random sample found no problems. Purchase order 56579 was receipt inspected and the material was not marked in accordance with the purchase order requirements. Documentation accompanying the order was traceable to the purchase order and the material was marked on site. Purchase order 56984 was receipt inspected and the vendor had supplied ASTM A540 Grade B27 instead of the ordered ASTM A540 Grade B23 material. N&D report number 2165 accepted

the material. Purchase order 57021 was inspected and no problems were found. The licensee had determined that the minor problems found do not constitute a 50.55(e) reportable condition and the material is satisfactory. No violations were identified.

8. Rework of Electrical Penetrations

During installation, the contractor had reported (N&D 2058) that the electrical penetration sleeves could not be installed due to the attachment pads being in the incorrect location. This condition existed on both ends of 18 penetrations. The item was corrected by rewelding new attachment pads at a rotational change of 33 degrees from the existing pads. The inspector reviewed the following documentation associated with this repair to assure compliance with specification 2BVS-65.

- Welding procedure and welder qualification for Pittsburgh DesMoines Steel Company
- Magnetic particle test report 2439
- Site receiving report of pads
- Nonconformance and disposition report 2058

In addition, the inspector performed a visual inspection of several of the pads for weld configuration and obvious defects. The inspector found all items acceptable and no violations were identified.

9. Review of Field Construction Procedures (FCP)

The inspector performed a detailed review of FCP 34 "Identification of Category 1 Structural Steel" and FCP 33 "Spacing Criteria and Drawing Interface Program" to ascertain compliance with the applicable commitments, code and regulatory guides. No violations were identified.

10. Anchor Plate Material Identification

The inspector performed a visual inspection of anchor base plates to assure compliance with FCP 34 for identification of Category 1 structural steel. The inspector observed the stamping "A" was present on the anchor plate surface. "A" is the designation for A36 material. The inspector found all six inspected anchor plates properly identified. No violations were identified.

11. Quality Control Training Program

The inspector observed the QC training film "Post Installation of Concrete Anchor Bolts (Hilti) Phase III." This film is part of the QC inspectors training. The film covers bolt spacing, measurement of embedment depths,

torque testing requirements, tension testing requirements, and turn-of-the-nut method of tightening bolts. The film is presented in a clear and concise manner and provides the QC inspector good training for inspection of anchor bolt installation. No violations were identified.

12. Unresolved Item

Areas for which more information is required to determine acceptability are considered unresolved. An unresolved item is included in paragraph 4.7.

13. Exit Interview

A meeting was held with the licensee representatives indicated in paragraph 1 on October 1, 1982, to discuss the inspection scope and findings.