Omaha Public Power District

444 South 16th Street Mall
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January 14, 2005
LIC-05-0008

U. S. Nuclear Regulatory Commission
Attn.: Document Control Desk
Washington, D.C. 20555

References:
1. Docket No. 50-285
2. Letter from OPPD (R. T. Ridenoure) to NRC (Document Control Desk) dated May 20, 2004, "Revised Relief Request for Examinations with less than 100% ASME Code Coverage for the Third 10-Year Interval" (LIC-04-0065)
3. Letter from NRC (A. B. Wang) to OPPD (R. T. Ridenoure) dated October 5, 2004, "Fort Calhoun Station, Unit No. 1 - Request for Additional Information on Relief Requests Related to Examinations with less than 100% ASME Code Coverage for the Third 10-Year Interval" (TAC No. MC3220) (NRC-04-0123)

SUBJECT: Response to Request for Additional Information on Relief Requests Related to Examinations with less than 100% ASME Code Coverage for the Third 10-Year Interval" (TAC No. MC3220)

Attachment 1 of this letter provides the Omaha Public Power District (OPPD) response to the NRC requests contained in Reference 3. Attachment 2 provides details associated with weld RPV-SC-C-11.

No commitments to the NRC are made in this letter.

If you require additional information, please contact Thomas C. Matthews at (402) 533-6938.

Sincerely,

D. J. Bannister
Manager – Fort Calhoun Station

TCM/tcm

Attachments:

1. OPPD Response to Request for Additional Information on Relief Requests Related to Examinations with less than 100% ASME Code Coverage for the Third 10-Year Interval"

2. Details of automated scan plan for reactor pressure weld RPV-SC-C-11

OPPD Response to Request for Additional Information on Relief Requests Related to Examinations with less than 100% ASME Code Coverage for the Third 10-Year Interval" (TAC No. MC3220)

NRC Information Request 1: Request for Relief RR-10, Examination Category B-A, Items B I .I 1 and B1 .I 2, Pressure Retaining Welds in Reactor Vessel

The licensee is seeking relief from the Code-required 100% volumetric coverage, as only 28.0% of circumferential girth weld RPV-SC-C-11 could be obtained. The licensee stated that limitations are caused by the six core stabilizing support lugs and the flow skirt which are not removable. A more complete description of how the support lugs and the flow skirt reduced the volume coverage by 72.0% has been omitted from the licensee's description. The licensee states that many areas of inaccessibility were so designated not because they could not be examined at all, but because the ultrasonic test (UT) sound beam only traveled in one or two directions, and not the four directions described in ASME Section XI. This type of generic statement with incomplete information is insufficient to make a recommendation on the relief request. Additionally, the licensee believes that additional inspection coverage at the expense of hardware redesign and/or modification would only allow incremental increases of examination coverage. No basis for such inference is mentioned in the relief request. It is also not clear whether the hardware referred to implies components of the reactor vessel or inspection devices.

The licensee is therefore requested to provide information on (1) how close to the support lugs and the flow skirt the remotely controlled UT heads could be placed (diagrams would be helpful, if necessary), and (2) a description of hardware design and/or modification that would be required to allow increased coverage volumes.

OPPD Response

(1) Attachment 2 from AREVA (Framatome ANP) shows the details of the automated scan plan for the OPPD reactor pressure weld RPV-SC-C-11 (AREVA weld designation W03). The scan plan has drawing number 1 depicting the weld location, the associated scans and the internal components causing limitations to the scanning.

(2) OPPD stated in the original relief request, "Additional inspection coverage at the time of the exam would have required hardware redesign and/or modification to allow minor incremental increases in the examination coverage." This meant that minor modification to the transducers (e.g., shaving a few millimeters off the edges of the transducer shoes to allow closer access due to the interfering components) would have resulted in no appreciable increase in code coverage. All transducers were made as small as possible for the applications. There are no other known hardware changes that could have been made at the time. All future exams should incorporate any technological advances that would allow increased coverage.

NRC Information Request 2: Request for Relief RR-11. Examination Category B-A, Item B1.40, Pressure Retaining Welds in Reactor Vessel

The licensee is seeking relief from the Code-required 100% volumetric coverage, as only 77.9% of head-to-flange Weld RPVCH-HF-1 could be obtained. The licensee stated that limitations are caused by the twelve evenly spaced seismic skirt lugs and the seismic skirt and the actual head to flange geometry. Details of the calculations of the excluded coverage volume of 22.1% have been omitted from the licensee's description. The licensee states that many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions, and not the four directions described in the ASME Section XI Code. However, only information about those regions where sound beam traveled in one direction is included in the relief request. The licensee believes that additional inspection coverage at the expense of hardware redesign and/or modification would only allow incremental increases of examination coverage. No basis for such inference is mentioned in the relief request. It is also not clear whether hardware referred to implies components of the reactor vessel or inspection devices.

The licensee states that the reported volumetric coverage of 77.9% represents adequate coverage because inaccessible examination volumes consist of a small percentage of the overall required examination volume. Also, the surface examination of the weld required by the code, was also limited by the presence of the seismic support lugs. It is not clear how much of the surface area of the weld was subjected to surface examination.

The licensee is therefore requested to provide: (1) the calculations used to arrive at the 77.9% examination volume coverage for head-to-flange Weld RPVCH-HF-1, (2) portions of the excluded regions, if applicable, for head-to-flange Weld RPVCH-HF-1 where sound beam traveled in fewer than four directions, and (3) if applicable, insights into hardware design and/or modification to allow increased coverage volumes.

OPPD Response

(1) The RPV head girth weld is approximately 132 inches in diameter or a total weld length of 414 inches (132 × 3.14 = 414). There are 12 seismic support lugs located at equal spacing along the weld, limiting the scanning for 6 inches at each lug. This limits a total of 72 inches of weld length, resulting in only 82.6% of the weld length that can be scanned (414 -72 = 342; then 342 ÷ 414 = 82.6%).

A cross sectional scale drawing of the weld required exam volume results in a total of 59.3 square inches. The scan with the transducer pointing either clockwise (CW) or counterclockwise (CCW) has no limitations. However, the scan with the transducer pointing towards the top of the head has a limitation from the flange (limiting rearward movement) which results in scanning of only 46 square inches, or 77.6% (46 ÷59.3). Also, the scan with the transducer pointing towards the flange is limited by the seismic skirt (also in the rearward direction) so that only 59.04 square inches are scanned, or 99.6% (59.04 ÷59.3).

The 82.6% of the weld that can be scanned requires scans in four directions: clockwise (CW), counterclockwise (CCW), towards the top of the head, and towards the flange. Each of these four scans is equal to 25% of the total. There is no interference with either the CW or CCW scans, so a credit of 25% for each may be claimed. The scan towards the top of the head is limited by the flange so that only 77.6% of the required volume can be examined in that direction. Thus, only 19.4% may be claimed for that scan (77.6% × 25%). The scan towards the flange is limited by the seismic skirt so that only 99.6% of the required volume can be examined in that direction. Thus only 24.9% may be claimed for that scan (99.6% × 25%).

Adding all four directional scans above results in 94.3% (25% + 25% +19.4% +24.9%). Therefore, of the 82.6% of the weld that could be scanned, only 94.3% of that volume was actually covered. Multiplying 82.6% by 94.3% results in 77.9% total of the code required volume.

It should also be noted that OPPD has been conservative in calculating code coverage on vessels. The 1989 Edition of ASME Section V (no addenda), Article 4, T-441.3.2.6 divides the code required volume into the actual weld metal and the weld heat affected zone (HAZ):

> *The angle beam search units shall be aimed at right angles to the weld axis, with the search unit manipulated so that the ultrasonic beams pass through the entire volume of weld metal. The adjacent base metal in the examination volume must be completely scanned by two angle beams, but need not be completely scanned by both beams from both directions (any combination of two angle beams will satisfy the requirement).*

Additionally, Article 4 T-441.3.2.7 of the code describes scanning for reflectors oriented transverse to the weld (in this case, CW and CCW):

> *Scanning shall be done in two directions 180 deg. to each other to the extent possible. Areas blocked by geometric conditions shall be examined from at least one direction.*

When these factors are taken into account, the only limitations for this examination are the lug locations, and only for the perpendicular scans (facing up and down). The CW and CCW scans would have covered nearly the entire weld in at least one direction (except for a small near surface area directly under the lugs), and the perpendicular scans would have passed sound through the entire weld metal in two directions and through all of the HAZ with at least two angles. This would all equate to a code-required coverage of nearly 90%.

(2) There are twelve seismic skirt support lugs located equally spaced on the head girth weld RPVCH-HF-1. Each of these lugs is six inches wide. The code required volume by each of these support lugs may only be scanned in either two or three of the required four directions. Where the lug is located on the weld no scanning is allowed in either the up or down direction, but scanning in the CW and CCW direction is possible. Conversely, the CW scan is limited on the CCW side and the CCW scan is limited on the CW side, although both of these areas are

accessible to both the up and down scans. Essentially, each lug casts a "shadow" in the weld required volume in all four directions, although the location of this "shadow" may be different for each scan.

(3) There are no hardware designs and/or modifications that would allow increased coverage. It should also be noted that during the 2006 refueling outage, the reactor vessel head will be replaced with a one piece head so that no head to flange weld will exist in the future.

NRC Information Request 3: Request for Relief RR-12, Examination Category B-B, Items B2.11 and B2.12, Pressure Retaining Welds in Vessels Other than the Reactor Vessel

The licensee is seeking relief from the Code-required 100% volumetric coverage, as only 77.0% of circumferential girth Weld PRZ-SC-5-403 and 66% of upper shell long seam Weld PRZ-SL-2-403A could be obtained. The licensee stated that while limitations for the inspection of the circumferential girth Weld PRZ-SC-5-403 and PRZ-SL-2-403A are caused by the insulation support ring and its support lugs. In the case of the circumferential girth Weld PRZ-SC-5-403, unambiguous designation of the excluded coverage volume of 23.0% has been omitted from the licensee's description. The licensee states that many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions, and not the four directions described in the ASME Section XI Code. Information about those regions where the sound beam traveled in fewer than four directions is omitted in the relief request. Additionally, the licensee believes that additional inspection coverage at the expense of hardware redesign and/or modification would only allow incremental increases of examination coverage. No basis for such inference is mentioned in the relief request. It is also not clear whether hardware referred to implies components of the reactor vessel or inspection devices.

The licensee is therefore requested to provide: (1) clear designations of excluded coverage regions during inspection of the circumferential girth Weld PRZ-SC-5-403 and the calculations used to arrive at the 77.0% volume coverage, (2) a description of the portions of the excluded regions, if applicable, for both circumferential girth Weld PRZ-SC-5-403 and long seam Weld PRZ-SL-2-403A where the sound beam traveled in fewer than four directions, and (3) if applicable, insights into hardware design and/or modification to allow increased coverage volumes.

OPPD Response

(1) A cross sectional scale drawing of the weld required exam volume results in a total of 20.2 square inches. By skewing the transducer, the scan with the transducer pointing either clockwise (CW) or counterclockwise (CCW) has a limitation from the insulation support ring which results in scanning of only 16.4 square inches, or 81.2% (16.4 ÷20.2). The scan with the transducer pointing towards the top of the pressurizer has a limitation from the insulation support ring which results in scanning of only 19.5 square inches, or 96.5% (19.5 ÷20.2). Also, the scan with

the transducer pointing towards the bottom of the pressurizer is limited by the insulation support ring so that only 10.7 square inches are scanned, or 53% (10.7 ÷20.2).

The weld requires scans in four directions: CW, CCW, towards the top of the pressurizer and towards the bottom of the pressurizer. Each of these four scans is equal to 25% of the total. The limitation with either the CW or CCW scan is 81.2%; thus, only 20.3% may be claimed for each of these scans (81.2% × 25%). The scan towards the top of the pressurizer is limited by the insulation support so that only 96.5% of the required volume can be examined in that direction. Thus, only 24.1% may be claimed for that scan (96.5% × 25%). The scan towards the bottom of the pressurizer is limited by the insulation support so that only 53% of the required volume can be examined in that direction. Thus, only 13.2% may be claimed for that scan (53% × 25%).

Adding all four directional scans above results in 77.9% (20.3% + 20.3% +24.1% +13.2%).

It should also be noted that OPPD has been conservative in calculating code coverage on vessels. The 1989 Edition of ASME Section V (no addenda), Article 4, T-441.3.2.6 divides the code required volume into the actual weld metal and the weld heat affected zone (HAZ):

> *The angle beam search units shall be aimed at right angles to the weld axis, with the search unit manipulated so that the ultrasonic beams pass through the entire volume of weld metal. The adjacent base metal in the examination volume must be completely scanned by two angle beams, but need not be completely scanned by both beams from both directions (any combination of two angle beams will satisfy the requirement).*

Additionally, Article 4 T-441.3.2.7 of the code describes scanning for reflectors oriented transverse to the weld (in this case, CW and CCW):

> *Scanning shall be done in two directions 180 deg. to each other to the extent possible. Areas blocked by geometric conditions shall be examined from at least one direction.*

When these factors are taken into account, the coverage of the HAZ would increase and the total code coverage would be over 80%.

(2) There is an insulation support with 8 welded lugs equally spaced at 45 degree intervals. This insulation support is located just above the girth weld PRZ-SC-5-403 so that it primarily interferes with scans where the transducer is facing towards the bottom of pressurizer. It also interferes slightly with the CW and CCW scans and marginally with the scan where the transducer is facing the top of the pressurizer. These limitations are shown on pages 13 thru 15 of report UT-99 which is included in Attachment B of relief request RR-12. The interference caused by the insulation support for the long seam PRZ-SL-2-403A is largely due to one of the 8 welded lugs being directly on the long seam weld. Since the code requires 12 inches of the intersecting long seam to be examined, and the support lug is 4 inches long, credit is conservatively taken for only 66.6% of the code required volume.

(3) There are no hardware designs and/or modifications that would allow increased coverage at this time. It should also be noted that during the 2006 refueling outage, the pressurizer will be replaced. The new pressurizer vessel will have no interfering insulation supports and there will no longer be any long seam welds.

NRC Information Request 4: Request for Relief RR-13, Examination Category B-D, Item B3.130, Full Penetration Welds of Nozzles in Vessels

The licensee is seeking relief from the Code-required 100% volumetric coverage, as only 72.4% of nozzle-to-vessel Weld SG-1 -N-1 has been completed. The licensee stated that limitations for the inspection of the Weld SG-1-N-1 are caused by nozzle geometry. Though examples of scan paths are included in Attachment D for Welds SG-2-Nl and SG-2-N3, typical portions of the required examination volumes that were either not examined from all directions or not examined at all are not included. The licensee also states that many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions, and not the four directions described in the ASME Section XI Code. Information about those regions where the sound beam traveled in fewer than four directions is omitted in the relief request. Additionally, the licensee believes that additional inspection coverage at the expense of hardware redesign and/or modification would only allow incremental increases of examination coverage.

No basis for such inference is mentioned in the relief request. It is also not clear whether the hardware referred to implies components of the reactor vessel or inspection devices.

The licensee is therefore requested to provide: (1) clear designations of excluded coverage regions during the inspection of the nozzle-to-vessel welds and the calculations used to arrive at the 72.4% volume coverage, (2) a description of the portions of the excluded region, if applicable, where the sound beam traveled in fewer than four directions, and (3) if applicable, insights into hardware design and/or modification to allow increased coverage volumes.

OPPD Response

(1) A cross sectional scale drawing of the weld required exam volume results in a total of 57.9 square inches. The scans were conducted from the shell side of the nozzle as well as the nozzle side. The ultrasonic (UT) instruments were calibrated to allow sufficient sound path (up to 22 inches) to project the sound beam into the weld required volume directly as well as utilizing a bounce from the far surfaces. All these scans resulted in a total area scanned of 41.8 square inches, or 72.2% (41.8 divided by 57.9). Of the 16.1 square inches not credited, 8.3 square inches had sound travel through in at least one direction. Beam spreads were performed on all the transducers, which would account for additional coverage, although no coverage was accredited to beam spread. For welds of this type of nozzle configuration, scans for transverse indications were performed to the best extent possible and no credit was added or subtracted.

(2) All scans were limited by the radius section of the crotch region of the nozzle and the area predominately not covered was the near surface just under the crotch region.

(3) There are no hardware designs and/or modifications that would allow increased coverage at this time.

NRC Information Request 5: Request for Relief RR-15, Examination Category B-D, Item B3.90, Full Penetration Welds of Nozzles in Vessels

The licensee is seeking relief from the Code-required 100% volumetric coverage, as only 82.0% of nozzle-to-vessel Welds RPV-N-1-A and RPV-N-1-B could be obtained. The licensee stated that the limitation for the inspection of the nozzle-to-vessel welds is caused by the nozzle inner radius buildup. Unambiguous designation of the excluded coverage volume of 18.0% has been omitted from the licensee's description. The licensee states that the transducers were manipulated on the shell side of the welds and there was no scanning performed from the nozzle side due to the geometry. However, Attachment C appears to show scans from the inside wall of the nozzles. It is also not clear whether the inspection was carried out solely from the inside of the vessel.

The licensee states that many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions, and not the four directions described in the ASME Section XI Code. Information about those regions where sound beam traveled in fewer than four directions is omitted in the relief request. Additionally, the licensee believes that additional inspection coverage at the expense of hardware redesign and/or modification would only allow incremental increases of examination coverage. No basis for such inference is mentioned in the relief request. It is also not clear whether hardware referred to implies components of the reactor vessel or inspection devices.

The licensee is therefore requested to provide: (1) a statement of whether examinations from the outside of the pressure vessel was also made, (2) an explanation of the inconsistency in statements and scan plan drawings included in Attachment C, (3) a description of whether an examination from the outside would increase the examination volume, (4) clear designations of excluded coverage regions during the inspection of the nozzle-to-vessel welds and the calculations used to arrive at the 82.0% volume coverage, (5) scan paths in regions for both welds where the sound beam traveled in fewer than four directions, and (6) if applicable, insights into hardware design and/or modification to allow increased coverage volumes.

OPPD Response

(1) No examinations were performed from the outside surfaces. See additional information in the answer to question 3 below.

(2) Scans were performed from both the shell surface and nozzle surfaces. The statement that scans were performed from the nozzle side meant that no scans were performed on the shell with the transducer facing away from the nozzle (nozzle side of shell scan).

(3) Scanning from the outside surface of the nozzle is even more limited by geometry than scanning from the inside surface. There is the crotch region where the shell meets the nozzle, the tapering region where the nozzle decreases in thickness as it extends away from the vessel, and finally the fact that the inner corner region is also shadowed by the nozzle buildup adjacent to it. This is the area that had the limited scan coverage, due to the same shadowing effect from the inner shell surface. This was, however, entirely scanned from the nozzle bore region.

(4) Attachment 2 from AREVA (Framatome ANP) shows the details of the automated scan plan for the OPPD reactor pressure welds RPV-N-1-A and RPV-N-1-B (AREVA weld designations W21 and W27). The scan plan has drawing number 5 depicting the weld location, the associated scans and the internal buildup area on the two hot leg nozzles that caused the limitation in scanning. It is worth noting that the four cold leg nozzles are free of this build up and thus had no limitations.

(5) For both welds, this region is the area around the nozzle buildup that forms a "bump" and limits transducer scanning, and thus shadows the areas adjacent to the buildup. Since 100% coverage was obtained for all scans from the nozzle bore side, the main limitation was with the scan on the shell side with the transducers facing the nozzle.

(6) There are no hardware designs and/or modifications that would allow increased coverage at this time.

NRC Information Request 6: Request for Relief RR-17, Examination Category B-J, Item B9.11 Pressure Retaining Welds in Piping

In the relief request the licensee states that certain Code-required examinations are impractical at their facility based on limitations due to component configurations. For each of the limited examinations listed in Relief Request RR-17, the licensee has clearly shown how the specific conditions related to these configurations impact the ultrasonic examinations. However, the licensee believes that additional inspection coverage at the expense of hardware redesign and/or modification would only allow incremental increases of examination coverage.

The licensee is seeking relief from the Code-required 100% volumetric coverage, as only 54.5% of circumferential piping Welds MRC-2/08 and MRC-2/20 could be obtained. The licensee stated that limitations for the inspection of the circumferential welds are caused by the adjacent elbow geometry. It appears that while inspecting from the elbow side, increasing the angle of refracted L-wave from 45 degrees would increase the examination volume. Therefore, the licensee is requested to provide (1) a discussion of whether higher angle refracted L-wave transducers was considered for inspection from the elbow side, and (2) if applicable, insights into hardware design and/or modification to allow increased coverage volumes.

OPPD Response

(1) The material of the elbows is centrifugally cast stainless steel (CCSS). This material does not lend itself well to ultrasonic examinations due to the coarse grain structure. The 45 degree focused dual transducers that were used for these examinations were specifically made to try to push concentrated sound through this very difficult material. Increasing the angle would also significantly increase the sound path travel and not enough sound energy would reach the area of interest.

It is worth noting that EPRI and the Performance Demonstration Initiative (PDI) are spearheading the efforts to determine the most effective systems to examine CCSS piping. All future examinations will continue to use the best means available at the time of the inspections.

(2) There are no hardware designs and/or modifications that would allow increased coverage at this time.

NRC Information Request 7: Request for Relief RR-18, Examination Category B-J. Item B5.70, Pressure Retaining Welds in Piping

In the relief request the licensee states that certain Code-required examinations are impractical at their facility based on limitations due to component configurations. However, in the section titled "Applicable Code Requirements," the item number is quoted as B5.70. Please clarify whether the Code Item number should be 9.31.

OPPD Response

The correct item number for category B-J is B9.31.

NRC Information Request 8. Request for Relief RR-19, Examination Category B-J, Item B9.11. Pressure Retaining Welds in Piping

In the relief request the licensee states that certain Code-required examinations are impractical at their facility based on limitations due to component configurations. However, for each of the limited examinations listed in Relief Request RR-19, the licensee has not unambiguously shown how the volumetric coverage for ultrasonic inspection of valve-to-elbow Weld 6-SI-22/03 was determined to be 50%. According to the report provided on page 508 of Attachment B, approximate volumetric coverage for the single-sided examination is 85.0%. However, since the maximum allowed coverage is 50.0% for single sided examination, the reviewer believes that credit should be taken for only 42.5% volumetric coverage.

Additionally, the licensee believes that additional inspection coverage at the expense of hardware redesign and/or modification would only allow incremental increases of examination coverage. No basis for such inference is mentioned in the relief request.

The licensee is therefore requested: (1) to clarify whether the volumetric coverage for the inspection of the Weld 6-Sl-22/03 should be 42.5%, and (2) to provide, if applicable, insights into hardware design and/or modification to allow increased coverage volumes.

OPPD Response

(1) Coverage credit is limited to the near side (50%) of the weld required volume. Since the near side was completely covered in all four directions, 100% credit can be taken for that side of the weld, thus 50% coverage is correct. The 15% that was not covered was entirely on the far side of the weld, for which no coverage may be claimed due to the rule changes.

(2) There are no hardware designs and/or modifications that would allow increased coverage at this time.

NRC Information Request 9: Request for Relief RR-22, Examination Category C-F-2 Item C5.51, Pressure Retaining Welds in Carbon or Low Alloy Piping

In the relief request the licensee states that certain Code-required examinations are impractical at their facility based on limitations due to component configurations. However, for each of the limited examinations listed in Relief Request RR-22, the licensee has not clearly shown how the claimed volumetric coverage has been computed. Instead, generic statements regarding the examination volumes have been presented.

The licensee is seeking relief from the Code-required 100% volumetric coverage, as only 41 .O% of pipe-to-flange Weld 6-MS-2005/02 and 48.0% of pipe-to-flange Weld 6-MS-2006/02 could be obtained. Similar reduced coverage statements have been made for the required surface examinations. The licensee stated that limitations for the inspection of the welds are caused by the welded lugs located at every 90 degrees. The limitation sketch provided by the licensee for the ultrasonic inspection of Weld 6-MS-2005/02 shows that only 70% of the required volume has been inspected by a single- sided examination. Therefore, it appears that the licensee can claim credit for only 35.0% volume coverage as opposed to 41 .O%. Similar conditions exist for Weld 6-MS-2006/02. Additionally, the licensee believes that additional inspection coverage at the expense of hardware redesign and/or modification would only allow incremental increases of examination coverage. No basis for such inference is mentioned in the relief request.

The licensee is therefore requested to demonstrate how: (1) 41 .0% of the required examination volume has been adequately inspected by UT for Weld 6-MS-2005/02, (2) 48.0% of the required examination volume has been adequately inspected by UT for Weld 6-MS-2006/02, and (3) if applicable, insights into hardware design and/or modification to allow increased coverage volume.

OPPD Response

(1) A cross sectional scale drawing of the weld required exam volume results in a total of 0.31 square inches. The scan with the transducer pointing either clockwise (CW) or counterclockwise (CCW) has no limitations as this examination on piping welds is done only on the root area (ASME Section Article III-4430). This was performed directly on the weld crown where possible, and where the weld crown was too rough, the transducer was placed on the adjacent base metal with the sound beam skewed towards the root of the weld. To be conservative, no credit was claimed for any coverage with either the CW or CCW scans.

With a valve flange located directly on one side of this weld, all the scans must be performed with the transducer pointing towards the flange, as no access is possible from the flange side due to its geometry. A 60 degree transducer was used to supplement the coverage of the 45 degree transducer so that maximum coverage could be obtained.

A calibration utilizing a 1 1/2 V-path was performed as described in the general notes for figure III-3230-1 of ASME Section XI Appendix III. This calibration resulted in scanning coverage of 0.25 square inches with the bounced sound beam and 0.13 square inches covered with the first leg of the sound beam. This resulted in only 0.06 square inches of weld required volume that had no sound pass through it. This area was located at the lower far corner of the examination area located on the flange side. The upper area on the flange side had the sound beam pass in only one direction as indicated on page 6 of Ultrasonic report number 189-UT, which is part of Attachment B of relief request number 22.

There are four lugs (each 1 ½ inches wide) located equally spaced around the 20 inches length of piping weld 6-MS-2005/02. Since these lugs are relatively thin, it was determined that the transducer could be skewed on each side so that the sound beam could be directed into the weld required volume beneath it. The weld required volume requires that the sound beam be directed directly towards the flange and that the sound beam be bounced towards the flange, so that the sound passes through the area in two directions. This area of two directional sound totaled 0.13 square inches or 41.9%. To be conservative, only the area in which the sound beam passed in both directions was credited. No credit was taken for the sound passing in just one direction (an additional 0.12 square inches, 38.7%).

(2) A cross sectional scale drawing of the weld required exam volume results in a total of 0.37 square inches. The scan with the transducer pointing either CW or CCW has no limitations as this examination on piping welds is done only on the root area (ASME Section XI, Article III-4430). This was performed directly on the weld crown where possible, and where the weld crown was too rough, the transducer was placed on the adjacent base metal with the sound beam skewed towards the root of the weld. To be conservative, no credit was claimed for any coverage with either the CW or CCW scans.

With a valve flange located directly on one side of this weld, all the scans must be performed with the transducer pointing towards the flange as no access is possible from the flange side due

to its geometry. A 60 degree transducer was used to supplement the coverage of the 45 degree transducer so that maximum coverage could be obtained.

A calibration utilizing a 1 1/2 V-path was performed as described in the general notes for figure III-3230-1 of ASME Section XI Appendix III. This calibration resulted in scanning coverage of 0.32 square inches with the bounced sound beam and 0.13 square inches covered with the first leg of the sound beam. This resulted in only 0.05 square inches of weld required volume that had no sound pass through it. This area was located at the lower far corner of the examination area located on the flange side. The upper area on the flange side had the sound beam pass in only one direction as indicated on page 6 of Ultrasonic report number 190-UT, which is part of Attachment B of relief request number 22.

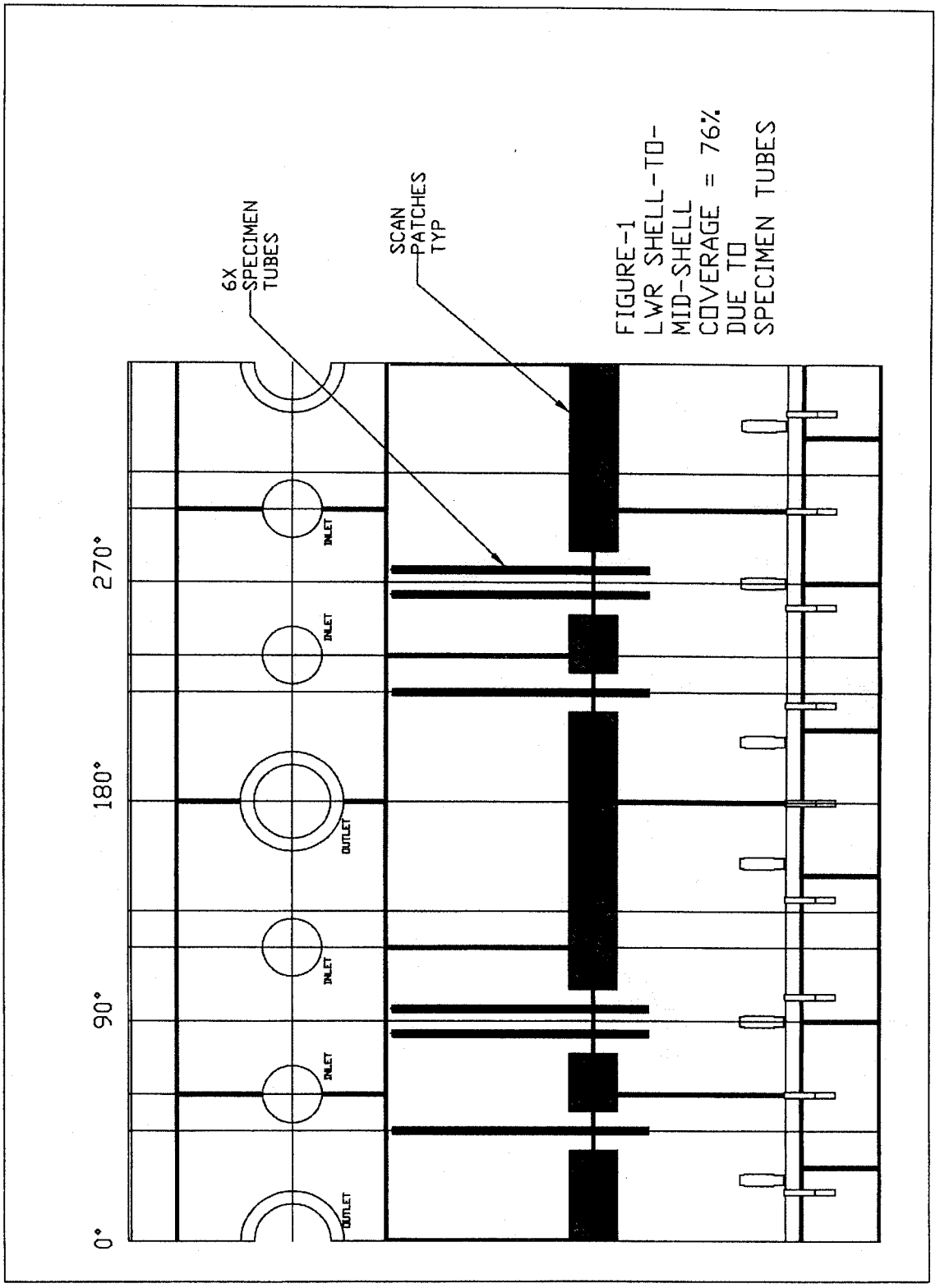
There are four lugs (each 1 ½ inches wide) located equally spaced around the 20 inches length of piping weld 6-MS-2006/02. Since these lugs are relatively thin, it was determined that the transducer could be skewed on each side so that the sound beam could be directed into the weld required volume beneath it. The weld required volume requires that the sound beam be directed directly towards the flange and that the sound beam be bounced towards the flange, so that the sound passes through the area in two directions. This area of two directional sound totaled 0.13 square inches or 35.1%. To be conservative, only the area in which the sound beam passed in both directions was credited. No credit was taken for the sound passing in just one direction (an additional 0.19 square inches, 51.3%).

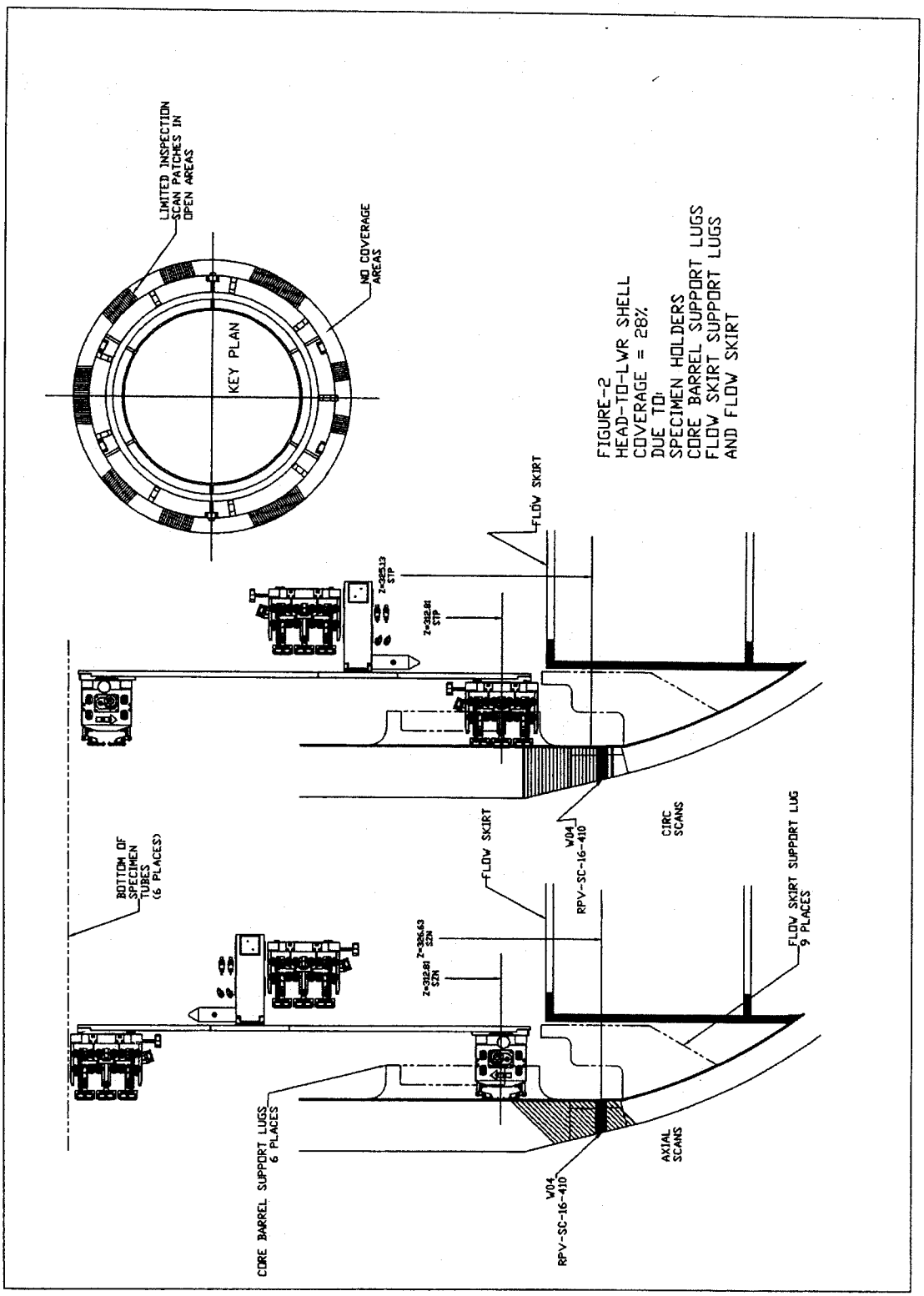
(3) There are no hardware designs and/or modifications that would allow increased coverage at this time.

Details of Automated Scan Plan for Reactor Pressure Weld RPV-SC-C-11

Fort Calhoun
10 Year ISI
Limited Coverage
(< 90%)

W03	**RPV-SC-C-11**	**LWR SHELL-TO-MID SHELL**
	COVERAGE = 76%	**(SEE FIGURE-1)**
W04	**RPV-SC-16-410**	**HEAD-TO-LWR SHELL**
	COVERAGE = 28%	**(SEE FIGURE-2)**
W12	**RPV-SL-A-3**	**LWR LONG SEAM @ 60 DEGREES**
W13	**RPV-SL-B-3**	**LWR LONG SEAM @ 180 DEGREES**
W14	**RPV-SL-C-3**	**LWR LONG SEAM @ 300 DEGREES**
	COVERAGE = 86%	**(SEE FIGURE-3)**
W15	**RPVLH-411-A**	**MERIDIONAL @ 30 DEGREES**
W16	**RPVLH-411-B**	**MERIDIONAL @ 90 DEGREES**
W17	**RPVLH-411-C**	**MERIDIONAL @ 150 DEGREES**
W18	**RPVLH-411-D**	**MERIDIONAL @ 210 DEGREES**
W19	**RPVLH-411-E**	**MERIDIONAL @ 270 DEGREES**
W20	**RPVLH-411-F**	**MERIDIONAL @ 330 DEGREES**
	COVERAGE = 23%	**(SEE FIGURE-4)**
W21	**RPV-N-1-A**	**OUTLET NOZZLE-TO-SHELL @ 0 DEGREES**
W27	**RPV-N-1-B**	**OUTLET NOZZLE-TO-SHELL @ 180 DEGREES**
	COVERAGE = 82%	**(SEE FIGURES -5)**


6X SPECIMEN TUBES
SCAN PATCHES TYP
FIGURE-1
LWR SHELL-TO-MID-SHELL COVERAGE = 76% DUE TO SPECIMEN TUBES
0°
90°
180°
270°
INLET
INLET
INLET
INLET
OUTLET
OUTLET


KEY PLAN
LIMITED INSPECTION SCAN PATCHES IN OPEN AREAS
NO COVERAGE AREAS
FIGURE-2
HEAD-TO-LWR SHELL
COVERAGE = 28%
DUE TO:
SPECIMEN HOLDERS
CORE BARREL SUPPORT LUGS
FLOW SKIRT SUPPORT LUGS
AND FLOW SKIRT
FLOW SKIRT
BOTTOM OF SPECIMEN TUBES (6 PLACES)
CORE BARREL SUPPORT LUGS 6 PLACES
W04
RPV-SC-16-410
CIRC SCANS
AXIAL SCANS
FLOW SKIRT SUPPORT LUG 9 PLACES

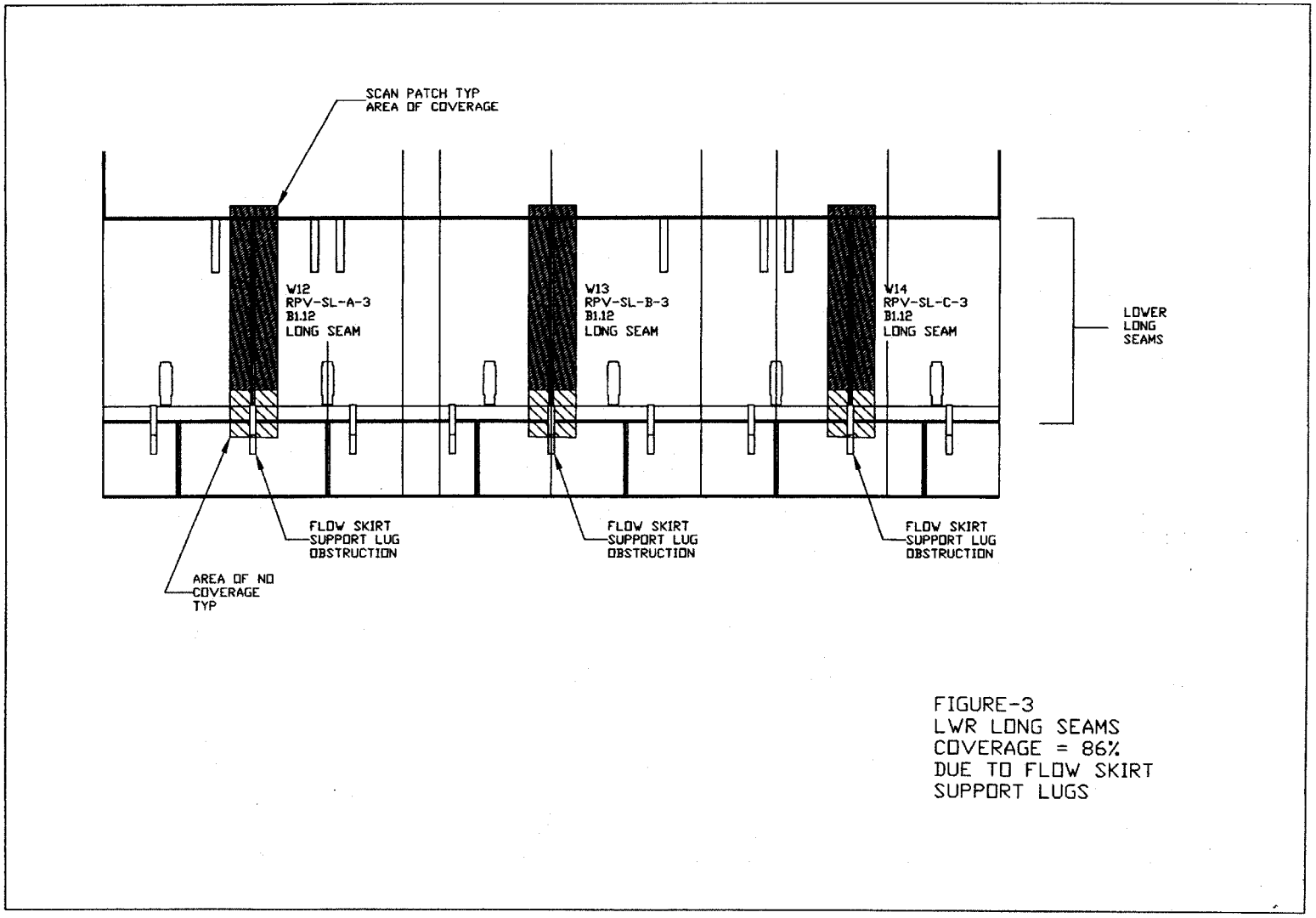


FIGURE-3
LWR LONG SEAMS
COVERAGE = 86%
DUE TO FLOW SKIRT
SUPPORT LUGS

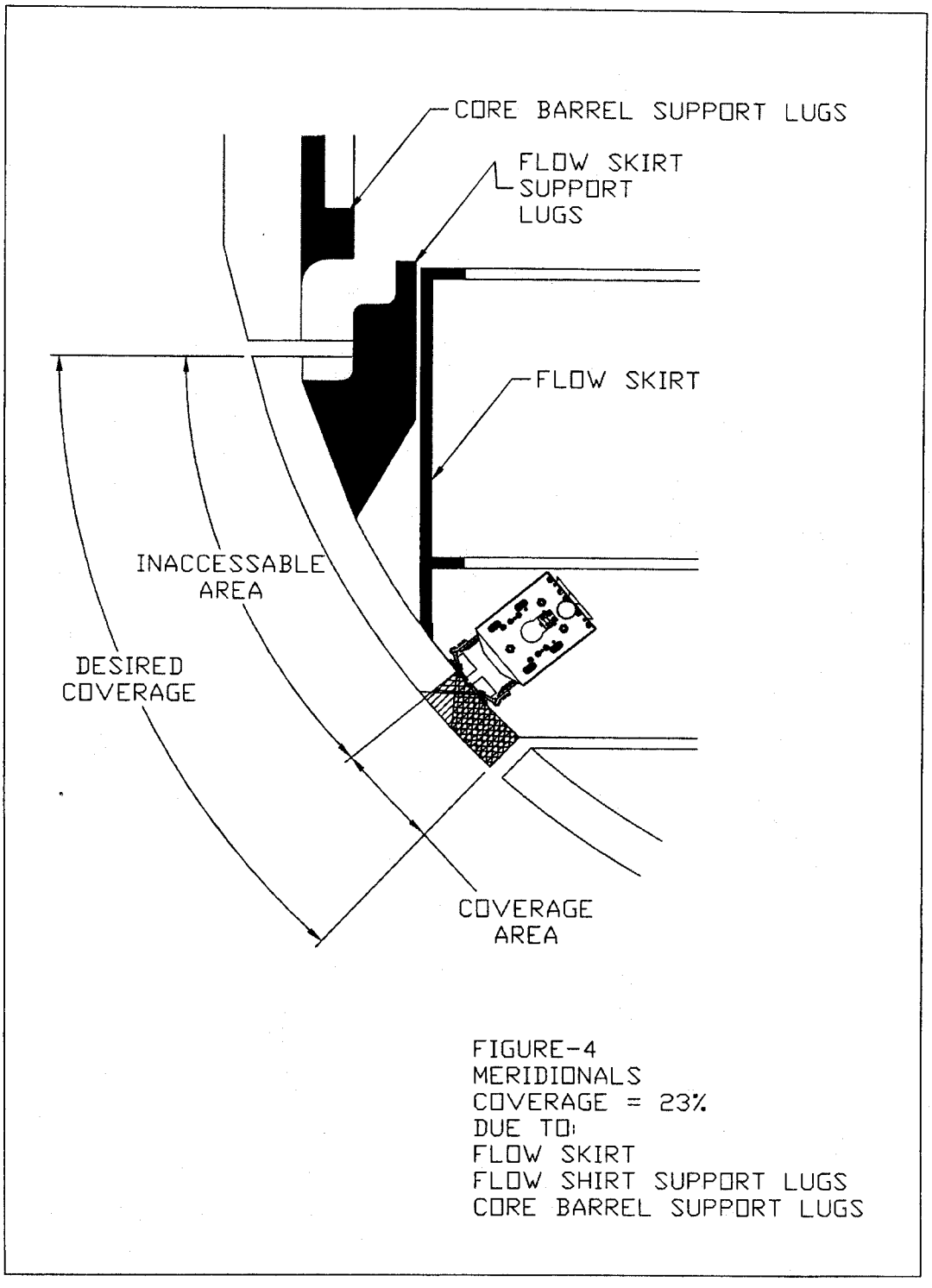
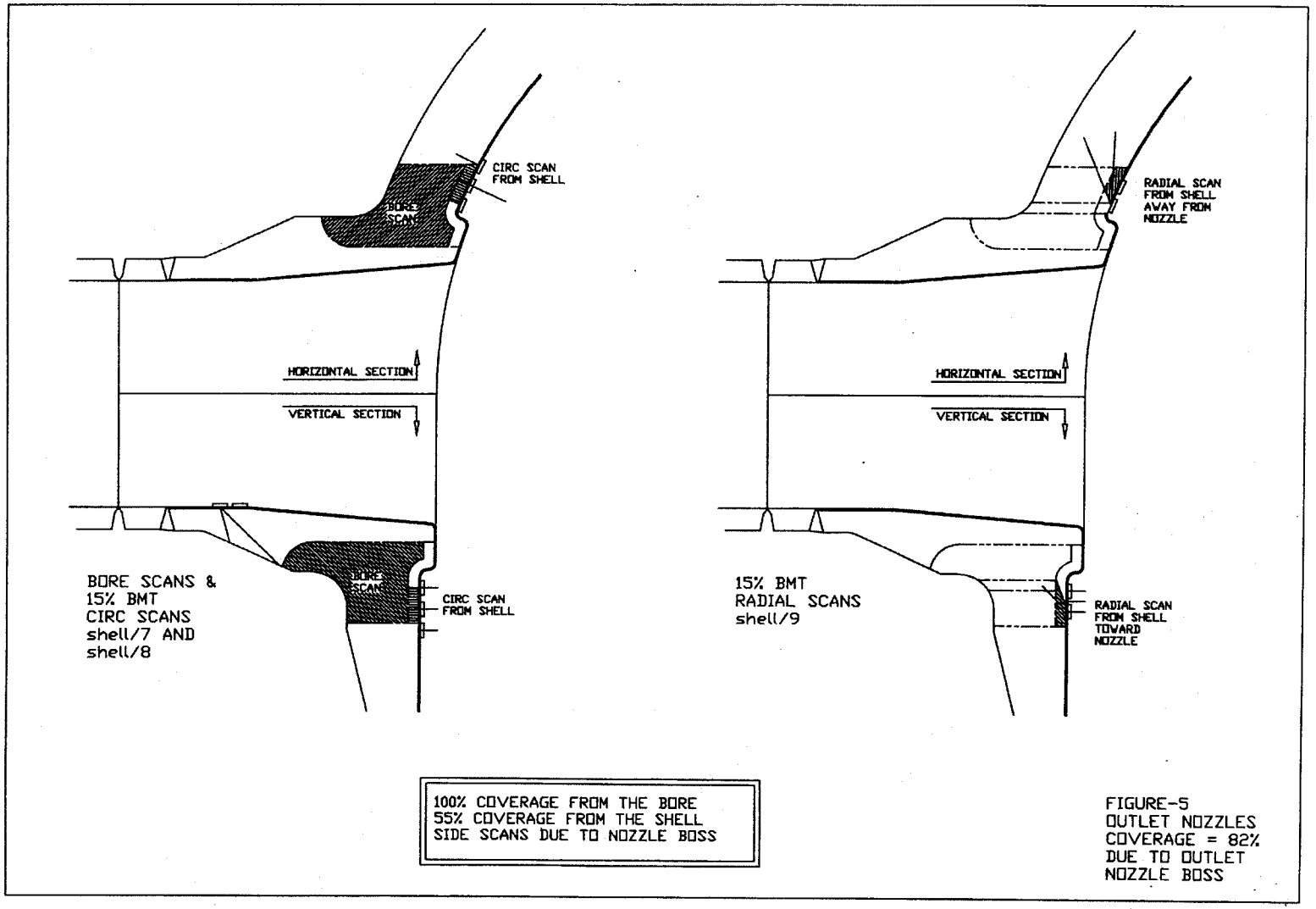


FIGURE-4
MERIDIONALS
COVERAGE = 23%
DUE TO:
FLOW SKIRT
FLOW SHIRT SUPPORT LUGS
CORE BARREL SUPPORT LUGS


CIRC SCAN
FROM SHELL
BORE
SCAN
HORIZONTAL SECTION
VERTICAL SECTION
BORE SCANS &
15% BMT
CIRC SCANS
shell/7 AND
shell/8
BORE
SCAN
CIRC SCAN
FROM SHELL
RADIAL SCAN
FROM SHELL
AWAY FROM
NOZZLE
HORIZONTAL SECTION
VERTICAL SECTION
15% BMT
RADIAL SCANS
shell/9
RADIAL SCAN
FROM SHELL
TOWARD
NOZZLE
100% COVERAGE FROM THE BORE
55% COVERAGE FROM THE SHELL
SIDE SCANS DUE TO NOZZLE BOSS
FIGURE-5
OUTLET NOZZLES
COVERAGE = 82%
DUE TO OUTLET
NOZZLE BOSS