



Duquesne Light

Nuclear Construction Division
Robinson Plaza, Building 2, Suite 210
Pittsburgh, PA 15205

2NRC-3-005

(412) 787-5141

(412) 923-1960

Telecopy (412) 787-2629

January 31, 1983

United States Nuclear Regulatory Commission
Region I
631 Park Avenue
King of Prussia, PA 19406

ATTENTION: Mr. Richard W. Starostecki
Division of Project and Resident Programs

SUBJECT: Beaver Valley Power Station - Unit No. 2
Docket No. 50-412
USNRC IE Inspection Report No. 50-412/82-11

Gentlemen:

This report, with attachments, is in response to the item of violation and unresolved item cited in Inspection Report No. 50-412/82-11 and as requested by your letter to Mr. E. J. Woolever, dated November 1, 1983.

Engineering Approach

The BVPS-2 HVAC systems require approximately 1600 QA Category I, seismic-ally designed, duct supports. Of these, about 600 supports are now installed. HVAC supports are attached to building structural steel or to structural concrete walls, floors, or ceilings. Embedment plates at uniform intervals and configurations have been incorporated into building designs for support of various QA Category I attachments (i.e., piping, HVAC, lighting fixtures, conduit, etc). Attachment of duct supports to embedment plates is the preferred methods of installation. Where attachments to embedment plates cannot be accomplished, surface mounted base-plate and drilled in Hilti bolts are used.

The support designs were based on standards which experience has shown to generally provide acceptable designs and low loads (usually less than 20 percent of allowables) to structures. Because the majority of the supports require some installation modifications, a unique individual calculation is finally produced which considers the as-installed conditions. Preparation of individual calculations started approximately 18 months ago and is scheduled to be completed April 1, 1983. Of the 1600 supports, approximately 1300 have been qualified by calculation. The supports reviewed by the NRC inspector did have qualifying calculations which included both the preferred and alternate details.

Generally, when engineering documents are issued, various procedures (both corporate and project) establish controlled methods to revise, review, monitor holds, reissue and approve these documents. They also provide a

description and procedure of filing, filming, distribution of documents for both the headquarters and site offices. These are available, for review, with our Site Engineering Group.

For those supports already installed, an as-built inspection program has been implemented to ensure that calculations adequately address the installed condition at the attachment to structure. This will remove any doubts resulting from questions related to drawing notes and tolerances. For future installations, drawing notes, tolerances, applicable specifications, and procedures have or will be revised to remove any ambiguities. Drawings continue to permit alternate installation details and tolerances. Any deviation will be recorded on Requests for Information (RI), Nonconformance and Disposition Reports (N&D), or Engineering and Design Coordination Reports (E&DCR) and resolved by Engineering.

Discussion of Violation

The referenced NRC letter indicates violation of 10CFR50, Appendix B, Criterion III, Design Control. Of the total estimated 1600 duct supports, these stated violations potentially apply to approximately 600 installed supports of which it is estimated that 100 have bolted plates. All installed duct supports are being reviewed for any of the noted conditions. Thus far, 320 supports have been as-built inspected. Of the 320 supports, 200 have been evaluated. All have been found acceptable and are in full agreement with engineering calculations.

It is now estimated that, due to misinterpretation, switching methods of support connections occurred on approximately 25 supports (25 to 50 plates), which represent about 4 percent of the installed supports. An evaluation will be made to determine conformance with the design calculations. If required, revised calculations will be issued. It is not anticipated that any plate or bolt overstress will occur since the applied loads are typically 10 to 20 percent of the support's load capacity. As stated earlier, the three supports specifically identified by the inspector each had supporting calculations for bolted baseplate designs that were each found to be well within acceptable limits.

The following numbered paragraphs respond to the same numbered sections of the NRC's inspector report. Violation wording is repeated in quotes:

- 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."

Response

Baseplates that are designed for use with Hilti bolts have provided and will provide specific tolerances for installation on the detail BZ drawings and the configuration will be fully justified by the supporting design calculations. The distance between bolts on

adjacent plates is addressed in FCP-103. The three supports questioned by the NRC inspector have been reviewed and found acceptable as installed. The balance of the installed baseplates will be inspected and any deviations from BZ drawings will be reconciled. This effort is scheduled to be completed by May 1, 1983. Also, refer to Response No. 2, General Items, found in the attachment to this letter.

- 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."

Response

This item is addressed in Response No. 3, General Items, found in the attachment to this letter.

- 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."

Response

This item is also addressed in Response No. 3, General Items, found in the attachment to this letter. Drawings which permit alternate details do not require as-built drawings for engineering confirmation of the support connection, provided all options are qualified by calculations and adequate design and inspection procedures are in effect. However, due to the potential for misinterpretation of BZ drawings for existing installations, these attachments will be subjected to the as-built inspection program previously described, and the affected BZ drawings will be reissued, if necessary, by August 1, 1983.

Summary

As requested by the NRC, we have examined the Management Control System and Quality Assurance Program with respect to the observed inconsistencies among procedures, drawings, specifications, calculations, and installation practices. We conclude that the Quality Assurance Program is adequate, but that certain inconsistencies among procedures, drawings, specifications, supporting calculations, and installation practices contributed to this situation.

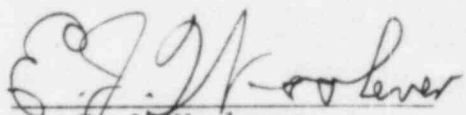
Specifically, the project management control policy is to identify all deviations from or inconsistencies among design drawings, specifications or procedures using, as appropriate, RI's, E&DCR's, N&D's or approved

changes to the actual document. This policy was not followed when details were switched without prior Engineering approval.

Detailed evaluation of duct support connections installed to date indicates that the amount of rework by either engineering or construction will be very small. Nevertheless, to strengthen controls in this area, BVPS-2 has identified the necessary changes to drawings, procedures, and specifications as described elsewhere in this letter. BVPS-2 has reiterated to craft supervisors, and will continue to emphasize in our training programs that adherence to drawings, specifications, and procedures is mandatory. We will strengthen our engineering reviews to ensure that connection details are specific, and that subsequent changes for constructability are also specific. BVPS-2 will apply these controls to all support connections including piping, electrical, and instrumentation tubing.

BVPS-2 has evaluated these observations for reportability under the provisions of 10CFR50.55(e). Since we have found no deficiencies which could have adversely affected safety of operation, our determination is negative.

DUQUESNE LIGHT COMPANY

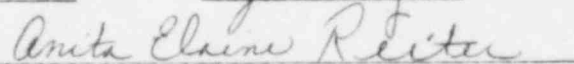
By 
E. J. Woolever
Vice President

SDH/wjs

Attachment

cc: Mr. G. Walton, NRC Resident Inspector
Ms. L. Lazo, Project Manager

SUBSCRIBED AND SWORN TO BEFORE ME THIS
31st DAY OF January, 1983.


Notary Public

ANITA ELAINE REITER, Notary Public
ROBINSON TOWNSHIP, ALLEGHENY COUNTY
BY COMMISSION EXPIRES OCTOBER 20, 1986

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF ALLEGHENY)

On this 31st day of January, 1983, before me, a Notary Public in and for said Commonwealth and County, personally appeared E. J. Woolever, who being duly sworn, deposed and said that (1) he is Vice President of Duquesne Light, (2) he is duly authorized to execute and file the foregoing Submittal on behalf of said Company, and (3) the statements set forth in the Submittal are true and correct to the best of his knowledge.

Anita Elaine Reiter
Notary Public

ANITA ELAINE REITER, Notary Public
ROBINSON TOWNSHIP, ALLEGHENY COUNTY
MY COMMISSION EXPIRES OCTOBER 20, 1986

ATTACHMENT

RESPONSE TO NRC OBSERVATIONS

General Items:

The following general items, which were mentioned more than once in the NRC inspector's audit observations, are grouped for convenience:

1. Deeper Holes/Longer Bolts

Minimum embedment depth is the controlling parameter for drilled in anchors and the appropriate requirements for embedment depth are provided in FCP-103, which is being revised and will be reissued by February 15, 1983, which will be the controlling document for installation. This document was used by Construction for installation.

In order to eliminate any possible confusion in the future, all bolt length and embedment depth information will be eliminated from the engineering drawings (BZ, RZ, etc.). This activity will be completed by May 1, 1983.

2. Less than 8 in. Bolt Spacing/Hole Tolerances/No Valid Calculations

FCP-103 indicates the requirements for maintaining proper hole spacing by stating that, "Spacing between centerlines of anchors in the same attachment or adjacent attachments of the same discipline shall be as shown on the Engineer's drawings. Where spacing is not shown, the minimum spacing shall conform to Attachment 3.2." Any situation not covered by FCP-103 must be brought to the attention of Engineering for resolution prior to implementation.

Support details indicated dimensions and tolerances consistent with FCP-103. However, in some cases general Note No. 3 on RZ drawings was misinterpreted to allow further modification of tolerances. This note has been removed from the RZ drawings. In addition, a generic calculation has been completed which provides the technical basis for the minimum/maximum bolt location tolerances stated on BZ details. This generic calculation shows that load distribution in the bolts is not significantly affected.

3. Switching Details/No Calculations

The use of alternate attachment details has always been based on prior engineering approval as noted on the design drawings. Site personnel have been advised that all installations must conform to the engineering drawing requirements including any note requiring prior engineering approval before the use of alternate standard details. Future BZ drawing details will either show only preferred attachment detail or will include fully prequalified specific alternatives which may be used without prior engineering approval.

Any additional alternatives or revisions to details will require prior engineering approval.

4. Two-Bolt Baseplates, Eccentric Attachments, and Unsymmetrical Bolt Patterns

Two-bolt baseplates require individual engineering calculations to justify their installation. EMTR-612 is a generic procedure to qualify standard symmetrical baseplates. Other designs using two-bolt baseplates, unsymmetrical bolt patterns or eccentric attachments are designed to additional criteria:

- a. Two-bolt baseplates are designed in accordance with 12241-NP(B)-272-Z15, Revision 0.
- b. Project guidance for design qualification of unsymmetrical bolt patterns and eccentric attachments is provided in an engineering procedure issued on August 8, 1981, to personnel performing this design function. A copy is available for review with the Site Engineering Group.

5. Gaps Under Bolted Baseplates

Gaps under baseplates were not restricted on engineering drawings. E&DCR-2PS-2413 and 2426, issued January 24 and 26, 1983, respectively, restricts gaps to 1/8 inch under baseplates at one or more bolts unless corrected by shimming or otherwise approved by Engineering. Existing baseplate installations will be reviewed and qualified through the present HVAC attachment as-built inspection program.

6. Incorrect Drawing Reference/Conflicting Drawing Notes

- a. Appropriate attachment details are shown on the BZ drawings and the use of alternate details required prior engineering approval. In some cases, incomplete or incorrect references to these details could lead to questions which should have been referred to engineering.
- b. The RZ drawing general Note No. 3 was misinterpreted to allow a bolt installation tolerance of 1-1/2 bolt diameters in addition to the tolerances specified on the BZ drawings and in FCP-103. This note has been removed from the RZ drawings as discussed in Item No. 2 above.
- c. Drawings RZ-539A-6A and RZ-516A-4J Note No. 17 also permits the use of alternate attachment details. This note has been removed.

Duct support drawing notes will be reviewed in detail to remove ambiguities or incorrect references, and, if necessary, drawings revised and reissued prior to installation of supports installed after May 1, 1983.

7. Pipe and Electrical Supports

a. Pipe Supports

The problems identified above do not apply to pipe supports except in areas of drilled-in anchor hole depth, bolt length, and baseplate gaps. The minimum embedment depth is the controlling parameter for drilled-in anchors and the appropriate requirements for embedment depth are provided in FCP-103, described in General Item 1, and FCP-207, which are the governing documents. These documents are used by Construction for installation.

A review similar to Item No. 5 above will be started by March 1, 1983 on installed pipe support baseplates to determine and reconcile excessive baseplate gaps, if any. The NRC resident inspector will be kept informed of our progress in this activity.

b. Electrical Supports

The problems identified for baseplate gaps due to ambiguities apply to electrical supports. We are evaluating the extent of this problem and will keep the NRC resident inspector informed of our progress in this activity.

Specific Items

The following are responses to each of the individual numbered paragraphs contained in Section 4.1 through 4.5 and Section 4.7 of the NRC's Inspection Report.

4. Review of Support Attachment for HVAC Systems

4.1 Installation Review for DSA-353

At the time of the NRC inspector's review, support DSA-353 was not installed and holes were being drilled for Hilti bolts. Three of the six required bolt holes had encountered rebar in the concrete and would be relocated by the craftsman. The three "good" holes had been drilled deeper than the maximum specified depth allowed by FCP-103. Drawing 516D-16-4A specified a 3/4 inch x 7 inch anchor to install the correct length bolts in accordance with FCP-103. To eliminate any confusion, the design length of bolt on the standard detail reference drawing has been eliminated. All bolt length requirements, including depth of embedment holes, will be controlled in accordance with FCP-103 for future applications. As stated in above Response No. 1, General Items, deeper holes do not have a significant effect.

The detail drawing for DSA-353 provided a design with a bolt hole spacing of 4-5/8 inches. This reduced spacing was recognized and qualified in calculation Z-516D-353. The craftsman advised the inspector that the bolts and plate size could be changed in accordance with general note No. 3 on drawing RZ-516A-4J. The drawing was misinterpreted to authorize further

relocation of the bolts. General Note No. 3 allowed a bolt hole relocation equal to 1-1/2 times the bolt diameter. For the 3/4 inch bolts specified for DSA-353, the tolerance allowed an additional 1-1/8 inch relocation per bolt resulting in a bolt spacing much less than that which was qualified (i.e., 4-5/8 inches).

General Note No. 3 was not intended to allow "additional" bolt relocations beyond specifically defined bolt spacings. This note has been deleted from the drawings to prevent potential misinterpretations in the future, as described in above Response No. 2, General Items.

A review of the calculations for DSA-353 indicated that the 4-5/8 inch bolt spacing had a large reserve design margin (i.e., applied loads were less than 1/10 of the allowable loads) and would still have resulted in an acceptable design if the 3 inch spacing had been used.

The drawing called for a bolted plate and called out as typical a welded plate connection. Detail F, for attachment to an embedment plate, was inadvertently referenced; alternate Detail F should have been specified and has been included in a subsequent drawing revision. The calculation, however, qualified both Detail F and alternate Detail F for this support.

4.2 Review of Other HVAC Supports

The NRC inspector noted that support DSA-207 had been installed with Hilti bolts but the drawing showed the support welded to a steel embedment. The inspector also noted two bolt holes approximately 3 inches apart which violates the 8 inch minimum specified in FCP-103.

The drawing notes were misinterpreted to mean that any alternate baseplate detail could be substituted for the preferred embedment design without Engineering approval. Calculations have been performed to show that the as-built installation is acceptable. Also, refer to Responses Nos. 2, 3, and 6, General Items.

4.3 Comparison of Design Procedures with Installation Practices

The NRC inspector reviewed EMTR-612 "Design Procedure for Baseplates Utilizing Drilled-In-Concrete Anchor Bolts," and noted the following:

4.3.1 "Baseplate shall be square or rectangular with not less than four anchor holes."

4.3.2 "For a baseplate in the X/Y plane, the anchor bolts shall be symmetrical about both X and Y axes."

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

4.3.4 Gaps larger than 1/8 inch under the baseplate at one or more bolts must be corrected by shimming unless otherwise approved by Engineering.

For resolution, refer to responses No. 4 and No. 5, General Items.

4.4 Drawing Discrepancies

The NRC inspector reviewed several drawings of seismic duct supports and found the following conditions:

4.4.1 The inspector noted that BZ-516D-72-1C did not reference applicable drawings for details.

BZ-516D-72-1C did reference the RZ drawings which referenced BZ-516D series. The index sheets on BZ-516D-2 gave BZ numbers for all details. To eliminate any confusion that may have existed, note No. 2 on BZ-516D-72-1C was revised to address the specific details. HVAC support drawings will be reviewed and revised as addressed in Response No. 6, General Items.

4.4.2 The inspector noted that BZ-516D-72-1C specified "Detail F" and the drawing showed a bolted baseplate.

This item was addressed in response to Paragraph 4.1.

4.4.3 The inspector noted that BZ-516D-16-4A specified a Hilti bolt diameter, length, and minimum embedment that could not be installed in accordance with the drawing. Refer to Response No. 1, General Items.

4.4.4 Conditions noted in these sections by the NRC inspector and regarding BZ-539C-71-2 are addressed in Section 4.2. The

4.4.5 attachments for the support will be reviewed in accordance with as-built inspection program as stated previously.

4.5 Inspection Procedure

Procedure IP9.6 has been revised and reissued to indicate that grout and shims are not to be considered as part of the final embedment depth.

4.7 Summary of NRC Questions and Concerns (Unresolved Items)

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."

Refer to Response No. 1, General Items.

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."

Refer to Response No. 1, General Items.

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?"

Refer to Response No. 6, General Items.

4.7.4 "The drawings specify bolt lengths and minimum embedment depth which cannot be accomplished. How is the minimum embedment depth assured?"

Refer to Response No. 1, General Items.

4.7.5 Plate vs. 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?"

Refer to Response No. 3, General Items.

4.7.6 "Inspection Procedure 9.6 needs to include instructions for inspection of grout and shims under baseplates installed with Hilti bolts."

Refer to Response No. 5, General Items.

4.7.7 "How is the requirement for control of gaps between base plates and concrete to less than 1/8 in to be implemented?"

Refer to Response No. 5, General Items.

4.7.8 "Are baseplates installed with two Hilti anchor bolts acceptable?"

Refer to Response No. 4, General Items.

4.7.9 "Do the types of problems identified above and in the Notice of Violation also apply to electrical and piping supports?"

Refer to Response No. 7, General Items.