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L-02-054

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: Beaver Valley Power Station, Unit No. 1 and No. 2
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
Reply to Request for Information Concerning BVPS Responses to NRC Bulletins 2001-01 and 2002-01

FirstEnergy Nuclear Operating Company (FENOC) has provided submittals, as required, in response to Bulletin 2001-01 "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles" dated August 3, 2001 and Bulletin 2002-01 "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity" dated March 18, 2002. These submittals include letters for Beaver Valley Power Station (BVPS) dated October 31, 2001 (L-01-136), March 28, 2002 (L-02-021), April 1, 2002 (L-02-032), and April 19, 2002 (L-02-040).

A request for additional information (seven questions) regarding these submittals was provided to BVPS on April 23, 2002. In a conference call on April 25, 2002, the requested additional information was discussed with the NRC reviewers. This submittal should allow the NRC staff to complete its review of the acceptability of the BVPS responses to these Bulletins.

A response to each of the seven questions is provided in Attachment A. These responses incorporate information that was previously submitted along with the clarifying information provided in the conference call and additional information obtained subsequent to the conference call.

As stated in the conference call, we have a high level of confidence that BVPS does not have the same reactor head degradation problems associated with the nozzle-to-head penetrations as has been observed at other facilities. This is based on our evaluation of the BVPS Unit 1 and Unit 2 inspection videotapes and photographs, which show no evidence or visual appearance that would indicate the presence of a through-wall leak associated with the vessel head penetrations. The radiation monitors and the plant

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instrumentation that monitor containment parameters at BVPS Unit 1 and 2 show no evidence of abnormal trends to indicate potential problems with chronic leakage.

If there are any questions concerning this matter, please contact Mr. Larry R. Freeland, Manager, Regulatory Affairs/Corrective Action at 724-682-5284.

I declare under penalty of perjury that the following is true and correct. Executed on May 10, 2002.

Sincerely,

L. W. Pearce

Attachment

c: Mr. D. S. Collins, Project Manager
Mr. D. M. Kern, Sr. Resident Inspector
Mr. H. J. Miller, NRC Region I Administrator
Mr. D. A. Allard, Director BRP/DEP
Mr. L. E. Ryan (BRP/DEP)
Ms. C. O'Clair, Ohio Emergency Management Agency

Attachment A

The following is a response to the NRC's request for additional information. This is based on the conference call held on 4/25/02 between BVPS and the NRC.

References:

1) L-01-136 dated 10/31/01, BVPS Unit 1 Reply for 1R14 to NRC Bulletin 2001-01
2) L-02-021 dated 03/28/02, BVPS Unit 2 Reply for 2R09 to NRC Bulletin 2001-01
3) L-02-032 dated 04/01/02, BVPS 15-day Response to NRC Bulletin 2002-01
4) L-02-040 dated 04/19/02, BVPS Supplemental Response to NRC Bulletin 2002-01
5) EPRI Report "*Visual Examination for Leakage of PWR Reactor Head Penetrations on Top of RPV Head: Revision 1 of 1006296, Includes Fall 2001 Inspection Results*"

NRC Question #1:

Has there been any abnormal fouling of the radiation monitor filter paper over the last several cycles?

BVPS Response:

BVPS Unit 1 and Unit 2 have not experienced abnormal fouling of radiation monitor filter paper. However it should be noted that the BVPS monitors are equipped with moving filter paper, whereas those at Davis-Besse are stationary. Each of the BVPS Units is equipped with a single particulate channel for monitoring the containment atmosphere. The filter media for these monitors consist of moving filter papers with a normal advance speed of 1 inch per hour. The filters at both Units are 99% efficient for particles that are 0.3 micron or greater in size. The nominal flow rates for the sample pumps are 2 CFM. These moving filter papers are changed out on a routine frequency of approximately every three weeks. Radiation Protection field personnel who perform the filter paper change reported that the filter papers, upon replacement, show no significant indications of foreign material such as particles, crystals, or debris. Experience with these channels over the last several operating cycles has not identified any events at either Unit, in which the filter media has become significantly "loaded" with particles or debris, nor has either Unit's Containment particulate channel been rendered inoperable due to media clogging.

A description of the Reactor Containment Building (RCB) Radiation Monitor Leakage Detection System was provided on pages 6 and 7 of Reference (3). These monitors, in conjunction with other plant instrumentation that monitor parameters such as containment sump pump-out rate, containment temperature and humidity, and trending of Reactor Coolant System (RCS) unidentified leakage rates provide indication(s) of potential reactor coolant system leakage. As noted on page 5 of Reference (3), a review of these key system parameters over the past two years has shown no adverse trends. The BVPS RCS leakage rate and the RCB sump pumpout rate were compared to recent data obtained from Davis-Besse over the same time period. The comparisons show no similar trends or precursors to indicate potential problems with chronic leakage inside the RCBs

at BVPS. Furthermore, currently there is essentially zero reported unidentified RCS leakage at both BVPS Unit 1 and BVPS Unit 2.

Historically at BVPS, the installed leakage detection radiation monitors have demonstrated the ability to identify RCS pressure boundary leakage. This ability has been successfully used in the past for the identification, confirmation, and trending of RCS leakage. The radiation monitors and the plant instrumentation that monitor containment parameters show no evidence of abnormal trends to indicate potential problems with chronic leakage inside the RCBs at BVPS.

NRC Question #2:

For Unit 1, a conoseal leak near Penetration 59 occurred. Historical records indicate that the boric acid residue was removed from the head. During the September 2001 inspection, there was accumulation of boric acid residue near the base of the penetration; however, it was not attributed to a leaking nozzle because of the pattern of the residue/deposits and the previous history of leakage in this area. Given more recent information from inspections at other plants, discuss the possibility that the residue/deposits, were a result of a leaking nozzle

BVPS Response:

Reference (4) described the BVPS Unit 1 history of external leakage above the head insulation at the flanged connection of Conoseal #1 which is located adjacent to Penetration 59:

- The first identified leakage was in 1984 during refueling outage 1R04. The leakage was from Conoseal #1 and the refueling logs indicate that the insulation in the vicinity of the leak was removed and the boric acid was cleaned following repair of the conoseal; however, the extent of cleaning could not be confirmed based on the available documentation.

- In 1991, during plant startup from refueling outage 1R08, a leak at Conoseal #1 was identified. Inspection reports indicate that the area was cleaned and inspected following the repair of the conoseal leak; however, the extent of cleaning is not documented.

While efforts were made to clean up the spillage from the external conoseal leaks from above the insulation, we have concluded that the boric acid residue, which was identified in the inspection video, resulted from leakage that ran down onto the insulation from above and propagated through the joints and down onto the region of the head area. Access for cleaning under the insulation is difficult. See attached Figures 1 & 2 for a top view and cross-sectional view of the insulation in relation to the top of the reactor vessel head. The sectionalized insulation pieces at the outer portions of the head are not designed to be removed without the removal of the ventilation shroud. Access is limited

to individual outer sections by prying up a section of the insulation to get underneath for the purposes of inspection. In addition, the radiation levels in this region during shutdown periods are relatively high (ranging from 1000 mR/hour at the opening of the access ports to the head region to approximately 1500-2000 mR/hour at the upper portions of the head area) which also limits accessibility, consistent with ALARA.

Based on the video evidence of the boric acid staining beneath the insulation and the documented history of conoseal leaks, we have concluded that the dry, white boric acid residue in the vicinity of Penetration 59 is the result of leakage from previous conoseal leaks which were not completely removed during the clean-up efforts. The recent inspection photographs, while identifying residue on the underside of the insulation and on the CRDM tubing above the head-to-penetration interface, did not identify accumulations of a size that would prevent detection of pressure boundary leakage or degradation. There is no evidence or visual characteristics that would indicate that the residue is the result of leakage from the head penetrations or CRDM nozzles.

Reference (1) provided the results of the reactor vessel head inspection during the most recent Unit 1 refueling outage (1R14). Boric acid residue was noted in the general vicinity of Penetration 59, including adjacent penetrations and the underside of the insulation. There was no abnormal accumulation at the base, and no deposits present at the nozzle/head interface that appeared similar to any known examples of leaking nozzles. (Reference 5 - EPRI Report 1006296, Rev. 1)

It should be noted that some of the individuals on the Framatome crew had previously performed similar examinations at Oconee before conducting the 1R14 examinations at BVPS Unit 1. Based on their experience, it was concluded that there was no evidence of penetration or CRDM nozzle leakage similar to that identified at Oconee (i.e.; no popcorn-like deposits).

Additionally, as identified in Reference (3), an NRC representative was present during the review of the Unit 1 1R14 inspections as part of a routine Inservice Inspection. The inspections performed in response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," were reviewed by the NRC in accordance with the requirements of NRC Temporary Instruction (TI) 2515/145, "Circumferential Cracking of RPV Head Penetration Nozzles." The description of the inspection scope and results are documented in Attachment 1 of NRC Inspection Report 50-334/01-08, 50-412/01-08 dated October 17, 2001.

In summary, based on the results of our review of the Unit 1 inspection videotape, and in consideration for the recent information from inspections at other plants, we have concluded that the white boric acid staining in the vicinity of Penetration 59 is the result of previous external leakage and not the result of a leaking penetration or CRDM nozzle.

NRC Question #3:

For Unit 1, boric acid residue/deposits were left on the head. Discuss the extent of these regions. For example, clarify if the bare metal of the head can be seen through the deposits or whether there is any significant (> 1 in. squared) area that is obscured.

BVPS Response:

As identified in Reference (4), a mapping of the entire Unit 1 reactor pressure vessel head has been performed based on the visual examinations captured on videotape by the robotic camera in September 2001.

The required "bare head" inspection was performed during the 1R14 refueling outage in September 2001. The criterion used for performing a "bare head" inspection was to view under the insulation so that the entire "bare head" could be evaluated.

The mapping indicated that greater than 90% of the reactor vessel head surface within the shroud periphery has a light dusting of boric acid residue. This dusting is primarily white in color and is generally less than 1/32" in thickness. This light dusting of residue did not mask the surface condition, as the machining groves on the head material could still be seen on the video. In some areas, loose flakes and loose debris were present, primarily on the uphill side of the CRDM penetrations. However, by observing the condition of the head in the immediate surrounding area, it was determined that these small areas were not masking any abnormal conditions. There were no areas with boric acid residue or debris sufficient to preclude or otherwise physically restrict robotic crawler or video probe access to any of the nozzle-to-head penetrations.

NRC Question #4:

Were all known leaks repaired during the last Unit 1 and Unit 2 refueling outages so as to preclude the possibility of wetting of the deposits?

BVPS Response:

Yes, identified leaks in the vicinity of the reactor vessel head region during the last BVPS Unit 1 and Unit 2 refueling outages were repaired and are summarized as follows:

- During the 1R14 refueling outage at Unit 1 in September-October 2001 there was minor seepage noted from the #4 Conoseal when the system was initially pressurized to approximately 300 psi during plant startup. The cause of the leak was attributed to a distortion of the upper gasket of the #4 Conoseal flanged connection. The gasket was replaced and no additional leakage was observed upon plant restart. This was not a significant leak and did not result in boric acid leakage or deposits on the insulation

or the head area. This is based on a re-inspection of the conoseal area conducted during plant start-up by qualified NDE personnel.

- At BVPS Unit 2, following the 2R09 refueling outage in February 2002, there was a light, dry dusting of boric acid observed on the upper surface of the #1 Conoseal when the system was initially pressurized to approximately 300 psi. Based on follow-up inspections of the area, it was determined that this was not an active leak. Additionally, during a subsequent forced outage on April 5, 2002, a containment entry was made and NDE personnel photographed the conoseal. The photos of the #1 Conoseal confirmed that there is no active leakage. (See Figure 3 which provides a copy of the subject photo.)

NRC Question #5:

For Penetration 65 in Unit 1, discuss the possibility that the leakage from above could have "washed away" any evidence of a leak coming from a crack in nozzle 65.

BVPS Response:

The possibility of any evidence of leakage being "washed away" prior to the 1R14 inspection has been evaluated and the following conclusions have been made:

- If there was any evidence of CRDM leakage present prior to the visual examination, RCS leakage from some source would have been identified. BVPS Unit 1 had no active leakage above the RPV head during the last cycle prior to the inspection.

- Assuming that leakage was occurring prior to the 1R14 inspection, evidence of the leakage product, either accumulated boric acid residue or corrosion products, would be present around the base of the CRDM and the evidence of streaming down the head would be present. The inspection did not identify any evidence of streaming or accumulations around the base of the CRDM or in the areas 'down stream" of the nozzle-to-head penetrations.

- If "washing" would have occurred in prior operating cycles, some evidence of this would have been observed during the recent inspections. There is no physical evidence of either leakage product from the CRDM or from leakage from above the CRDM during the previous cycle and, therefore, the possibility that accumulations from the base of Penetration 65 being "washed away" is not credible.

The inspection performed during the 1R14 refueling outage found no indications of boric acid leakage from any penetrations in the Reactor Vessel Head at BVPS Unit 1. As can be seen from the BVPS Unit 1 photos provided in Reference (4), none of the penetrations

displayed boric acid accumulations (popcorn or string-like in nature) similar to a failed CRDM penetration experienced at other plants as noted by EPRI in Reference (5).

No vessel head nozzle penetrations at BVPS Unit 1 exhibit any visual appearance or characteristics that would indicate the presence of a through-wall flaw. The indications of boric acid accumulations in the vicinity of Penetration 65 noted during the visual examinations were associated with previously identified external conoseal leaks from above the head insulation area.

No significant rust-colored corrosion products were identified on the head and the residue noted during the recent visual examinations was predominately white in color, indicating that corrosion similar to that described at Davis-Besse was not occurring. All areas where either boric acid residue and/or evidence of corrosion were evaluated to determine the source of leakage and ensure that active leakage was not occurring at the nozzle or nozzle-to-head interface. The lack of a quantifiable amount of corrosion products on the head and the absence of rust-colored staining or streaking from the nozzles or from under the shroud support ring provide additional evidence that there is no active leakage at the head penetrations.

NRC Question #6:

Discuss your plans for removing the boric acid deposits from the Unit 1 head.

BVPS Response:

At BVPS Unit 1, we are planning to clean the entire head during the next refueling outage. The details and method(s) that will be used have not been finalized. Communications have been established with other utilities with similar head configurations that have cleaned their heads to determine which methods have been successfully used. A work order for this activity has been generated for inclusion in the 1R15 refueling outage scope. In the event of an extended forced outage that would allow sufficient time to clean the head area, we will evaluate the feasibility of cleaning the head at that time based on our existing planning efforts, length of the forced outage and ALARA considerations.

NRC Question #7:

Discuss your schedule for providing the results of your evaluations for determining the scope of the next Unit 2 reactor vessel head inspection.

BVPS Response:

Visual examinations of the BVPS Unit 2 reactor pressure vessel head were conducted in February 2002 during the 2R09 refueling outage and the results were documented in Reference (2). In summary, the overall condition of the head was very clean with no evidence of leakage associated with head penetrations or CRDM nozzles.

The inspections performed in response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," were reviewed by the NRC in accordance with the requirements of NRC Temporary Instruction (TI) 2515/145, "Circumferential Cracking of RPV Head Penetration Nozzles." The description of the inspection scope and results are documented in Attachment 1 of NRC Inspection Report 50-334/02-02, 50-412/02-02 dated April 24, 2002.

Based on the results of the inspection conducted in February of this year which observed and recorded the Unit 2 head area to be very clean and no indications of leakage, future follow-up inspections will be based on insights gained from BVPS Unit 1 head inspection results, the industry, recommendations developed by the EPRI Material Reliability Program and the recommendations of the ASME Code Task Group on Alloy 600.

Figure 1
Cross-Sectional View of Reactor Pressure Vessel Head

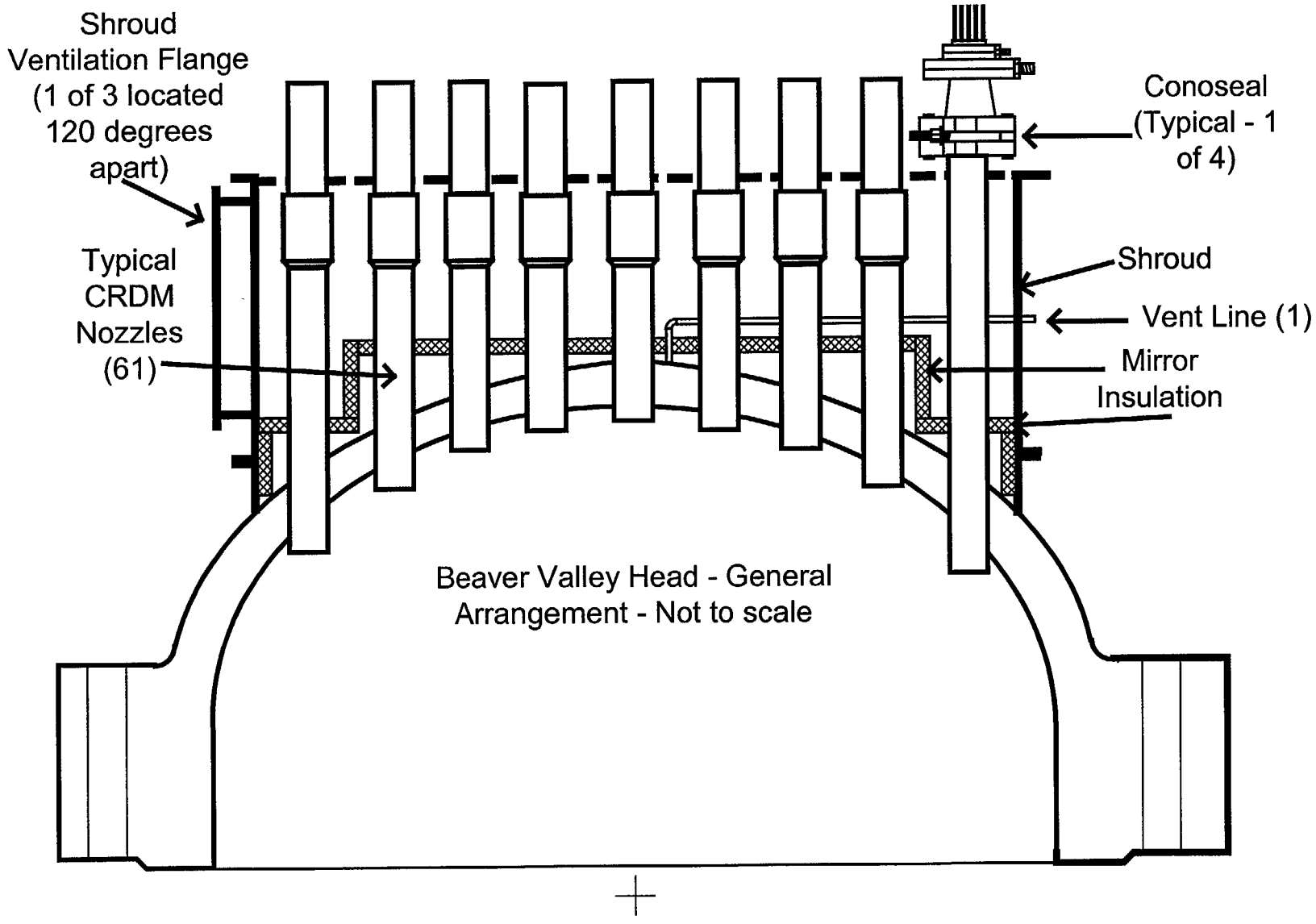

Figure 2

BV-1 Basic Insulation Panel Orientation

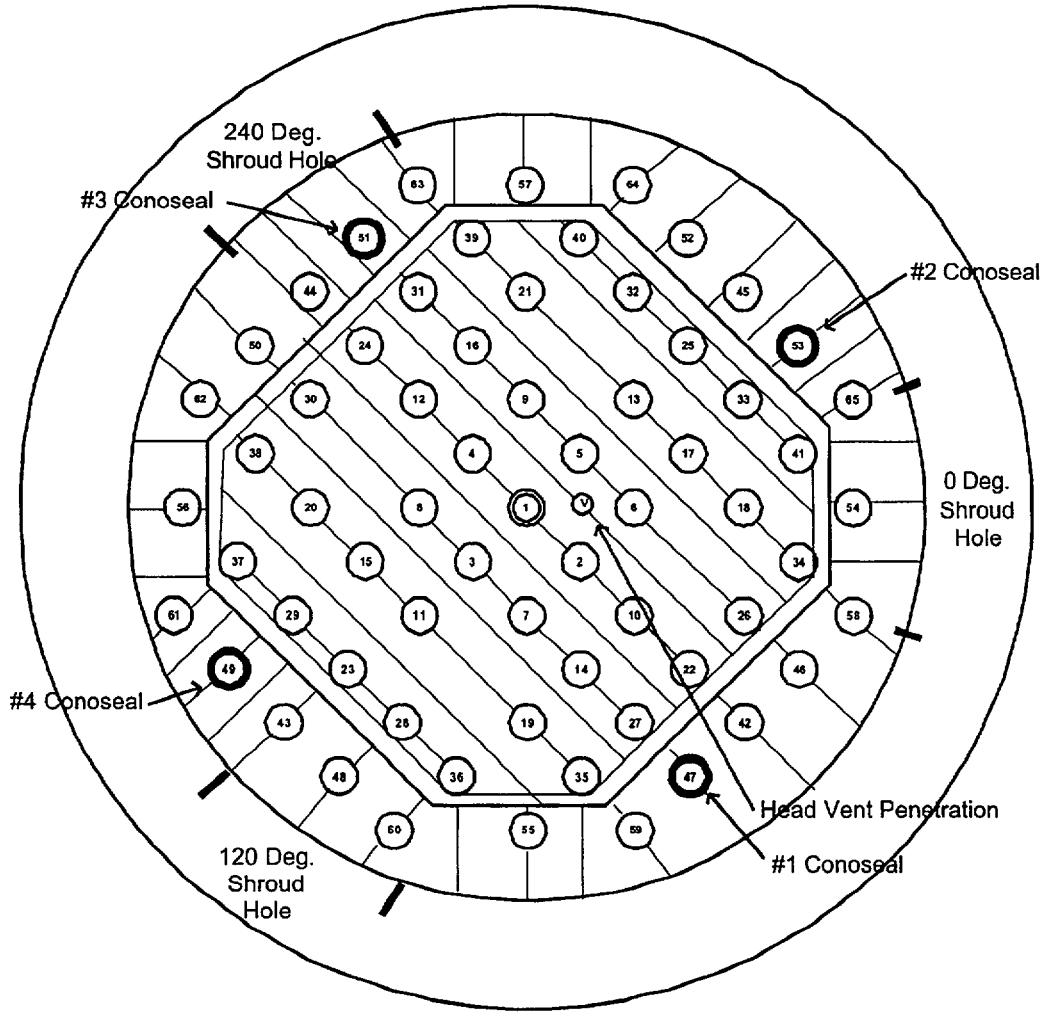

Figure 3

BVPS Unit 2
Conoseal #1

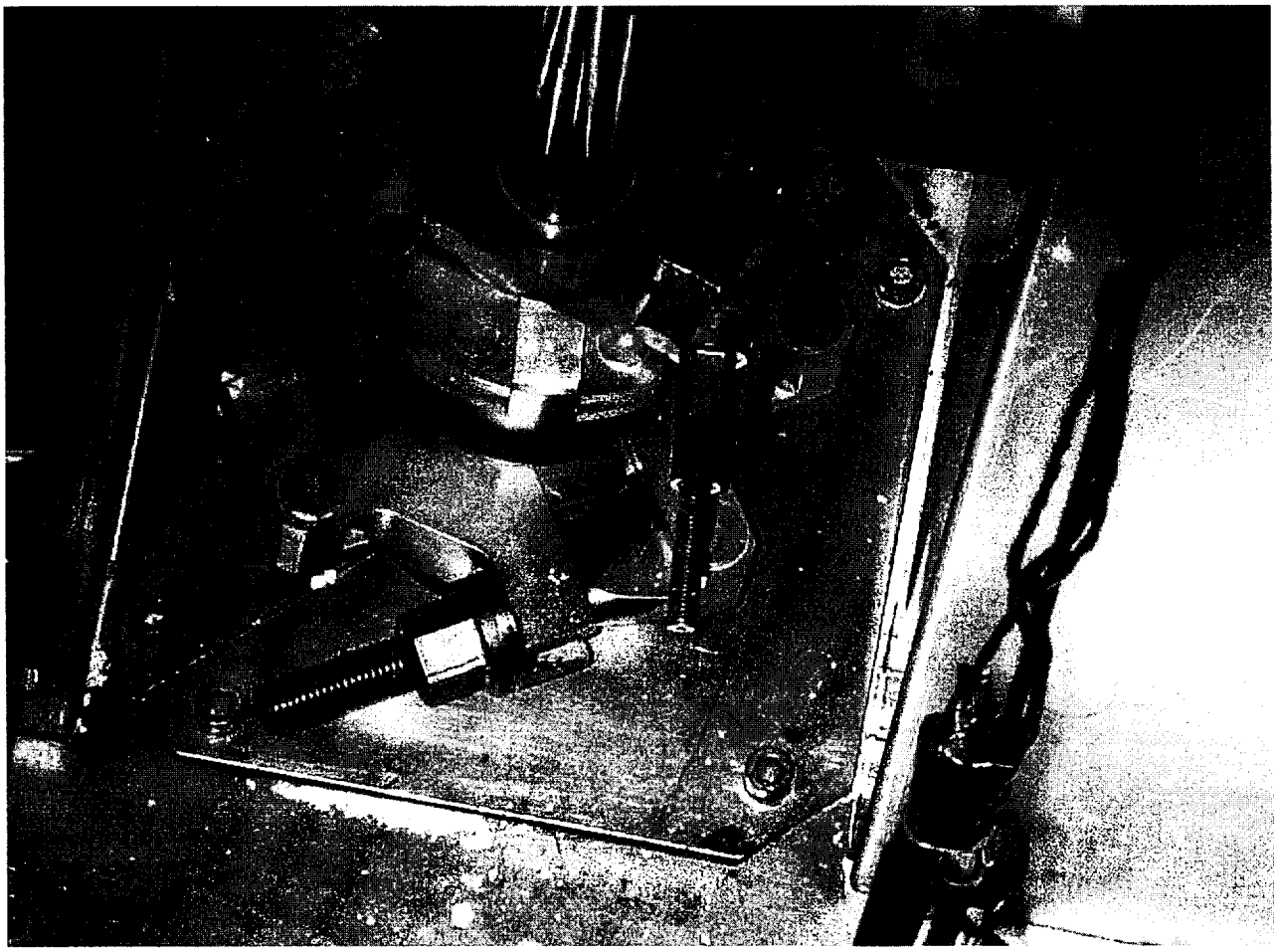

Photo taken during subsequent forced outage on April 5, 2002
(showing no evidence of active leakage)