FENOC
FirstEnergy Nuclear Operating Company

Beaver Valley Power Station
P.O. Box 4
Shippingport, PA 15077-0004

Lew W. Myers
Senior Vice President

724-682-5234
Fax: 724-643-8069

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L-01-097

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
ISI (Inservice Inspection) Program
Response to RAI and Revised Relief Request

On February 6, 2001 Relief Request 1-TYP-3-B5.70-1, Revision 1 was submitted, applicable to the Ten-Year ISI Program at BVPS Unit 1. The subsequent NRC review resulted in a Request for Additional Information (RAI). This submittal provides a response to the RAI questions and a revision to the relief request in order that the NRC review/approval process can be completed. Attachment 1 contains the RAI questions and the BVPS response. Revised Relief Request 1-TYP-3-B5.70-1, Revision 2 is enclosed as Attachment 2.

The NRC response to this request for relief is requested prior to August 1, 2001, which is the end of the First Period of the Third Interval for BVPS Unit 1.

If you have any questions regarding this submittal, please contact Mr. Thomas S. Cosgrove, Manager, Regulatory Affairs at 724-682-5203.

Sincerely,

Robert E. Donnellan
FOR
Lew W. Myers

Attachment 1 Response to Request for Additional Information on BV-1 Relief Request 1-TYP-3-B5.70-1, Revision 1 submitted on February 6, 2001

Attachment 2 Relief Request 1-TYP-3-B5.70-1, Revision 2

c: Mr. L. J. Burkhart, Project Manager
Mr. D. M. Kern, Sr. Resident Inspector
Mr. H. J. Miller, NRC Region I Administrator

A047

Attachment 1

Response to Request for Additional Information on

BV-1 Relief request 1-TYP-3-B5.70-1, Rev. 1 submitted on February 6, 2001

Question 2.1:

List the obtained coverage for each specific weld and any significant indications. For welds not examined for the third interval yet, submit relief after the examinations have been performed.

Response:

The following welds have been examined to date in the third interval:

1. DLW-LOOP1-2-F04 — Examined on 10/20/97 – limited examination – approximately 51.8% of required volume examined – no recorded indications

2. DLW-LOOP1-3-F05 — Examined on 10/20/97 – limited examination – approximately 51.8% of the required volume examined – no recorded indications

Attachment 2 provides a revised relief request which only addresses the above two welds which have been examined during the third interval. Additional relief requests will be submitted if warranted for future weld examination limitations.

Question 2.2:

What is the reason for the examination coverage change? Please provide the reasoning and documentation for the current credited examination coverage being lower than previous examinations. The submittal stated that the limitations are documented in the most recent examination reports. Please provide documentation on the limitations and explain the current methods used to calculate coverage. Discuss and compare the changes in limitations and coverage calculations from previous intervals.

Response:

Graphical representations of the examination areas covered are provided in Figures 2 and 3 for axial scans and Figures 4 and 5 for circumferential scans. The principal coverage limitation for these welds is in the axial scan direction 2 scan (no coverage in scan direction 2 from the channel head side due to head curvature). This limitation has always been identified during examinations. Both changes in calculated coverage were the result of search unit contact limitations identified in the circumferential scans (directions 3 & 4) performed in 1997. Previous examinations did not identify limitations for the circumferential scanning directions. The limiting condition documented in 1997 is the proximity of the channel head curvature, which limits the ability of the relatively large contoured dual element search unit to make contact on the channel head side(s) of the weld(s). This causes search unit "lift-off". (See figure 6). The same search unit design has been used to examine these welds since 1984, so the loss of contact documented on the examination report was based on the experience of the examiner(s) performing the examinations.

The identified circumferential scan limitations are believed to be the result of differences in examiner technique. Past experience in the examination of this weld configuration has shown that large contoured

search units require much more couplant than smaller search units. Liberal application of couplant can often overcome some of the surface irregularities that cause loss of contact. In the most recent examinations, the examiner felt that there was a sufficient loss of contact to result in a limitation, which was identified on the examination report.

The following Examination Coverage Calculation method for calculating coverage for weld configurations has been used at Beaver Valley Power Station since March 1998. The volumetric examination coverage for piping welds is calculated based on the area of a two-dimensional cross-section of the weld and adjacent material obtained through UT profiling and design drawings. These coverage percentages are input into a calculation to determine volumetric examination coverage. Each of the four scan directions is given an equal value for overall coverage in the following manner:

- Scan direction 1 = axial scan from the datum point side of the weld (usually upstream)
- Scan direction 2 = axial scan from the opposite side of the weld (usually downstream)
- Scan direction 3 = clockwise circumferential scan (facing direction of flow)
- Scan direction 4 = counterclockwise circumferential scan

In both of these cases, the following limitations were identified:

- Scan direction 1 (axial scan from elbow) – complete coverage 100%
- Scan direction 2 (axial scan from channel head) – no coverage 0%
- Scan direction 3 (cw circumferential scan) – limited coverage 55%
- Scan direction 4 (ccw circumferential scan) – limited coverage 55%

Summing the above coverage for each scan direction results in 210% covered out of possible "400%" (210 / 400). Therefore, 52.5% coverage is obtained using the current coverage calculation methodology.

Question 2.3:

What assurance is provided that a significant flaw would be detected with the limited UT coverage?

Response:

The refracted longitudinal wave ultrasonic technique employed for these examinations has been demonstrated to be the most effective technique for the examination of austenitic welds joining cast stainless steel components. The ultrasonic examination procedure used to perform the examinations was qualified on the Westinghouse Owner's group crack specimens and has demonstrated the ability to detect significant flaws in welds joining cast stainless components.

The principal coverage limitation is in the axial scan direction 2 examination from the nozzle side of the weld. The axial scan from the fitting side would detect significant circumferentially oriented flaws within

the required examination volume. The newly identified circumferential scan limitation is based on limited coverage of the inside diameter (ID) surface on the nozzle side of the weld (Illustrated in Figure 2). Shallow, inside diameter axially oriented flaws on the nozzle side of the required volume may not be detected, however the probability of detection of such hypothetical flaws would increase significantly if they grew to significant through-wall dimension, because through-wall growth would also result in a corresponding increase in flaw length. Surface examinations (liquid penetrant) are also performed on these welds at the same frequency as the volumetric UT examination.

Question 2.4:

What is the weld configuration? (include base materials and weld in the diagrams)

Response:

The weld configuration and materials shown in Figure 1 are derived from fabrication drawings and ultrasonic profiling. The welds are 308L filler material joining A351 Grade CF8M cast stainless steel elbows to A216 Grade WCC steam generator channel heads. The channel heads are clad with 309L/308L stainless steel and the weld – deposited safe-ends are made with 309L/308L stainless steel material.

Question 2.5:

What prevents examining these welds from the ID?

Response:

The welds are only physically accessible for a brief period of time during refueling outages prior to installation of the nozzle dams used to facilitate steam generator tubing examinations. High radiation dose considerations preclude manual UT examination from the ID surface. Additionally, there are currently no qualified robotic delivery systems or examination techniques to perform volumetric examination of these weld configurations from the inside diameter surface.

Beaver Valley Power Station Unit 1 Steam Generator Channel head to Elbow Weld Configuration (Typical)

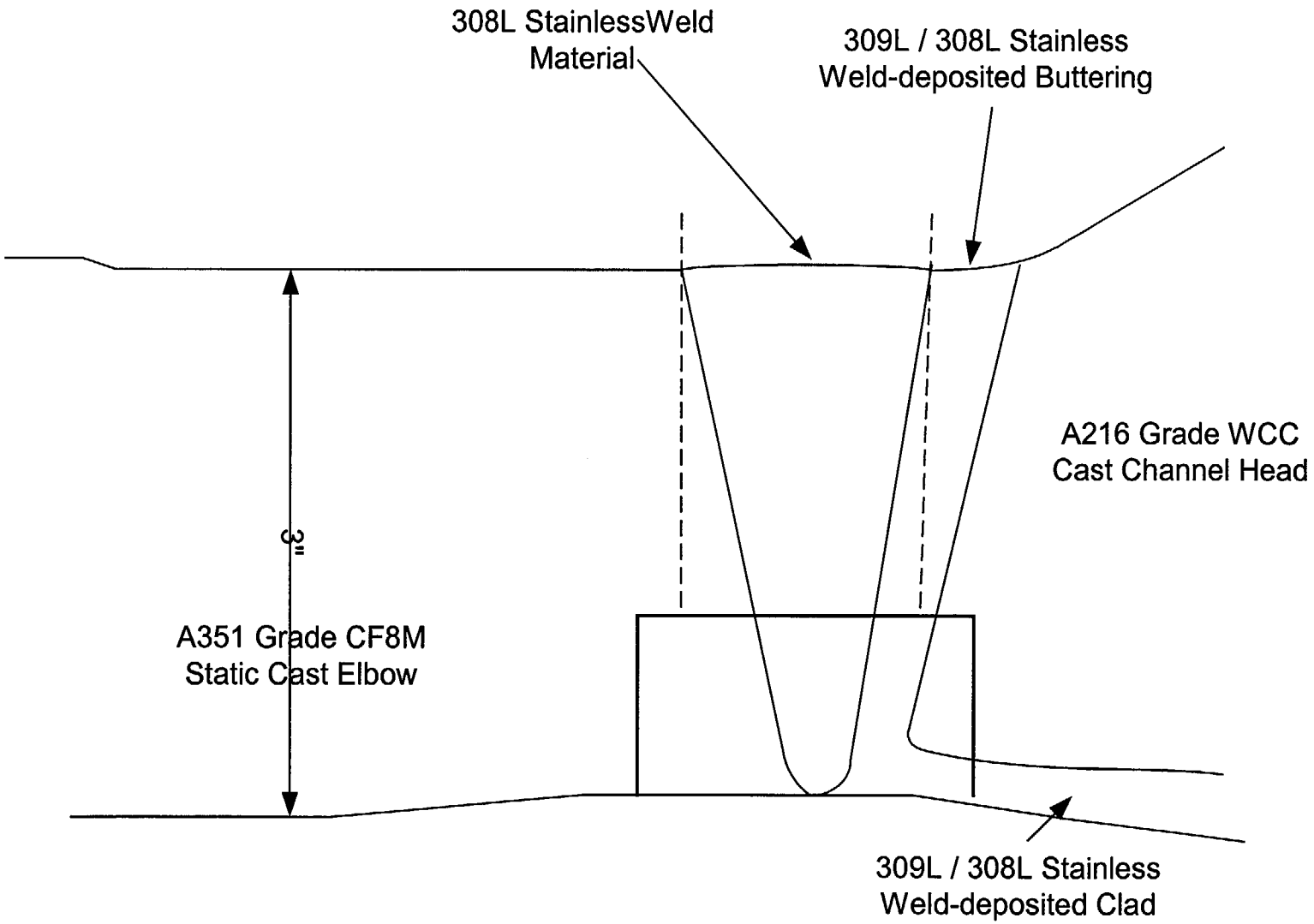

Figure 1

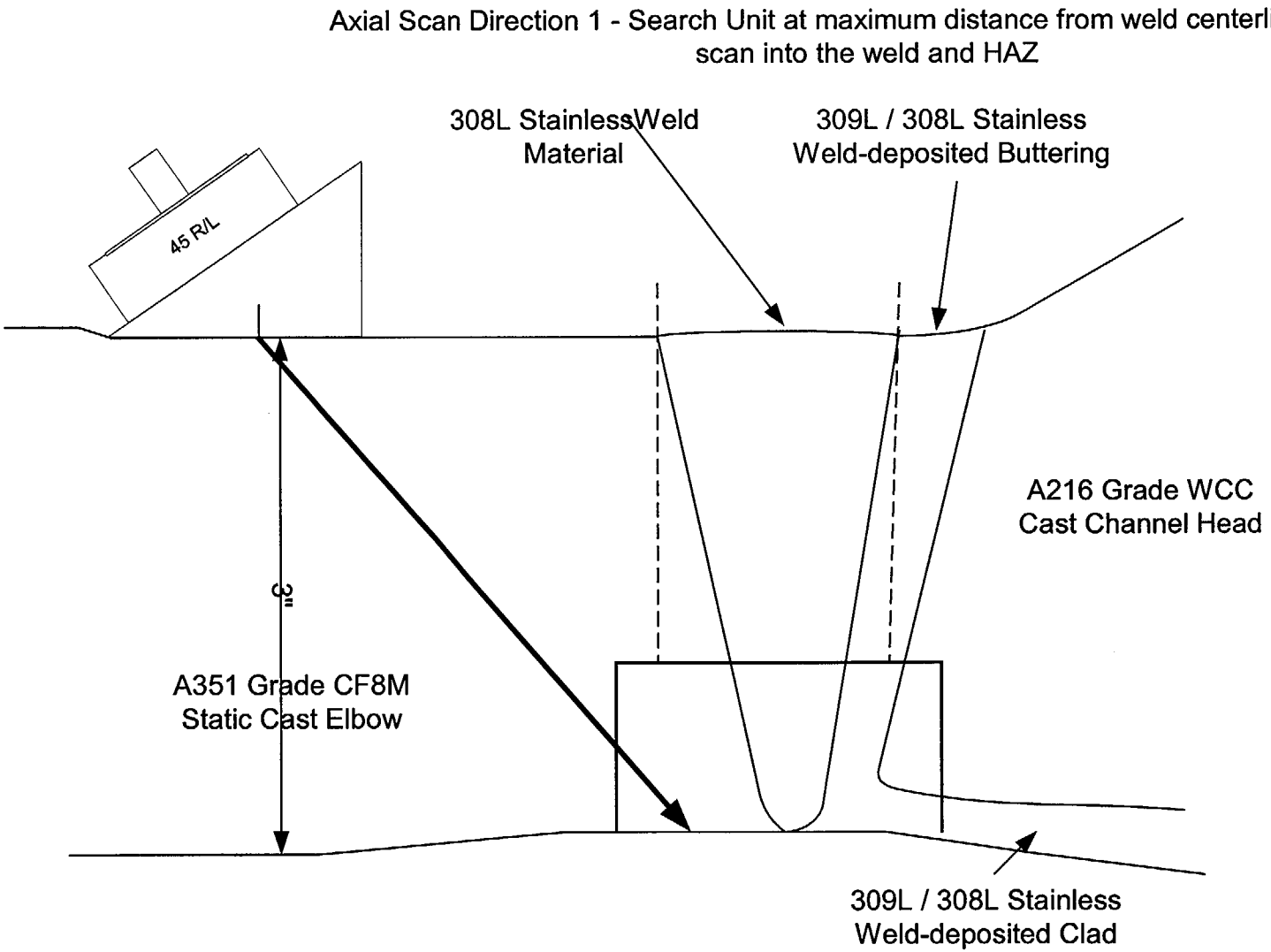
Axial Scan Direction 1 - Search Unit at maximum distance from weld centerline - raster scan into the weld and HAZ
308L Stainless Weld Material
309L / 308L Stainless Weld-deposited Buttering
45 R/L
A216 Grade WCC Cast Channel Head
≥t
A351 Grade CF8M Static Cast Elbow
309L / 308L Stainless Weld-deposited Clad

Figure 2

Axial Scan Direction 1 - search unit moved across weld - toward channel head

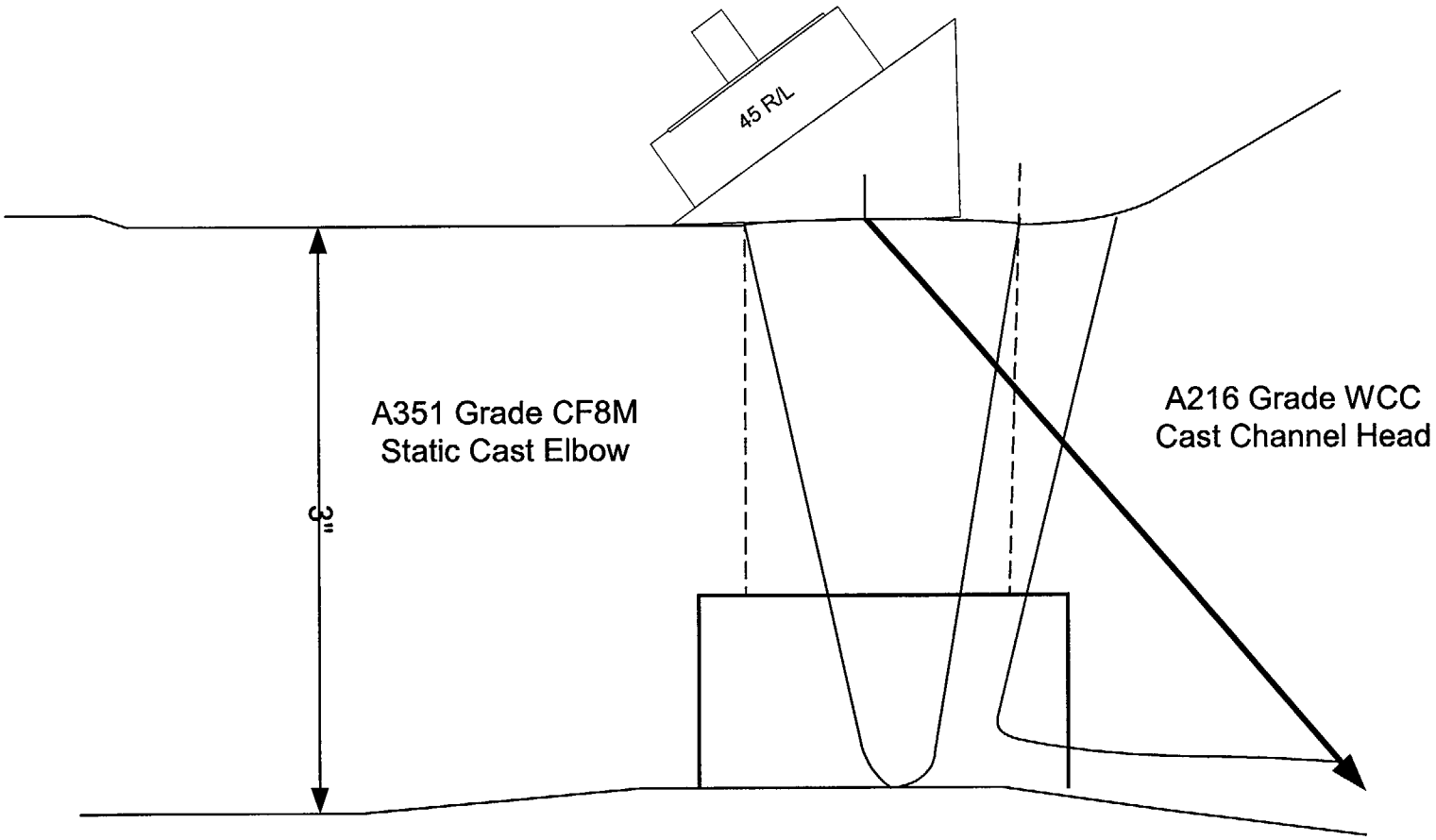

Figure 3

Circumferential Scan directions 3 & 4 - dual element contoured wedges scanned adjacent to and on the weld surface

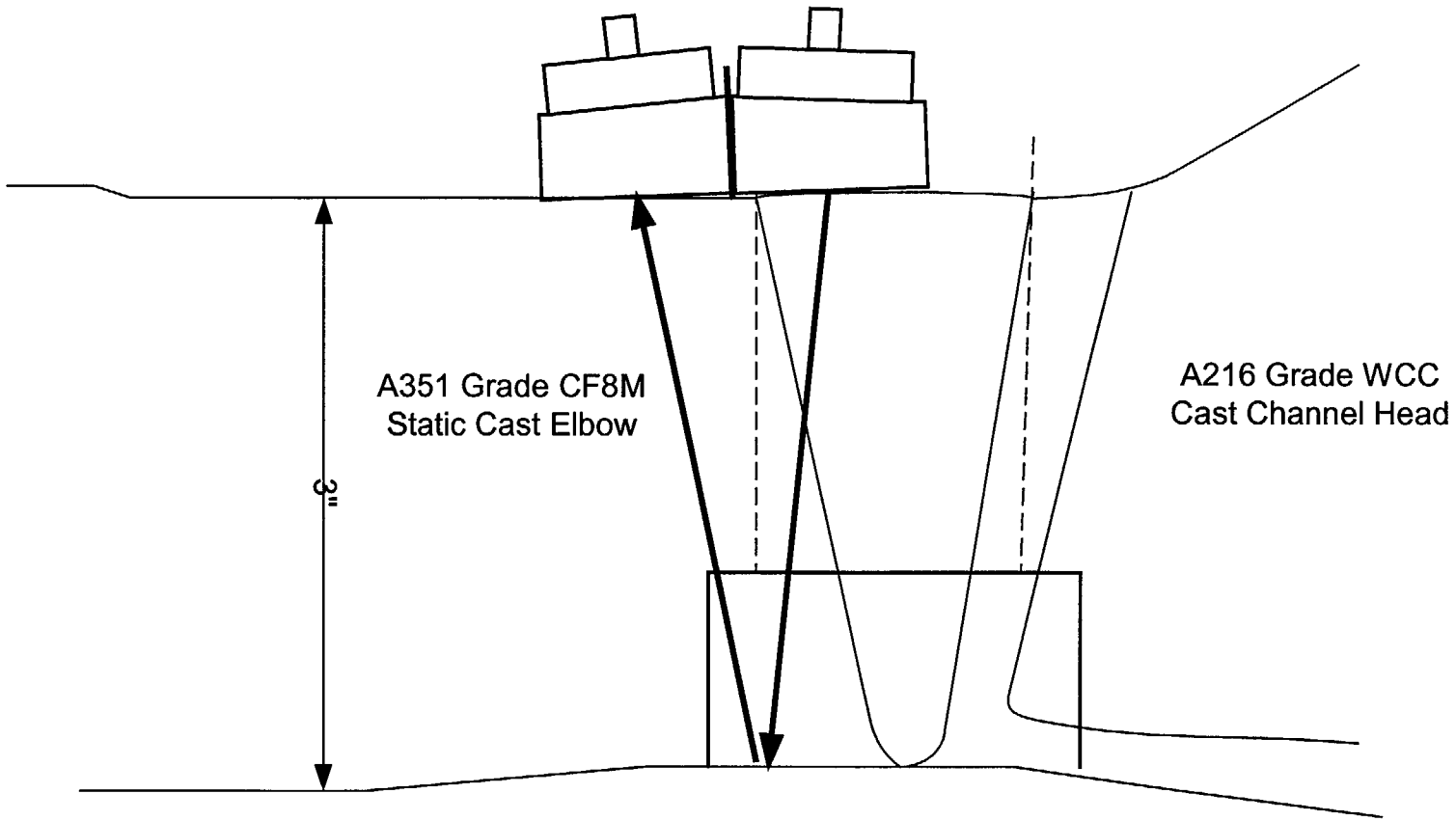

Figure 4

Circumferential scan directions 3 & 4 - scan coverage shown with contoured search unit on the weld at the point where loss of contact due to curvature starts.

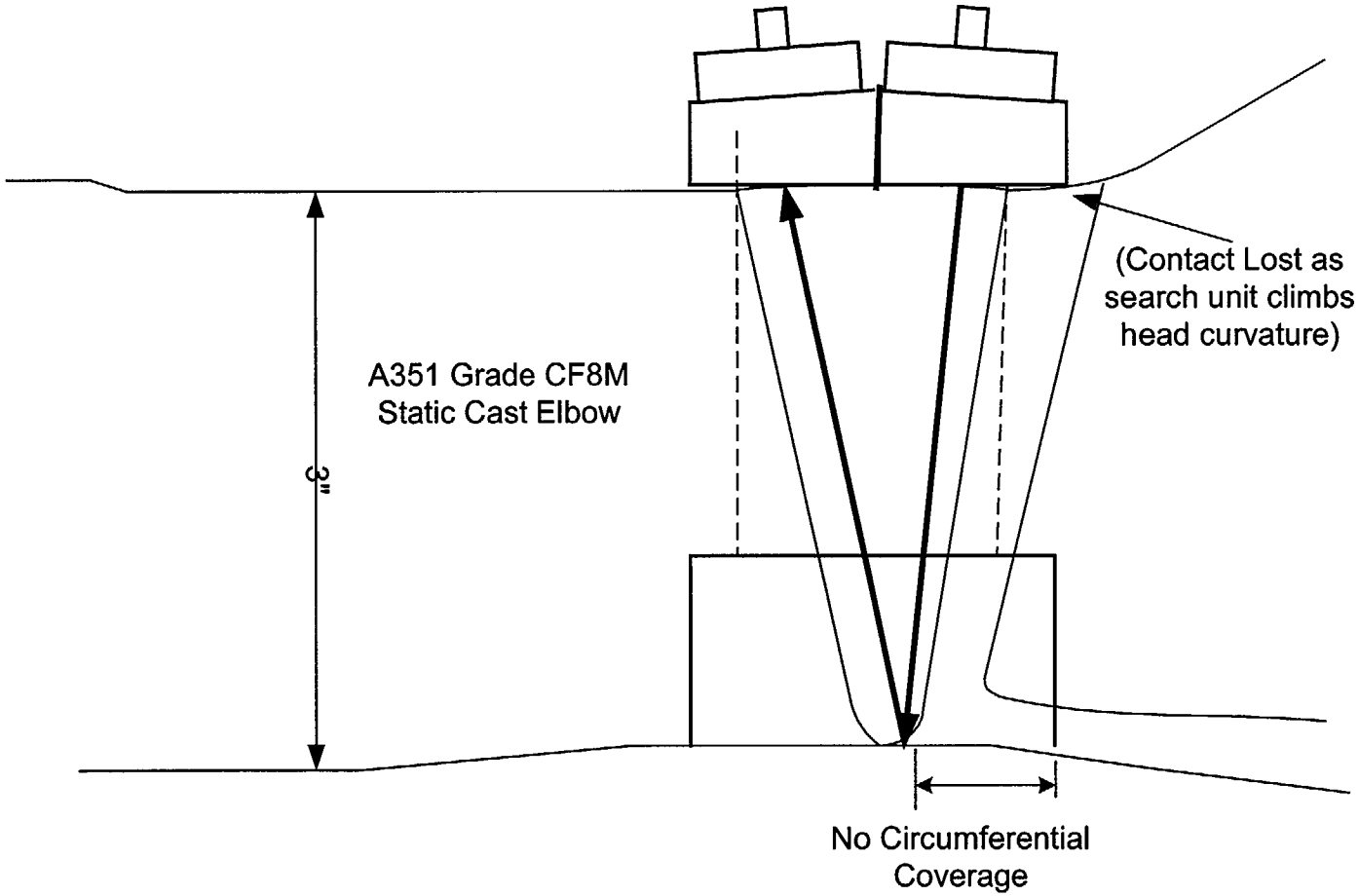

Figure 5

Circumferential Scan directions 3 & 4 - Search unit contact lost when the search unit climbs the channel head curvature

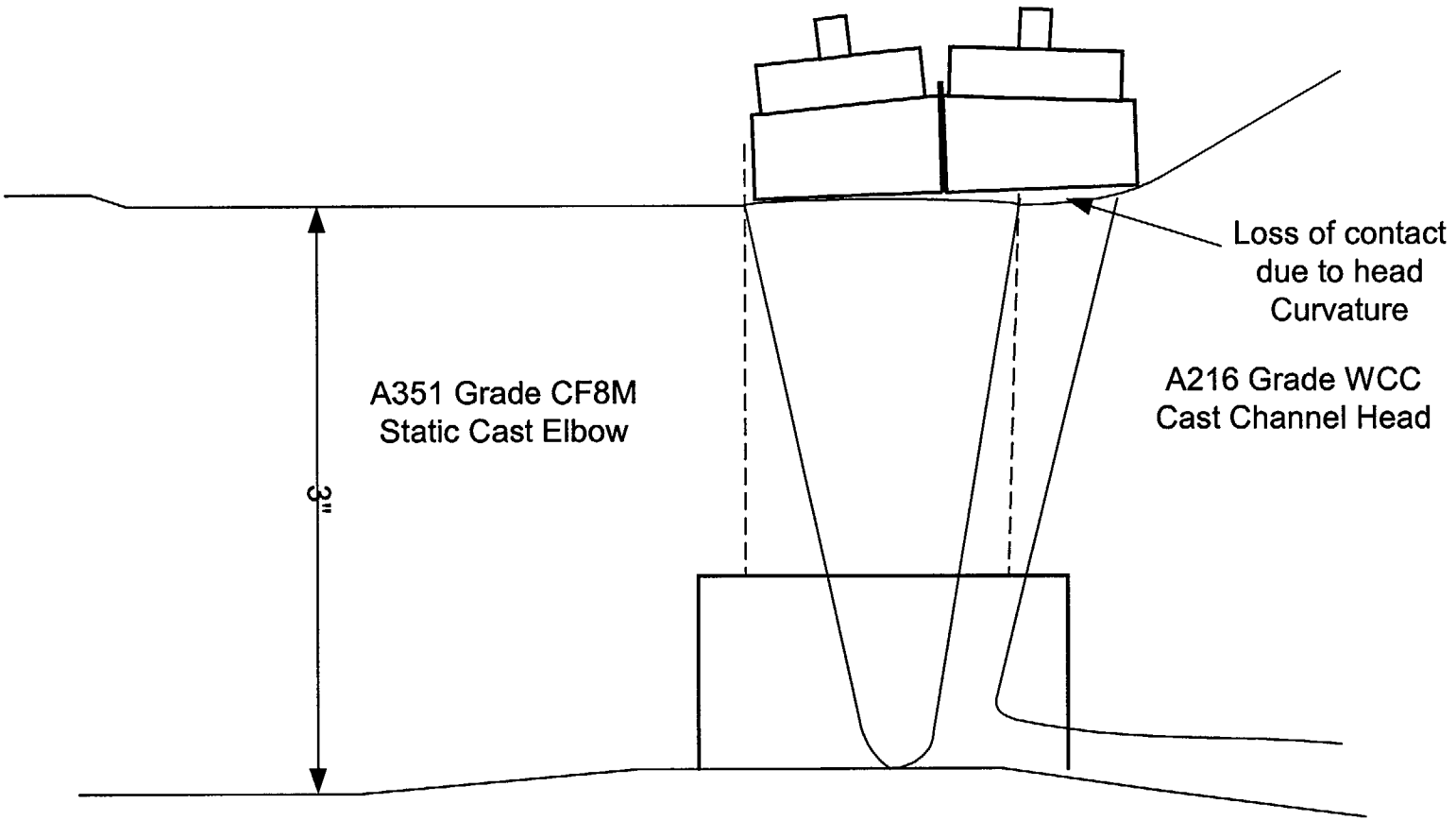

Figure 6

Attachment 2

Beaver Valley Power Station Unit No. 1

RELIEF REQUEST NO. 1-TYP-3-B5.70-1, Rev. 2

COMPONENT

Steam Generator Nozzle Safe End to Pipe Welds:

DLW-LOOP1-2-F-04 DLW-LOOP1-3-F-05

DRAWING NO.

ISI-L-001A

ASME CODE (1989 Edition) / REGULATORY REQUIREMENTS

Item No. B5.70 (IWB-2500-1, Category B-F) requires a surface and volumetric examination.

RELIEF REQUESTED

In accordance with 10CFR50.55a(g)(5)(iii), relief is requested from the Code examination coverage requirements on the basis that compliance with the Code requirement is impractical due to component geometry limitations.

BASIS OF RELIEF

The Steam Generator nozzle to safe end welds are austenitic welds that connect the nozzles to loop piping elbows. The as-cast surface and taper of the nozzle precludes examination from the nozzle side of the weld. Ultrasonic examinations can be performed on the surface of the welds. The opposite sides of the welds are both A351 Grade CF8M cast elbows, machined for a distance of approximately 3 inches from the surface edge of the welds.

Two sets of (axially and circumferentially) contoured 45 degree, side-by-side, refracted longitudinal wave search units were used to perform the examinations.

Previous examinations identified a limitation in axial scan direction 1 due to the distance from the weld to the edge of the machined surface on the elbow. This reported limitation may have been conservatively calculated. Subsequent examinations and plots on the profiled weld area have shown that this distance is adequate to attain coverage of the required volume in axial scan direction 1. Ultrasonic examinations performed during the current (3rd) Inspection Interval on the two welds resulted in complete coverage in axial scan direction 1, no coverage in axial scan direction 2 and a newly identified limitation that resulted in 55% coverage in both circumferential scan directions 3 and 4. This results in a total coverage of approximately 52% of the required volume. This limitation is illustrated in Figure 1.

ALTERNATIVE EXAMINATION

The alternative to the examination requirement will be to use the completed surface examination and the completed ultrasonic examination that were performed to the maximum extent possible. The percentage of the required examination volume that was limited was recorded on the examination report and in the outage summary report.

Notes: Revision 0 of this Relief Request estimated the expected UT coverage for these welds to be approximately 70% based on previous examinations performed in the first and second Inspection Intervals. Subsequent calculations have shown the basis for this request may have been conservative. The NRC Safety Evaluation dated 12/29/98 approved revision 0 of this request, but required submittal of a new request for relief if the Third Inspection Interval examinations resulted in less volumetric coverage than estimated.

Revision 1 of this Relief Request submitted on February 1, 2001 resulted in a Request for Additional Information. Based on research performed to provide the additional information, it was determined that another revision of this relief request was necessary to further clarify the reason for the submittal, and to remove the other similarly configured welds from the Relief Request since they have not yet been inspected in this current Interval.

Circumferential Scan directions 3 & 4 - Search unit contact lost when the search unit climbs the channel head curvature

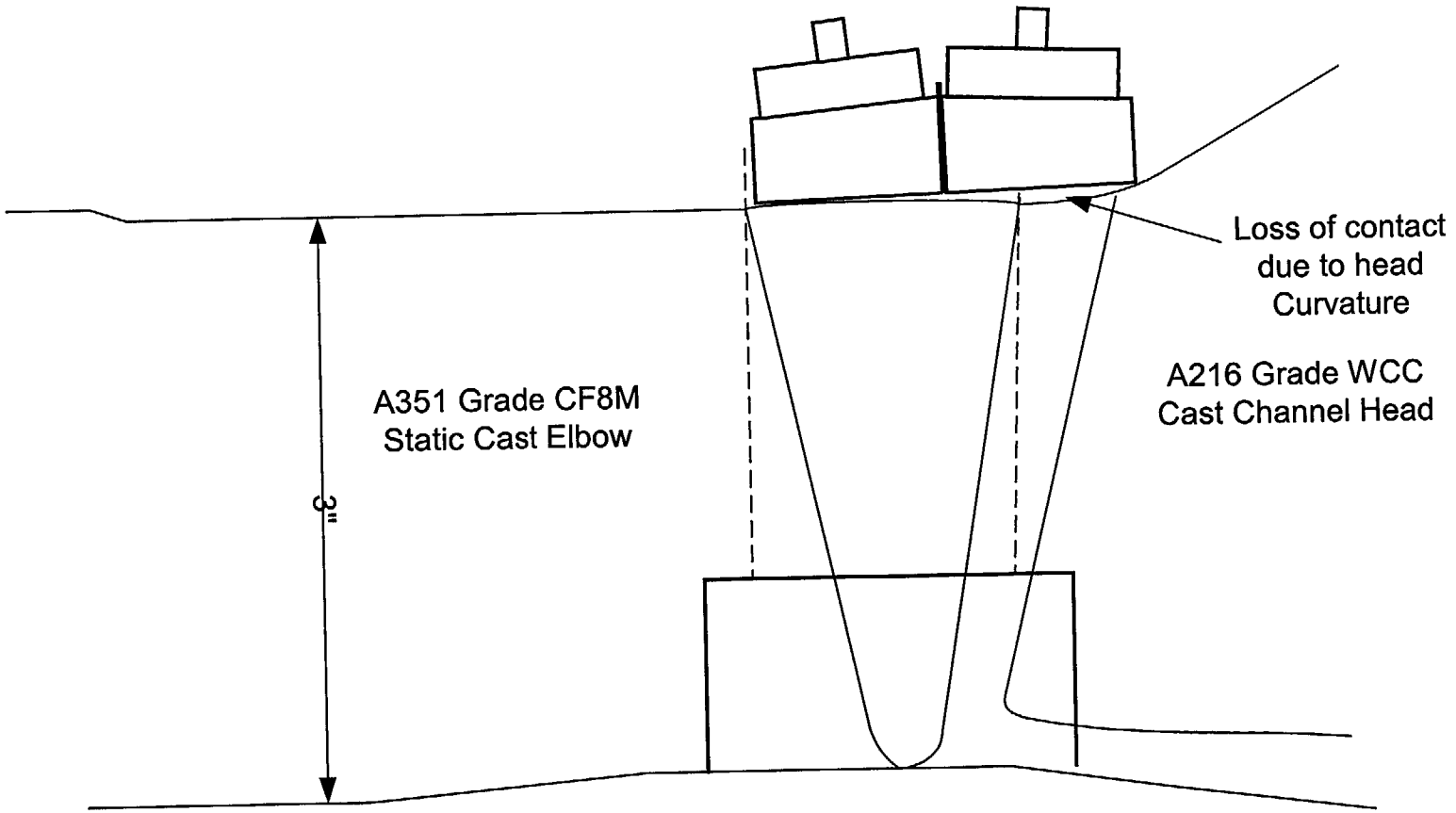

Figure 1