Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

February 27, 2013

10 CFR 50.4
10CFR 50.55a

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Browns Ferry Nuclear Plant, Unit 2
Renewed Facility Operating License No. DPR-52
NRC Docket No. 50-260

Subject: **Response to Request for Additional Information Regarding Relief Request 2-ISI-28 (TAC NO. ME8779)**

References:

1. Letter from TVA to NRC, "American Society of Mechanical Engineers, Section XI Code, Inservice Inspection Program for the Unit 2 Third Ten-Year Inspection Interval, Request for Relief 2-ISI-28," dated May 24, 2012

2. Letter from NRC to TVA, "Browns Ferry Nuclear Plant, Unit 2 - Request for Additional Information Regarding Relief Request 2-ISI-28 (TAC NO. ME8779)," dated November 2, 2012 (ADAMS No. ML12306A352)

On May 24, 2012, the Tennessee Valley Authority (TVA) submitted "American Society of Mechanical Engineers, Section XI Code, Inservice Inspection Program for the Unit 2 Third Ten-Year Inspection Interval, Request for Relief 2-ISI-28 (Reference 1). By NRC letter dated November 2, 2012 (Reference 2), TVA received a Request for Additional Information (RAI) regarding Relief Request 2-ISI-28 for Browns Ferry Nuclear Plant (BFN) Unit 2. The NRC requested the response within 90 days from the date of issuance. Per email dated January 30, 2013, TVA requested and was granted a 21-day extension for the response to the RAI letter. Per email dated February 15, 2013, TVA requested and was granted a 7-day extension for the response to the RAI letter. Therefore, the response is due 118 days from date of issuance, i.e., by February 27, 2013.

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NRR

The enclosure to this letter provides the TVA response to the NRC RAI letter.

This letter does not include any new regulatory commitments. Please direct any questions concerning this matter to Tom Hess at (423) 751-3487.

Respectfully,

for

J. W. Shea
Vice President, Nuclear Licensing

Enclosure:

TVA Response to NRC Request for Information

cc: (Enclosure):

NRC Regional Administrator – Region II
NRC Senior Resident Inspector – Browns Ferry Nuclear Plant
Alabama State Department of Public Health

Response to Request for Additional Information Regarding Relief Request 2-ISI-28

TVA Response to NRC Request for Information

NRC Request for Additional Information Question 1

The Table on page E-6 indicates that the request is for two welds. For each sketch provided, identify the weld(s) that relief is being requested by using standard American Welding Society weld symbols pointing to each weld face to identify that weld. If a weld face contains more than one weld designation, identify this on each sketch

TVA Response

Request for Relief 2-ISI-28 requests relief from weld examination coverage requirements for one reactor pressure vessel nozzle-to-vessel full penetration weld and nozzle inside radius section. Attachment 1 shows the nozzle to vessel weld (N10-NV), including the requested weld symbols. A built up pad machined to form a socket for connection of Standby Liquid Control (SLC) piping is present on the inner radius of the nozzle forging. Details of the inner radius configuration are provided in Attachment 2.

NRC Request for Additional Information Question 2

Identify the American Society of Mechanical Engineers material designation for each part of each weld. If a material is clad with Stainless Steel or other metal, clearly identify that material.

TVA Response

The SLC nozzle is located in the lower head upper segment of the bottom head assembly. The SLC nozzle forging is fabricated from ASTM A 508, Class 2 manganese-molybdenum steel conforming to ASME Code Case 1332-2 and welded to the lower head using E9016-G. The lower head upper segment is clad with E309L.

NRC Request for Additional Information Question 3

Provide specific details of the basis that 100 percent ultrasonic testing cannot be accomplished, such as the specific design and the conditions that prevent the welds from being examined 100 percent by the ultrasonic testing technique.

TVA Response

Specifically, the limitations are due to the radius of curvature in the transition area between the nozzle and the vessel shell, and geometric design configurations limiting access to a single side of the weld. In order to meet the Code requirements, the nozzles and/or subject vessels would have to be modified to facilitate access for ultrasonic search units.

NRC Request for Additional Information Question 4

Address whether any indications, detected on the RPV nozzle-to-vessel welds, were evaluated to be either relevant or nonrelevant indications. If any indications were detected, discuss the disposition of these indications.

TVA Response

There were no recordable indications identified during the inspection of Welds N10-NV and N10-IR.

NRC Request for Additional Information Question 5

Address how the coverage for the N10-IR inner radius examination was calculated. Provide a coverage map showing the areas that were missed.

TVA Response

Modeling report IR-2004-43 was developed by the EPRI NDE Center. The essential geometric parameters of the Browns Ferry Standby Liquid Control nozzle and the qualified procedure essential variables were input into the EPRI software to calculate the coverage obtained. Attachment 3 provides the coverage map for the limited volume of coverage.

NRC Request for Additional Information Question 6

From the Coverage Data Sheets (CDSs), CDS-01 shows that the 60-degree probe can approach very close to the edge of the fillet. In CDS-02, the drawing shows that the 50-degree probe stops much earlier and the line labeled "50°" appears to be drawn with an angle of 60 degrees. Provide a drawing that shows the regions inspected by the 50-and 60-degree probes.

TVA Response

The area of limitation, calculated in CDS-01, is based on the index point of the 60 degree transducer, when the front (nose) is butted up against the outside nozzle radius. The index point location, in this case, can be marked by the extrapolation of the dashed arrow that is depicted exiting the Code Required Volume of Coverage (CRV). Note that the solid arrow that points to the vessel toe of the outside radius is for reference only, and does not apply to the transducer exit point, nor was used in the calculation of the achieved volume. The depiction of transducer angles presented in CDS-02 are representative of the compound angles of skew (+/- 13 to 40 degrees) coupled with the angle of propagation (50 degree shear) within the material, at the minimum and maximum radial transducer positions. This results in a parallax. However, the two-dimensional (single-slice) drawing depicts that the 50 degree shear transducer at the maximum radial position with a skew of +/- 40 degrees strikes the ID at the outer limit (vessel side of weld) of the CRV. Likewise, the 50 degree shear transducer at the minimum radial position with a skew of +/- 13 degrees strikes the ID at the inner limit (nozzle side of weld) of the CRV. Modeling report IR-2003-31 was developed by the EPRI NDE Center utilizing modeling software. The essential geometric parameters of the Browns Ferry Standby Liquid Control nozzle and the qualified procedure essential variables were input into the software to calculate the coverage obtained. The coverage plot on CDS-02 combines the

details of the modeling report IR-2003-31, Figure 2-4 and Figure 2-5, for the calculation of the extent of circumferential coverage.

NRC Request for Additional Information Question 7

In CDS-02, showing the circumferential examination for axial flaws, the drawing appears to show that the weld was inspected using a 50-and 60-degree skew. This drawing appears to be a drawing of the axial inspection. Please verify the skew angles used to calculate the coverage of the circumferential examination.

TVA Response

The depiction in CDS-02 uses compound angles (incident angle plus skew angles) resulting in a parallax, as rendered in the two-dimensional drawing. However, the skew angles used for the 50 degree shear transducer were +/- 13 degrees to +/- 40 degrees, which results in a maximum misorientation angle of 0 degrees (perpendicular to an axial flaw), for the circumferential exam. CDS-02 is correctly identified as circumferential exam coverage.

NRC Request for Additional Information Question 8

For Weld N10-NV, the calculation for circumferential ultrasonic examination coverage gives a higher weight to the lower 15 percent than the upper 85 percent. From the CDSs, it appears that the Composite Axial plus Circumferential Coverage is 81.7 percent, not 86.2 percent. Confirm that the Composite Axial plus Circumferential Coverage is 86.2 percent. If not, address the discrepancy.

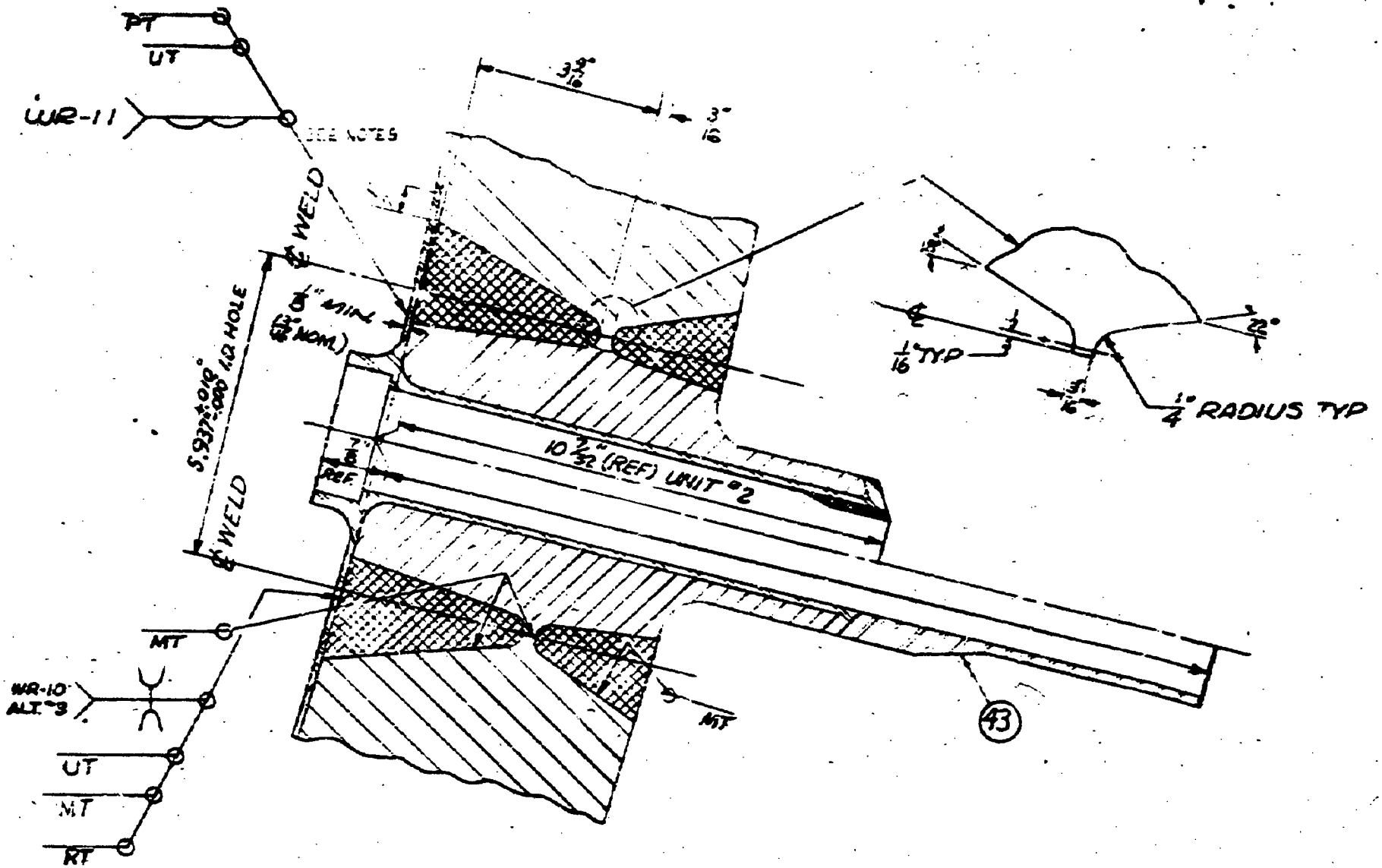
TVA Response

The correct value of the Composite Axial plus Circumferential Coverage is 81.7 percent. The calculation in the examination report determined the percentage of coverage obtained. But, during calculation of the circumferential coverage of the upper 85% of thickness (T), the calculation did not include the appropriate weighting factor of 85% (0.85). The value should have been multiplied by 85% (0.85) prior to composite. This error has been entered into TVA's Corrective Action Program.

ATTACHMENTS:

1. Detail B, Drawing 122858E-11, Lower Head Upper Segment Drawing
2. Detail B, Drawing 151863E, Modification of 2" Liquid Control Nozzle
3. IR 2004-43, Figures 4 and 5

Attachment 1
Detail B, Drawing 122858E-11, Lower Head Upper Segment Drawing



DETAIL B
SCALE : 6"-1'-0"

Attachment 2
Detail B, Drawing 151863E, Modification of 2" Liquid Control Nozzle

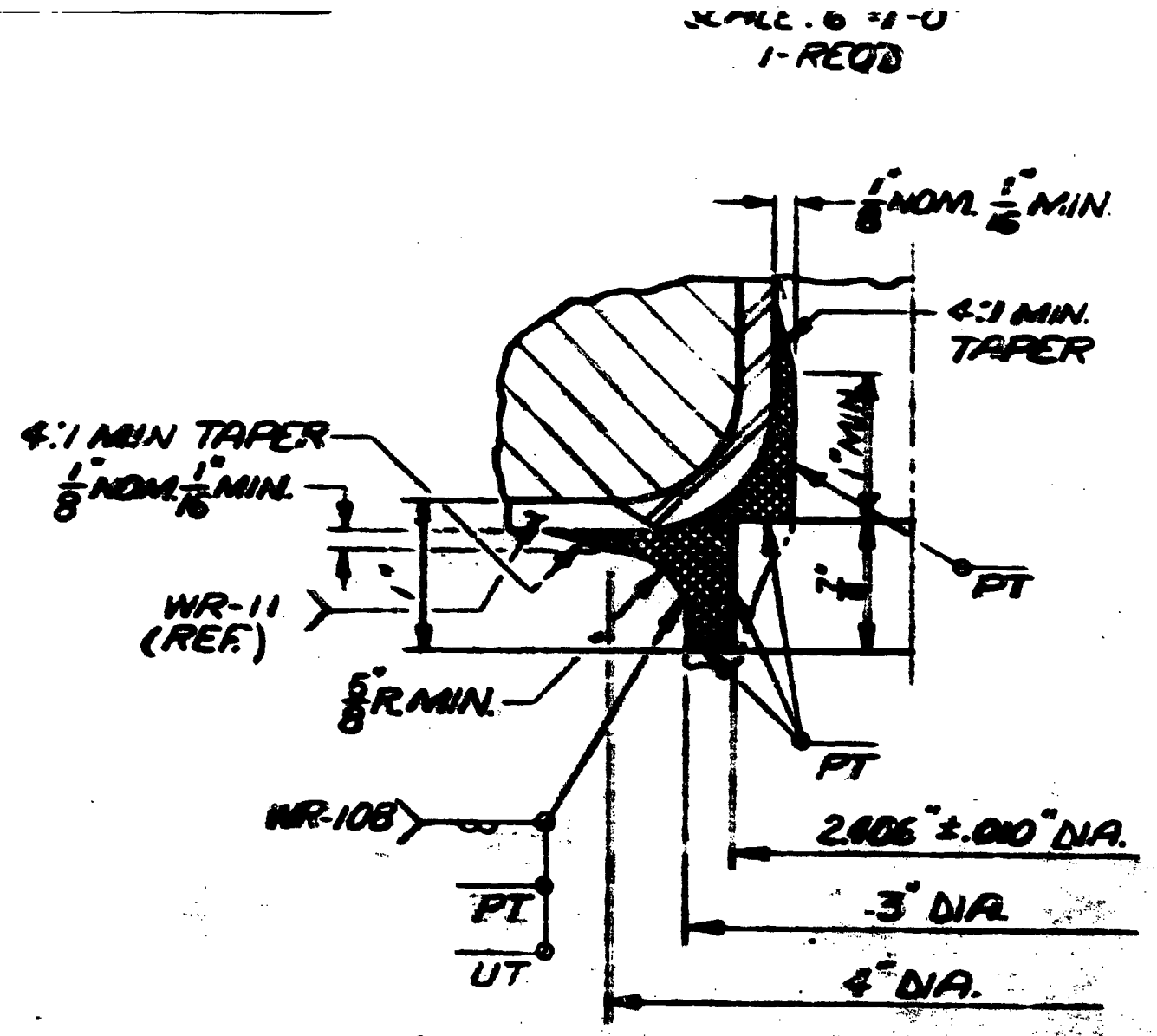


Figure 4 shows the minimum and maximum probe radial positions and the portion of the examination volume covered by the vessel shell detection technique, 70/(2 to 23)v, for probes scanned at the azimuth angle of 0°.

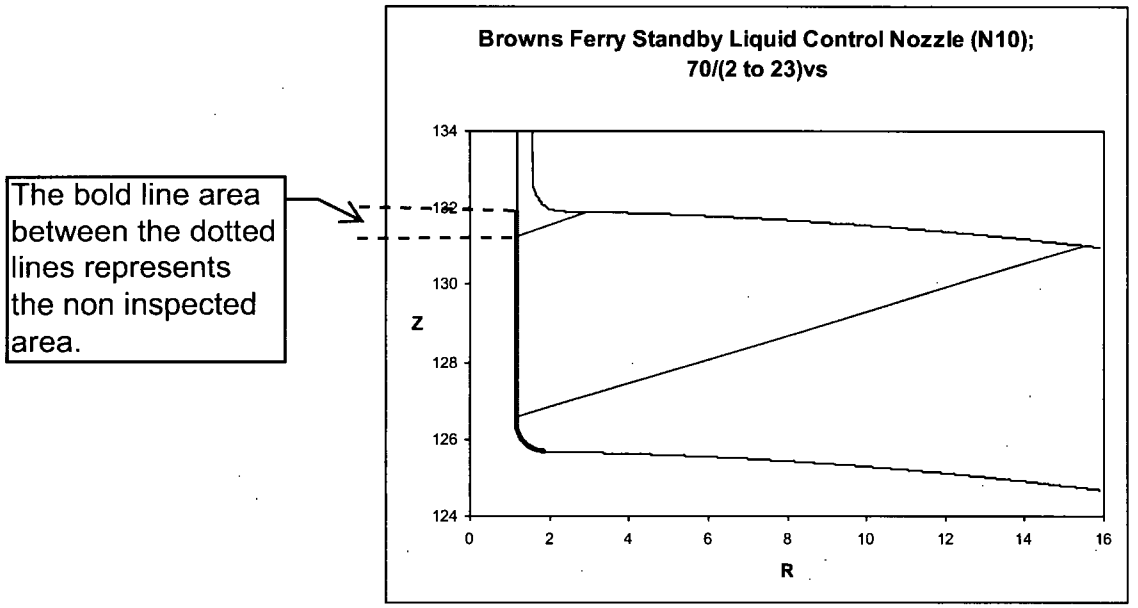


Figure 4. Browns Ferry Standby Liquid Control Nozzle (N10): Probe Scan Limits and Examination Coverage for Vessel Shell Detection Technique, 70/(2 to 23)v.

Figure 5 shows the minimum and maximum probe radial positions and the portion of the examination volume covered by the vessel shell detection technique, 65/(1 to 10)v, for probes scanned at the azimuth angle of 0°.

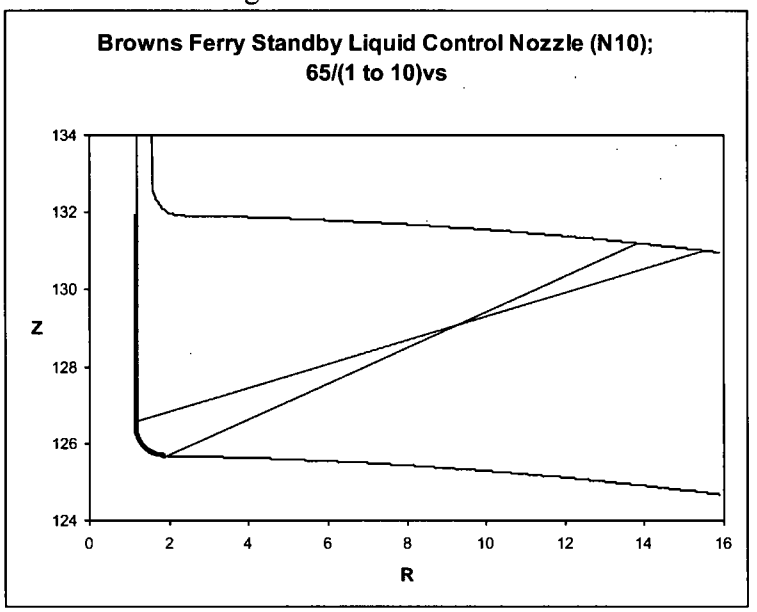


Figure 5. Browns Ferry Standby Liquid Control Nozzle (N10): Probe Scan Limits and Examination Coverage for Vessel Shell Detection Technique, 65/(1 to 10)v.