CENTERIOR ENERGY

300 Madison Avenue
Toledo, OH 43652-0001
419-249-2300

John P. Stetz
Vice President - Nuclear
Davis-Besse

Docket Number 50-346

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United States Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Subject: Request for Relief From Certain ASME Code Requirements for Inservice Inspection for the Davis-Besse Nuclear Power Station

Gentlemen:

The purpose of this letter is to request relief pursuant to 10CFR 50.55a(g)(5)(iii) from certain requirements of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. The requests for relief deal with examination coverage for surface and volumetric examinations of certain components, and with criteria for selection of additional components for examination when unacceptable indications are discovered. Details concerning the requested relief are provided in the attached Relief Requests RR-A10, RR-A11, RR-A12 and RR-B7.

Toledo Edison (TE) submitted the Second Ten-Year Interval Inservice Inspection Program for the Davis-Besse Nuclear Power Station (DBNPS) to the Nuclear Regulatory Commission (NRC) by letters dated September 12, 1990 (Serial Number 1846) and October 8, 1991 (Serial Number 1972). In these submittals, TE committed to following the guidance in ASME Code Case N-460 with regard to examination coverage for Class 1 and Class 2 welds. Code Case N-460 states that a reduction in examination coverage for any Class 1 or Class 2 weld due to interference by another compo ent or part geometry is acceptable, provided the reduction in coverage is less than 10 percent. Relief Requests RR-A10, RR-A11 and RR-B7 request relief from ASME Code





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requirements for certain welds where surface or volumetric examination coverage is reduced by greater than 10 percent due to component geometry or interference. Toledo Edison proposes to examine the affected components to the maximum extent practicable with due consideration given to radiation dose received during the examinations.

Relief Request RR-A12 requests relief from Section XI of the ASME Code, 1986 Edition, Subsections IWB-2430 and IWC-2430. These subsections provide requirements for additional component examinations to be performed if unacceptable indications are discovered. In determining the scope of additional examinations, the 1986 Edition of the ASME Code does not allow consideration of the component material or service conditions. Later editions of the ASME Code allow for consideration of these items in determining the scope of additional examinations. This request for relief is similar to that submitted by GPU Nuclear Corporation (Docket Number 50-288) and approved by the NRC by letter dated October 8, 1992.

Toledo Edison requests that these Relief Requests be approved by April 1, 1996 in order to support the inspections in upcoming refueling outage.

Should you have any questions or require additional information, please contact Mr. William T. O'Connor, Manager - Regulatory Affairs, at (419) 249-2366.

Very truly yours,

NKP/eld

Attachments

cc: L. L. Gundrum, NRC Project Manager
H. J. Miller, Regional Administrator, NRC Region III
S. Stasek, DB-1 NRC Senior Resident Inspector
Utility Radiological Safety Board

# RELIEF REQUEST RR-A10

## COMPONENT DESCRIPTION:

Reactor Coolant Piping Branch Connection Welds

| | | |
|---|---|---|
| 1 - | 12 inch | Decay Heat Nozzle Branch Connection Weld |
| 1 - | 10 inch | Surge Line Nozzle Branch Connection Weld |
| 4 - | 2.5 inch | Drain Line Nozzle Branch Connection Welds |
| 4 - | 2.5 inch | High Pressure Injection Nozzle Branch Connection Welds |

## ASME CODE CLASS:

ASME Section XI Class 1

## ASME EXAMINATION REQUIREMENTS:

Subsection IWB, Table IWB-2500-1, Examination Category B-J, Item No. B9.31 (Branch Pipe Connection Welds NPS 4 or Larger) requires a surface and volumetric examination of 25 percent of the population of branch connection welds during the 10-year interval. The examination requirements are identified in Figure No. IWB-2500-9,-10, and -11. Essentially 100 percent of the weld length requires examination.

Code Case N-460 states that when the entire examination volume or area cannot be examined due to interference by another component or part geometry, a reduction in examination coverage may be accepted provided the reduction in coverage for that weld is less than 10 percent.

## BASIS FOR RELIEF:

The volumetric examination of the identified welds is limited by the component geometry such that the reduction in coverage is greater than 10 percent. The surface examination is not limited.

The branch connection weld configuration is similar to Figure IWB-2500-9. Article III-4000 requires a total of four scans for complete examination coverage.

Scan 1 - A circumferential scan clockwise around the nozzle for reflectors transverse to the weld.
Scan 2 - A circumferential scan counter-clockwise around the nozzle for reflectors transverse to the weld.
Scan 3 - An axial scan from the pipe surface around the nozzle for reflectors parallel to the weld.
Scan 4 - An axial scan from the nozzle surface around the nozzle for reflectors parallel to the weld.

The Reactor Coolant Piping is cladded which limits the examination path to a one-half vee sound path.

Each branch connection weld can be completely (100 percent) examined circumferentially in both directions. It can also be examined completely (100 percent) in the axial direction from the pipe surface. However, no reliable scan can be performed from the nozzle side due to the nozzle radius interfering with the examination scan. The Reactor Coolant Piping cladding also limits the ability to "bounce" the ultrasonic beam from the pipe side of the weld to obtain coverage in the fourth beam direction. Therefore, only 3 of the 4 required beam directions can be obtained. This results in 75 percent of the examination coverage. The attached sketch provides an illustration of the typical nozzle configuration and examination coverage.

The examination volume is examined in at least one direction to detect reflectors in both the parallel and transverse directions to the weld. This should detect any defects which may exist.

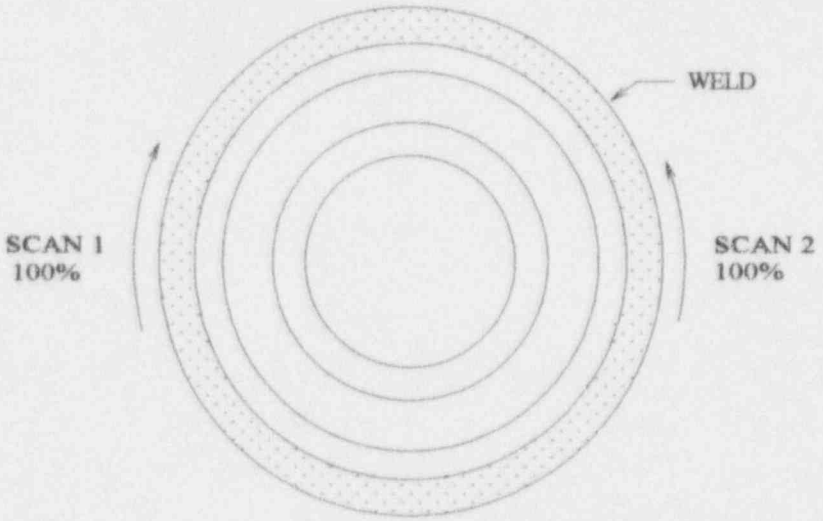
Additional welds exist for this examination category item, but are in less critical locations or are subject to less severe service conditions. However, these welds are similar in configuration and would also require relief if they were selected for examination during the present 10-year interval.

ALTERNATIVE EXAMINATION:

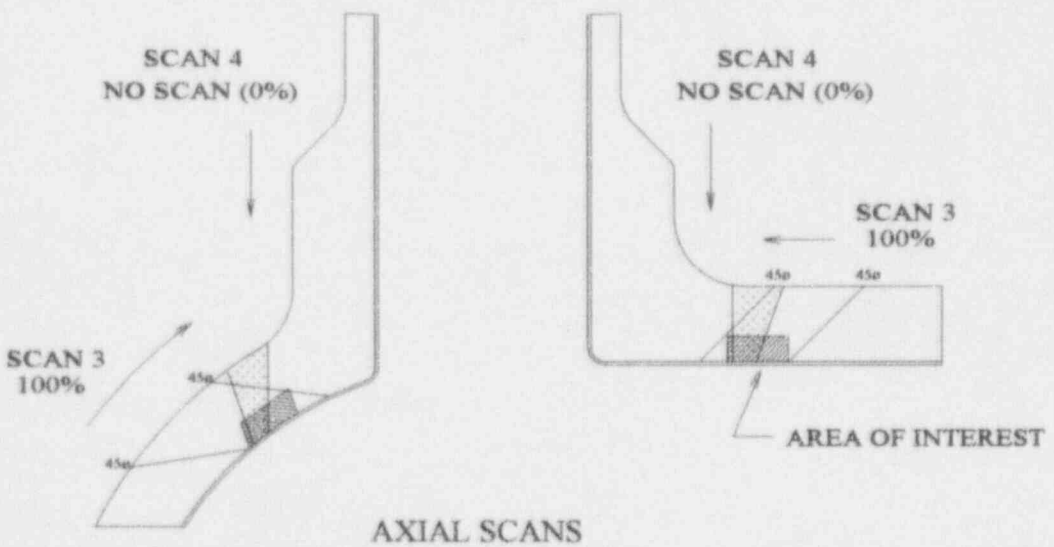
Each weld will be examined in the circumferential direction in accordance with ASME Code requirements. Each weld will be examined in the axial direction from the pipe surface only. The surface examination will be performed as required by the ASME Code.

# REACTOR COOLANT BRANCH CONNECTION WELDS

SCAN 1 - 100% COVERAGE
SCAN 2 - 100% COVERAGE
SCAN 3 - 100% COVERAGE
SCAN 4 - 0% COVERAGE
AVERAGE OF THE FOUR SCANS = EXAM 75% COMPLETE




CIRCUMFERENTIAL SCANS
100% COVERAGE




AXIAL SCANS
50% COVERAGE

# RELIEF REQUEST
# RR-A11

## COMPONENT DESCRIPTION:

Welds
- 1 - Pressurizer Spray Nozzle to Upper Pressurizer Head Weld
- 3 - Pressurizer Relief Nozzle to Upper Pressurizer Head Welds
- 1 - Pressurizer Surge Line Nozzle to Lower Pressurizer Head Weld
- 4 - Steam Generator Outlet Nozzle to Lower Head Welds
- 2 - Steam Generator Inlet Nozzle to Upper Head Welds

Inside Radius Sections
- 1 - Pressurizer Spray Nozzle Inside Radius Section
- 3 - Pressurizer Relief Nozzle Inside Radius Section
- 1 - Pressurizer Surge Line Nozzle Inside Radius Section
- 4 - Steam Generator Outlet Nozzle Inside Radius Section
- 2 - Steam Generator Inlet Nozzle Inside Radius

## ASME CODE CLASS:

ASME Section XI Class 1

## ASME EXAMINATION REQUIREMENTS:

Subsection IWB, Table IWB-2500-1, Examination Category B-D, Item No. B3.110 (Pressurizer Nozzle to Vessel Welds) requires a volumetric examination of all nozzle to vessel welds.

Subsection IWB, Table IWB-2500-1, Examination Category B-D, Item No. B3.120 (Pressurizer Nozzle Inside Radius Section) requires a volumetric examination of the Inside Radius Section of all nozzles.

Subsection IWB, Table IWB-2500-1, Examination Category B-D, Item No. B3.130 (Steam Generators Primary Side Nozzle to Vessel Welds) requires a volumetric examination of all nozzle to vessel welds.

Subsection IWB, Table IWB-2500-1, Examination Category B-D, Item No. B3.140 (Steam Generator Primary Side Nozzle Inside Radius Section) requires a volumetric examination the Inside Radius Section of all nozzles.

The examination requirements for these examinations are identified in Figure No. IWB-2500-7(a).

Code Case N-460 states that when the entire examination volume or area cannot be examined due to interference by another component or part geometry, a reduction in examination coverage may be accepted provided the reduction in coverage for that weld is less than 10 percent.

BASIS FOR RELIEF:

The volumetric examination of the identified welds and inside radii is limited by the nozzle configurations and the inability to "bounce" the ultrasonic beam from the vessel's inside cladded surface. This reduces the examination coverage more than 10 percent.

Article 4, Section V of the ASME Code, 1986 Edition requires the weld and adjacent base metal to be examined using nominal angles of 45 and 60 degrees, (deviation is permitted if geometry limits the coverage, however, separation of angles must be at least 10 degrees) and a straight beam. Four basic scan directions are required for the angle beams. Two perpendicular to the weld axis (axial scan) from opposite directions and two parallel to the weld axis (circumferential scan) from opposite directions. These requirements apply for each of the angle beams used (i.e., 45 and 60 degrees). Each of the 45 and 60 degree angle beams is required to pass through all of the weld volume in the four basic scan directions. However, the adjacent base metal scanning requirements allow the two beam angles to pass through in only one direction each for the axial and circumferential scans.

The following methodology was used to determine the extent of examination coverage. The attached sketches depict a typical nozzle configuration and illustrate this methodology.

1. A scaled cross sectional drawing of the component configuration, extent of coverage and the area of interest was drawn using a Computer Aided Design Drafting (CADD) program. The examination area was divided into 4 zones. Zone 1 and 3 are the base material on either side of the weld. Zone 2 is the weld material. Zone 4 is the Inside Radius Section as applicable.

2. As noted above, Zones 1 and 3 require 5 scans (45 and 60 degrees from 1 axial and 1 circumferential direction and a straight beam) while Zone 2 requires 9 scans (45 and 60 degrees from 2 axial and 2 circumferential directions and a straight beam). Each scan is assigned a weighting factor to be used in the determination of the overall examination coverage. For example, The axial scan of the Zone 1 base material for reflectors parallel to the weld (axial scan) consists of 2 angle beam scans from one direction. This represents 2 of the 5 (40 percent) base metal scans in the Zone 1 area.

Therefore the axial scan in Zone 1 is assigned a weighting factor of 0.40. Similarly, weighting factors for the other scans were determined as follows:

| Zone 1 (5 scans) | Zone 2 (9 scans) | Zone 3 (5 scans) |
|---|---|---|
| Axial = 40% (0.40) | Axial = 44% (0.44) | Axial = 40% (0.40) |
| Circ = 40% (0.40) | Circ = 44% (0.44) | Circ = 40% (0.40) |
| 0 degrees = 20% (0.20) | 0 degrees = 12% (0.12) | 0 degrees = 20% (0.20) |

3. The examination coverage (i.e., the amount of the sound beam that passes through each zone) was plotted on the CADD drawing for each of the ASME Code required scans. The area covered in each zone by the axial, circumferential, and straight beam examinations was then measured by CADD. If the area covered received all tne required scans it was considered 100 percent complete. If it received one-half of the required scans it is considered 50 percent complete, etc. This area is then multiplied by the weld length to determined the examination volume covered.

4. The examination volume covered in each zone by the axial, circumferential, and straight beam scans is multiplied by the weight factor. After applying a weight to each scan, they are added together and divided by the total area for that zone to determine the percent complete for the zone. Then all the 3 zones are added together and divided by 3 to determine the total examination coverage.

5. Zone 4 Inside Radius examinations are considered base material exams and the same parameters associated with Zones 1 and 3 apply to Zone 4 examinations.

6. When the total examination coverage is less than 90 percent, additional angles, such as 70 degrees and 35 degrees are plotted to determine if they will increase the examination coverage. Based on this determination and the principals of ALARA, additional scans beyond those required by the ASME Code are performed to increase examination coverage when considered practical.

Using this methodology, the total examination coverage for each of the following components has been determined to be less than the 90 percent limitation imposed by Code Case N-460. These limitations are caused by the nozzle radii and configurations.

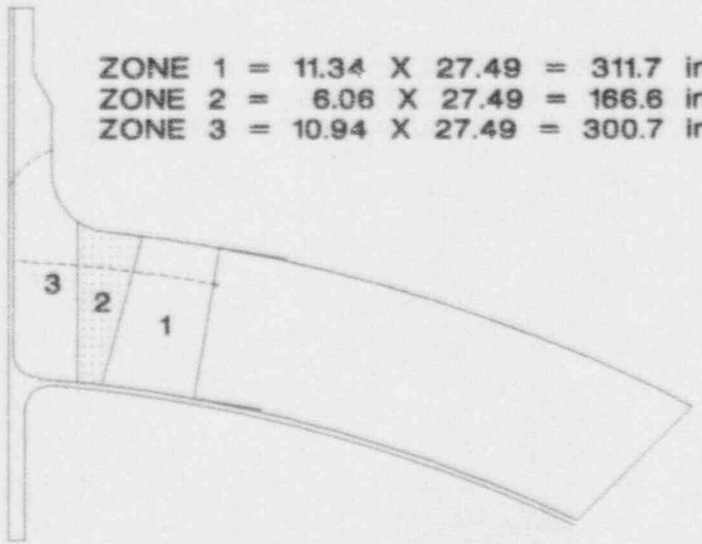
| Component | Examination Coverage |
|---|---|
| Pressurizer Spray Nozzle to Upper Pressurizer Head Weld | 72% |
| Pressurizer Relief Nozzle to Upper Pressurizer Head Weld | 60% |
| Pressurizer Surge Line Nozzle to Lower Pressurizer Head Weld | 69% |
| Steam Generator Outlet Nozzle to Lower Head Weld | 75% |
| Steam Generator Inlet Nozzle to Upper Head Weld | 72% |
| Pressurizer Spray Nozzle Inside Radius Section | 45% |
| Pressurizer Relief Nozzle Inside Radius Section | 51% |
| Pressurizer Surge Line Nozzle Inside Radius Section | 50% |
| Steam Generator Outlet Nozzle Inside Radius Section | 46% |
| Steam Generator Inlet Nozzle Inside Radius Section | 52% |

ALTERNATIVE EXAMINATION:

Each weld will be examined to the maximum extent practical within the principals of ALARA.

# PRESSURIZER SPRAY NOZZLE

WELD DIAMETER = 8.75 in.
WELD CIRCUMFERENCE = 27.49 in.




ZONE 1 = 11.34 X 27.49 = 311.7 $in^3$
ZONE 2 = 6.06 X 27.49 = 166.6 $in^3$
ZONE 3 = 10.94 X 27.49 = 300.7 $in^3$

AREAS BELOW WERE CALCULATED BY CADD

| ZONE | TOTAL VOLUME ( $in.^3$ ) | COVERAGE ($in^3$) | | | TOTAL % COMPLETE |
|---|---|---|---|---|---|
| | | AXIAL | CIRC. | 0° | |
| 1 | 311.7 | 311.7 | 311.7 | 311.7 | 100% |
| | | X .40 | X .40 | X .20 | |
| | | 124.7 | 124.7 | 62.34 | |
| 2 | 166.6 | 78.1 | 115.7 | 166.6 | 63.2% |
| | | X .44 | X .44 | X .12 | |
| | | 34.4 | 50.9 | 19.99 | |
| 3 | 300.7 | 237.78 | 19.2 | 300.7 | 54.2% |
| | | X .40 | X .40 | X .20 | |
| | | 95.11 | 7.7 | 60.14 | |
| | | | | | 72% |

AXIAL DIRECTION COVERAGE

ZONE 1

11.34 $in^2$ x 100% (2 angles, 1 direction) = 11.34 $in^2$
x 27.49 in (circumference)
311.7 $in^2$

ZONE 2

5.69 $in^2$ x 50% (2 angles, 1 direction) = 2.8 $in^2$
0.18 $in^2$ x 25% (1 angle, 1 direction) = 0.04 $in^2$
+
27.49 in (circumference) x 2.84 $in^2$ = 78.1 $in^2$

ZONE 3

7.45 $in^2$ x 100%(2 angles, 1 direction) = 7.45 $in^2$
2.41 $in^2$ x 50% (1 angle, 1 direction) = 1.20 $in^2$
+
27.49 in (circumference) x 8.65 $in^2$ = 237.78 $in^2$

CIRCUMFERENCIAL DIRECTION COVERAGE

ZONE 1

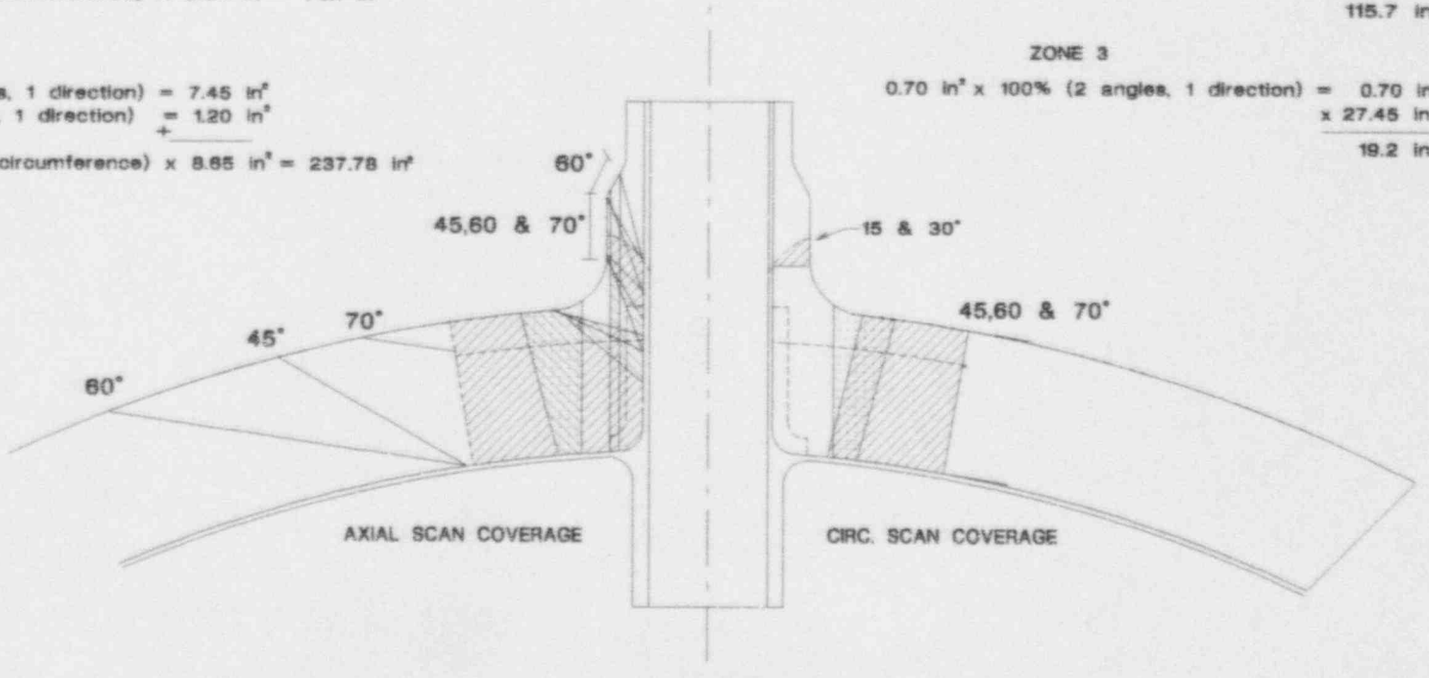
11.34 $in^2$ x 100% (2 angles, 1 direction) = 11.34 $in^2$
x 27.45 $in^2$ (circumference)
311.7 $in^2$

ZONE 2

4.21 $in^2$ x 100% (2 angles, 2 direction) = 4.21 $in^2$
x 27.45 $in^2$ (circumference)
115.7 $in^2$

ZONE 3

0.70 $in^2$ x 100% (2 angles, 1 direction) = 0.70 $in^2$
x 27.45 $in^2$ (circumference)
19.2 $in^2$




100%

50%

25%

0° SCAN COVERAGE = 100%
(ZONES 1, 2 & 3)

RELIEF REQUEST RR-A11
ATTACHMENT 2
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# PZR. SPRAY NOZ. - Inside Radius Exam.

AREA 4 TOTAL AREA = 2.45
AREA 4 CIRCUMFERENCE = 14.14

| AREA | TOTAL VOLUME ( $in.^3$ ) | COVERAGE | | TOTAL % COMPLETE |
|---|---|---|---|---|
| | | AXIAL | CIRC. | |
| 4 | 34.64 | 31.1 | 0.0 | 45% |
| | | X .50 | X .50 | |
| | | 15.55 | 0.0 | |

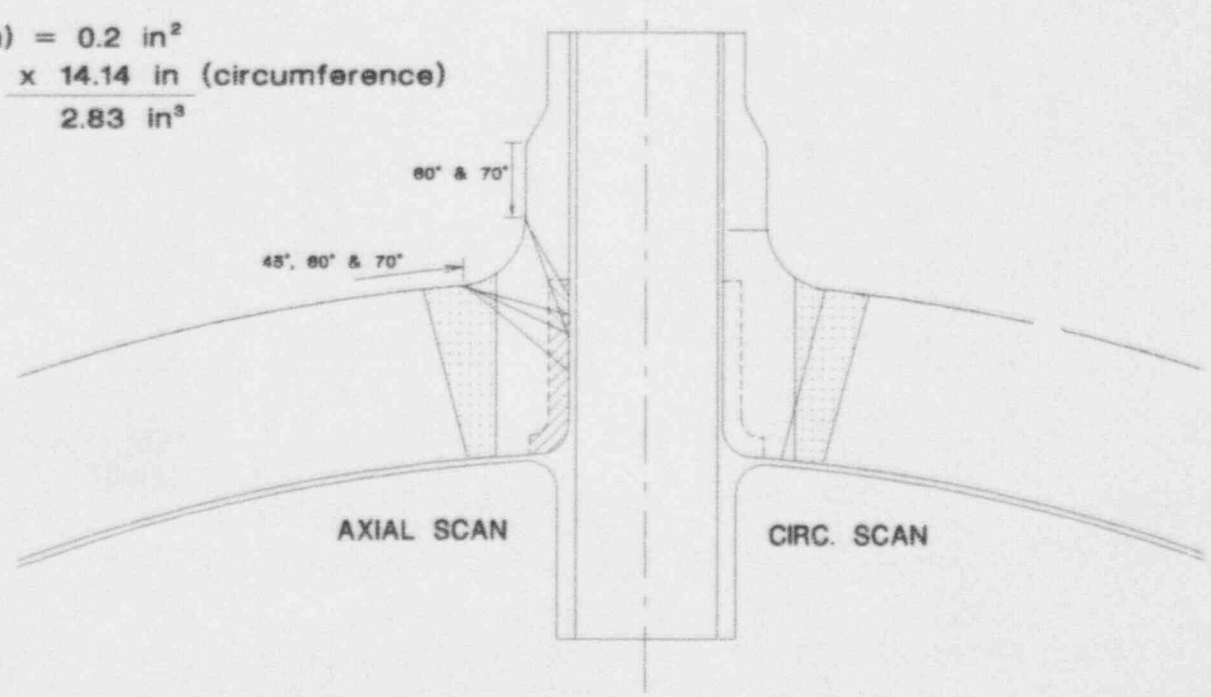
AXIAL DIRECTION COVERAGE

2.0 $in^2$ x 100% (2 angles, 1 direction) = 2.0 $in^2$
x 14.14 in (circumference)
28.28 $in^3$

0.4 $in^2$ x 50% (2 angles, 1 direction) = 0.2 $in^2$
x 14.14 in (circumference)
2.83 $in^3$

CIRCUMFERENCIAL DIRECTION COVERAGE

0.0 $in^3$



# RELIEF REQUEST RR-B7

## COMPONENT DESCRIPTION:

6 inch High Pressure Injection Pump Suction Nozzle to Casing Weld

4 inch High Pressure Injection Pump Discharge Nozzle to Casing Weld

## ASME CODE CLASS:

ASME Section XI Class 2

## ASME EXAMINATION REQUIREMENTS:

Subsection IWC, Table IWC-2500-1, Examination Category C-G, Item No. C6.10 (Pump Casing Welds) requires a surface examination of all welds. In cases where multiple pumps are of similar design, size, function, and service, the welds in one pump may be selected.

Code Case N-460 states that when the entire examination area cannot be examined due to interference by another component or part geometry, a reduction in examination coverage may be accepted provided the reduction in coverage for that weld is less than 10 percent.

## BASIS FOR RELIEF:

The surface examination of the identified welds is limited by the component geometry such that the reduction in coverage is greater than 10 percent.

An integrally welded attachment is welded at the point where the suction and discharge nozzles attach to the High Pressure Injection Pump casing.

The circumference of the discharge nozzle to casing weld is approximately 21 inches. The attachment covers up approximately 4.75 inches of the discharge nozzle to casing weld. Therefore, only 77 percent of the examination area is available for examination.

The circumference of the suction nozzle to casing weld is approximately 14 inches. The attachment covers up approximately 4.75 inches of the discharge nozzle to casing weld. Therefore, only 66 percent of the examination area is available for examination.

The discharge and suction nozzle welds on both High Pressure Injection Pumps are of similar design. Therefore, no other welds are available for examination.

ALTERNATIVE EXAMINATION:

No alternative examination is proposed. The available surface area of the High Pressure Injection Pump discharge and suction nozzle to casing welds will be surface examined to the maximum extent possible.

# RELIEF REQUEST RR-A12

COMPONENT DESCRIPTION:

IWB-2430 and IWC-2430 Additional Examinations

ASME CODE CLASS:

ASME Section XI, Class 1 and 2 with the exception of Code Categories B-E, B-P, and C-H.

ASME EXAMINATION REQUIREMENTS:

IWB-2430 requires the examination of additional components when indications exceeding the acceptance criteria of Table IWB-3410-1 are revealed.

IWC-2430 requires the examination of additional components when indications exceeding the acceptance criteria of Table IWC-3000 are revealed.

BASIS FOR RELIEF:

Approval to use IWB-2430 and IWC-2430 of the 1989 Edition, 1991 Addenda of ASME Section XI is requested.

The 1986 Edition of ASME Section XI is very prescriptive in determining the number of additional examinations required when indications exceeding the acceptance standards are found. The root cause or the service conditions to which the component was subjected is not considered when determining the additional examinations. This could result in examining components which do not have the same failure mechanisms as the component which contained the unacceptable indication. Examination time, cost, and radiation exposure would increase without an increase in public health or safety.

The 1989 Edition, 1991 Addenda of ASME Section XI uses the material and service conditions of the component when determining the need for additional examinations, thereby eliminating the need to perform examinations on components which are not subjected to similar service conditions or are of similar materials.

ALTERNATIVE EXAMINATION:

Additional examinations will be determined using IWB-2430 or IWC-2430 of the 1989 Edition, 1991 Addenda of ASME Section XI.