

TECHNICAL EVALUATION REPORT  
NORTH ANNA POWER STATION UNIT NO. 1  
INSERVICE INSPECTION PROGRAM

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Science Applications, Inc.  
McLean, Virginia 22102

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## CONTENTS

INTRODUCTION . . . . .	1
I. CLASS 1 COMPONENTS . . . . .	4
A. Reactor Vessel . . . . .	4
1. Reactor Vessel Closure Head Cladding and Vessel Cladding, Category B-I-1, Items B1.13 and B1.14 . . . . .	4
B. Pressurizer . . . . .	6
1. Nozzle to Safe-End Welds, Category B-F, Item B2.4 . . . . .	6
C. Heat Exchangers and Steam Generators (No relief requests)	
D. Piping Pressure Boundary . . . . .	8
1. Branch Pipe Connection Welds Exceeding 6-Inch Diameter, Category B-J, Item B4.6 . . . . .	8
2. Integrally Welded Supports, Category B-K-1, Item B4.9 . . . . .	10
E. Pump Pressure Boundary . . . . .	11
1. Reactor Coolant Pump, Seal Housing Bolting (In Place and Removed), Category B-G-1, Items B5.1 and B5.2 . . . . .	11
2. Pump Casing Welds, Category B-L-1, Item B5.6 . . . . .	13
F. Valve Pressure Boundary . . . . .	15
1. Pressure Retaining Bolting When Removed, Category B-G-1, Item B6.2 . . . . .	15
II. CLASS 2 COMPONENTS . . . . .	16
A. Pressure Vessels . . . . .	16
1. Residual Heat Exchanger, Shell to Tubesheet Flange Welds, Category C-A, Item C1.1 . . . . .	16
2. Seal Water Return Filters, Cover Weldment-to-Shell Weld and Head-to-Shell Weld, Category C-A, Item C1.1 . . . . .	18
3. Steam Generators, Steam Outlet Nozzle-to-Shell Weld and Feedwater Inlet Nozzle-to-Shell Weld, Category C-B, Item C1.2 . . . . .	19
4. Residual Heat Exchanger (Tube Side), Nozzle-to-Vessel Welds, Category C-B, Item C1.2 . . . . .	21
B. Piping . . . . .	22
1. Branch Pipe-to-Pipe Welds, Categories C-F and C-G, Item C2.3 . . . . .	22



C. Pumps . . . . .	24
1. Centrifugal Charging Pumps, Pump Casing Welds, Category C-F, Item C3.1 . . . . .	24
D. Valves (No relief requests)	
III. CLASS 3 COMPONENTS (No relief requests)	
IV. PRESSURE TESTS . . . . .	25
A. General (No relief requests)	
B. Class 1 System Pressure Tests . . . . .	25
1. Piping Between Two Check Valves or Two Normally Closed Valves . . . . .	25
C. Class 2 System Pressure Tests . . . . .	27
1. Systems That Cannot Be Isolated from Class 1 Systems . . .	27
D. Class 3 System Pressure Tests . . . . .	29
1. Systems in Continuous Use . . . . .	29
V. GENERAL (No relief requests)	
REFERENCES . . . . .	32



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## INTRODUCTION

The revision to 10 CFR 50.55a, published in February 1976, required that Inservice Inspection (ISI) Programs be updated to meet the requirements (to the extent practical) of the Edition and Addenda of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code\* incorporated in the Regulation by reference in paragraph (b). This updating of the programs was required to be done every 40 months to reflect the new requirements of the later editions of Section XI.

As specified in the February 1976 revision, for plants with Operating Licenses issued prior to March 1, 1976, the regulations became effective after September 1, 1976, at the start of the next regular 40-month inspection period. The initial inservice examinations conducted during the first 40-month period were to comply with the requirements in editions of Section XI and addenda in effect no more than six months prior to the date of start of facility commercial operation.

The Regulation recognized that the requirements of the later editions and addenda of the Section XI might not be practical to implement at facilities because of limitations of design, geometry, and materials of construction of components and systems. It therefore permitted determinations of impractical examination or testing requirements to be evaluated. Relief from these requirements could be granted provided health and safety of the public were not endangered giving due consideration to the burden placed on the licensee if the requirements were imposed. This report provides evaluations of the various requests for relief by the licensee, Virginia Electric and Power Company (VEPCO), of the North Anna Power Station Unit 1. It deals only with inservice examinations of components and with system pressure tests. Inservice tests of pumps and valves (IST programs) are being evaluated separately.

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\* Hereinafter referred to as Section XI or Code.



The revision to 10 CFR 50.55a, effective November 1, 1979, modified the time interval for updating ISI programs and incorporated by reference a later edition and addenda of Section XI. The updating intervals were extended from 40 months to 120 months to be consistent with intervals as defined in Section XI.

For plants with Operating Licenses issued prior to March 1, 1976, the provisions of the November 1, 1979, revision are effective after September 1, 1976, at the start of the next one-third of the 120-month interval. During the one-third of an interval and throughout the remainder of the interval, inservice examinations shall comply with the latest edition and addenda of Section XI, incorporated by reference in the Regulation, on the date 12 months prior to the start of that one-third of an interval. For North Anna, the ISI program and the relief requests evaluated in this report cover the entire first 10-year interval, i.e., from June 1978 through June 1988. This program was based upon the 1974 Edition of Section XI of the ASME Boiler and Pressure Vessel Code with Addenda through the Summer of 1975.

The November 1979 revision of the Regulation also provides that the ISI programs may meet the requirements of subsequent code editions and addenda, incorporated by reference in Paragraph (b) and subject to Nuclear Regulatory Commission (NRC) approval. Portions of such editions or addenda may be used, provided that all related requirements of the respective editions or addenda are met. These instances are addressed on a case-by-case basis in the body of this report.

Finally, Section XI of the Code provides for certain components and systems to be exempted from its requirements. In some instances, these exemptions are not acceptable to NRC or are only acceptable with restrictions. As appropriate, these instances are also discussed in this report.

References (1) to (8) listed at the end of this report pertain to information transmittals on the Inservice Inspection (ISI) Program between the licensee and NRC. A submittal was made by the licensee on August 9, 1977,<sup>(1)</sup> and was followed by an additional relief request on December 29, 1981.<sup>(5)</sup> By letters of October 19, 1977,<sup>(2)</sup> and March 10, 1982,<sup>(6)</sup> the NRC requested additional information. The licensee provided some responses on December 16, 1977,<sup>(3)</sup> and amplified these responses by letter of October 27, 1978.<sup>(4)</sup> Additional responses were made on May 27, 1982,<sup>(7)</sup> and August 12, 1982.<sup>(8)</sup>



From these submittals, a total of 13 requests for relief from Code requirements or updating to a later code were identified. These requests are evaluated in the following sections of this report. In addition, five earlier relief requests in Reference 1 were withdrawn by the licensee in Reference 8: Seal Water Return Filters, Integrally Welded Supports, Category C-C, Item C1.3; Seal Water Filters, Head-to-Shell Weld and Shell-to-Flange Weld, Category C-A, Item C1.1; Seal Water Injection Filters, Integrally Welded Supports, Category C-C, Item C1.3; Reactor Coolant Filter, Cover Weldment-to-Shell Weld and Head-to-Shell Weld, Category C-A, Item C1.1; and Reactor Coolant Filter, Integrally Welded Supports, Category C-C, Item C1.3. One request made in Reference 1 on repair procedures was withdrawn in Reference 6.

I. CLASS 1 COMPONENTS

A. Reactor Vessel

1. Reactor Vessel Closure Head Cladding and Vessel Cladding,  
Category B-I-1, Items B1.13 and B1.14

Code Requirement

The examinations performed during each inspection interval shall cover 100% of the patch areas. The areas shall include at least six patches (each 36 sq. in.) evenly distributed, in the closure head, and six patches (each 36 sq. in.) evenly distributed in the accessible sections of vessel shell. The examination shall be (1) visual and surface, or (2) volumetric for the closure head cladding, and visual for the vessel cladding.

Code Relief Request

Relief is requested from performing Code required examinations of vessel cladding.

Proposed Alternative Examination

None.

Licensee's Basis for Requesting Relief

The examination is not justified because of high radiation levels. The requirements do not appear in the 1977 Edition of the Code.

Evaluation

The 1977 Edition of Section XI has been referenced in 10 CFR 50.55a and inservice examinations may meet the requirements of this edition in lieu of those from previous editions with the following provisions:

- (a) Commission approval is required to update to the more recent edition (pursuant to 10 CFR 50.55 a (g)(4)(iv)).
- (b) When applying the 1977 Edition, all of the addenda through Summer 1978 Addenda must be used.
- (c) Any requirement of the more recent edition which is related to the one(s) under consideration must also be met.



The requirements for examining closure-head cladding and vessel cladding are deleted from the 1977 Edition with addenda through Summer 1978.

#### Recommendations

Pursuant to 10 CFR 50.55a(g)(4)(iv), approval should be granted to update to the requirements of the Summer 1978 Addenda for Category B-1-1 items. This approval would delete the requirement to examine these items.

#### References

Reference 5.



Science Applications, Inc.

B. Pressurizer

1. Nozzle to Safe-End Welds, Category B-F, Item B2.4

Code Requirement

Volumetric and surface examinations shall be performed during each inspection interval and shall cover the circumference of 100% of the welds. The areas examined shall include the dissimilar metal welds and base metal for, at least, one wall thickness beyond the edge of the weld.

Code Relief Request

Relief is requested from making a full volumetric examination.

Proposed Alternative Examination

Welds will be examined to the extent practical.

Licensee's Basis for Requesting Relief

The arrangements and details of the piping system and components are such that some examinations as required by IWB-2600 are limited due to geometric configuration or accessibility. Generally, these limitations exist at pipe to fitting welds, where examination can only be fully performed from the pipe side, the fitting geometry limiting or even precluding examination from the opposite side. Welds having such restrictions will be examined to the extent practical.

Evaluation

In a subsequent response to a request for information, the licensee states that:

The configuration of a typical pressurizer nozzle to safe-end weld (Category B-F) is shown in Figure S5.90-2. Ultrasonic examinations can be performed on 100 percent of the weld and the base metal on the safe-end side to the extent required by IWB-3514.1. The configuration of the nozzle limits the examination to approximately 80 percent of the required base metal on the nozzle side. Surface examinations can be performed to 100 percent of the code requirement.

Access to the weld from both sides is not available but it is apparently possible to make a full V-path ultrasonic



examination of the weld from one side. This examination complies with the more recent 1977 Code (Summer 1978 Addenda), Article III-4420. The required angle beam calibration is given in Article III-3230. Figure IWB-2500-8 shows the areas to be volumetrically and surface examined for this Code item (now B5.20). This examination is considered more effective than the full volumetric examination specified in the 1974 Edition, Summer 1975 Addenda.

The 1977 Edition of Section XI has been referenced in 10 CFR 50.55a and inservice examinations may meet the requirements of this edition in lieu of those from previous editions with the following provisions:

- (a) Commission approval is required to update to the more recent edition (pursuant to 10 CFR 50.55a (g)(4)(iv)).
- (b) When applying the 1977 Edition, all of the addenda through Summer 1978 Addenda must be used.
- (c) Any requirement of the more recent edition which is related to the one(s) under consideration must also be met.

#### Recommendations

Based on the above evaluation, relief from Code requirements should not be granted. Instead, pursuant to 10 CFR 50.55a (g)(4)(iv), approval should be granted to update to the requirements of the 1977 Edition, Summer 1978 Addenda, for Item B5.20. This approval would permit a full V-weld examination from one side, and a more limited volumetric examination. It would also require a surface examination.

#### References

References 1, 2 and 3.

C. Heat Exchangers and Steam Generators  
No relief requests.



D. Piping Pressure Boundary

1. Branch Pipe Connection Welds Exceeding 6-Inch Diameter,  
Category B-J, Item B4.6

Code Requirement

The volumetric examination of longitudinal and circumferential welds and base metal for one wall thickness beyond the edge of the weld is required. The examinations performed during each inspection interval shall cover all of the area of 25% of the circumferential joints including the adjoining one foot sections of longitudinal joints and 25% of pipe branch connection joints.

Code Relief Request

Relief is requested from full volumetric examination.

Proposed Alternative Examination

Volumetric examination to the extent practical supplemented by surface examination.

Licensee's Basis for Requesting Relief

The geometric configuration of the weld surface may prevent ultrasonic examinations from being performed to the extent required by IWB-2600. Examinations will be performed to the extent practical from the pipe and nozzle surfaces adjacent to the weld. Surface examinations of the weld may be performed, as necessary to supplement the volumetric examination.

Evaluation

In a subsequent response to a request for information the licensee states the following:

The configuration of the reactor coolant branch nozzle connection welds is as shown in Figure S5.90-4. Ultrasonic examinations cannot be performed on the surface of the weld. Surface examination will be performed on 100 percent of the weld and adjacent base material.

It may be possible to make a full V-path ultrasonic examination of the weld from the nozzle forging side. This examination complies with the more recent 1977 Code (Summer 1978 Addenda), Article III-4420. The required angle beam calibration is given in Article III-3230. The 1977 Edition



of Section XI has been referenced in 10 CFR 50.55a and inservice examinations may meet the requirements of this edition in lieu of those from previous editions with the following provisions:

- (a) Commission approval is required to update to the more recent edition (pursuant to 10 CFR 50.55a-(g)(4)(iv);
- (b) When applying the 1977 Edition, all of the addenda through Summer 1978 Addenda must be used;
- (c) Any requirement of the more recent edition which is related to the one(s) under consideration must also be met.

If a full volumetric examination cannot be made from one side, it should be supplemented by a surface examination. This surface examination should meet the intent of Figure IWB-2500-10 of the Summer 1978 Addenda of the 1977 Edition. (Although Item B9.31 of this code version calls for volumetric examination, no examination volume is shown on this figure.)

#### Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, the code requirements are impractical. It is further concluded that the alternative examination discussed above will provide necessary added assurance of structural reliability. Therefore, the following is recommended:

Pursuant to 10 CFR 50.55a(g)(4)(iv), approval should be granted to update to the requirements of the 1977 Edition, Summer 1978 Addenda, to examine Item B4.6 welds using the techniques in Appendix III, specifically Articles III-3230 and III,4420, with the following provision:

If a full volumetric examination cannot be made from one side of the weld, a surface examination to Figure IWB-2500-10 of the Summer 1978 Addenda should also be done.

#### References

References 1, 2 and 3.



## 2. Integrally Welded Supports, Category B-K-1, Item B4.9

### Code Requirement

The areas for volumetric examination shall include the integrally welded external support attachments. This includes the welds to the pressure retaining boundary and the base metal beneath the weld zone and along the support attachment member for a distance of two support thicknesses. The examination performed during each inspection interval shall cover 25% of the integrally welded supports and shall be scheduled within the interval per IWB-2411.

### Code Relief Request

Relief is requested from the full volumetric examination.

### Proposed Alternative Examination

Surface examination will be performed on integrally welded attachments to supplement the volumetric examination.

### Licensee's Basis for Requesting Relief

The piping system integrally welded supports are attached to the pipe by fillet welds. The configuration of such welds is such that examinations cannot be performed to the extent required by IWB-2600 and only the base material of the pipe wall can be examined by ultrasonic techniques.

### Evaluation

The geometry of fillet welds for piping supports generally cannot be examined to the extent required by Section XI by ultrasonic examination. Ultrasonic examination of the base metal would detect piping flaws in the heat affected zone but would provide little or no information on weld penetration. Any penetration flaws would most likely generate at the surface and be detectable by surface examination.

### Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, the code requirements are impractical. It is further concluded that the alternative examination discussed above will provide necessary added assurance of structural reliability. Therefore, it is recommended that relief from 100% volumetric examination be granted provided the alternative surface examination is performed.

### References

Reference 1.



E. Pump Pressure Boundary

1. Reactor Coolant Pump, Seal Housing Bolting (In Place and Removed), Category B-G-1, Items B5.1 and B5.2

Code Requirement

Volumetric examination for bolting in place and volumetric and surface when removed of bolting 2 inches and larger in diameter. The examinations shall cover 100% of the bolts, studs, nuts, and threads in base material and flange ligaments between threaded stud holes. The examination schedule shall be according to paragraph IWB-2400.

Bolting may be examined either in place under tension, when the connection is disassembled, or when bolting is removed.

Code Relief Request

Pump bolting cannot be volumetrically examined in place; relief is requested to only examine the pump bolting when pumps are disassembled for maintenance.

Proposed Alternative Examination

Examination will be performed, to the extent required by IWB-2600, when the seal housing is disassembled for maintenance.

Licensee's Basis for Requesting Relief

The reactor coolant pump seal housing bolts are of the socket head type and the configuration is such that ultrasonic examinations as required by IWB-2600 cannot be performed when the bolting is in place.

Evaluation

The design of the seal housing bolts prevents ultrasonic examination, and radiography is an impractical technique to use with the bolting in place. To disassemble a reactor coolant pump at the frequency required to perform the examination would place an undue burden on the licensee without providing a comparable increase in the level of safety of the facility.

The ISI program requires that at least one pump in the group be disassembled and the casing weld be examined once every 10 years. The bolting should be examined at the same time; thus, as a minimum, the bolting of at least one pump will be examined every 10 years. This limited inspection and the



routine monitoring for leakage will provide adequate information about the condition of seal housing bolts.

#### Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the bolts discussed above, the code requirements are impractical. It is further concluded that the alternative examination discussed above will provide necessary added assurance of structural reliability. Therefore, it is recommended that relief to examine the pump bolting only when the pumps are disassembled for maintenance (and casing weld examination) be granted.

#### References

Reference 1.



2. Pump Casing Welds, Category B-L-1, Item B5.6

Code Requirement

Volumetric examination shall cover the weld metal and the base metal for one wall thickness beyond the edge of the weld. The examinations performed during each inspection interval shall include 100% of the pressure-retaining welds in at least one pump in each group of pumps performing similar functions in system (e.g., recirculating coolant pumps). The examinations may be performed at or near the end of the inspection interval.

Code Relief Request

Relief is requested from volumetric examination.

Proposed Alternative Examination

None.

Licensee's Basis for Requesting Relief

Volumetric examinations as required by IWB-2600 will be attempted utilizing radiographic techniques. The success of these examinations will be dependent upon the availability of high energy gamma sources and the level of background radiation. Internal fittings in the pump may also provide restriction to the extent of examination that can be performed.

Evaluation

Ultrasonic examination of these welds is impractical because of the heavy wall and cast stainless material of the pump casing.

Other licensees have made successful volumetric examinations by taking multiple shots using the miniature linear accelerator (MINAC) of the weld area and 1/2-inch on each side. An evaluation of the applicability of this examination technique at North Anna should be made. The 1974 Code calls for an examination for a distance of one wall thickness on each side of the weld. With the MINAC technique this is impractical, and examination of 1/2-inch on each side of the weld is adequate. This is in compliance with the 1977 Edition through Summer 1978 Addenda of Section XI.



#### Conclusions and Recommendations

Not enough information has been supplied to show that this request is impractical and relief should be denied. If later in the interval, the licensee determines that the MINAC technique is not practical and a suitable alternative volumetric examination cannot be found, the licensee should make another relief request.

#### References

Reference 1.



Science Applications, Inc.

F. Valve Pressure Boundary

1. Pressure Retaining Bolting When Removed, Category B-G-1  
Item B6.2

Code Requirement

Volumetric and surface examinations are required. The areas shall include bolts, studs, nuts, bushings, washers, and threads in base material and flange ligaments between threaded stud holes. The examinations performed during each inspection interval shall cover 100% of the bolts, studs, nuts, bushings, and threads in base material and flange ligaments between threaded stud holes. Bolting may be examined either in place under tension, when the connection is disassembled, or when the bolting is removed. The examination schedule shall be according to paragraph IWB-2400.

Code Relief Request

Request relief from schedule given in paragraph IWB-2400.

Proposed Alternative Examination

Examination will only be performed when valve body is disassembled for other reasons.

Licensee's Basis for Requesting Relief

This examination to the extent required by IWB-2600 will only be performed when the valve is disassembled for maintenance purposes or at the end of the 10 year interval when disassembly is undertaken for the valve body examination.

Evaluation

The licensee has not asked for relief from Item B6.1 which indicates that the bolting will be examined either in place or when disassembled according to the schedule in IWB-2400. This complies with the Code and relief is not necessary.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that Code relief is not required and should not be granted.

References

- Reference 1.



## II. CLASS 2 COMPONENTS

### A. Pressure Vessels

#### 1. Residual Heat Exchanger, Shell to Tubesheet Flange Welds, Category C-A, Item C1.1

##### Code Requirement

A volumetric examination covering at least 20% of each circumferential weld, uniformly distributed among three areas around the vessel circumference shall be done over the lifetime of the plant (four intervals and three periods within each interval).

##### Code Relief Request

Relief is requested from performing the volumetric examination to the extent required by Code.

##### Proposed Alternative Examination

Examination will be performed to extent practical.

##### Licensee's Basis for Requesting Relief

The curvature of the weld reinforcement limits the extent that examinations can be performed for reflectors transverse to the weld as required by T535.2 of Section V. Examinations will be performed to the extent practical.

##### Evaluation

In a response to a subsequent request for information the licensee states that:

Examination of 20 percent of the total length of the residual heat exchanger shell to tubesheet flange weld (Category C-A) can be performed from the shell side utilizing angle beams. Examination from the top of the weld would be limited by the weld crown. Surface examination could be performed on 100 percent of the area requiring examination. (The extent of the ISI examination will be 90% of that required by Code).

Full volumetric examination is impractical and the volumetric examination proposed above is adequate provided it is supplemented with a surface examination and a visual inspection for leaks during pressure testing.



### Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the weld discussed above, the Code requirements are impractical. It is further concluded that the alternative examination discussed above will provide necessary added assurance of structural reliability. Therefore, it is recommended that relief from the full volumetric examination be granted, provided the alternative surface examination and visual examination for evidence of leakage per IWC-5000 are performed.

### References

References 1, 2 and 3.



2. Seal Water Return Filters, Cover Weldment-to-Shell Weld and Head-to-Shell Weld, Category C-A, Item C1.1

Code Requirement

Volumetric examination of the shell and head circumferential welds which are gross structural discontinuities is required. This includes weld metal and base metal for one plate thickness beyond the edge of the weld joint. The examinations shall cover at least 20% of each circumferential weld, uniformly distributed among three areas around the vessel circumference. The examinations shall be scheduled over the lifetime of the plate (four intervals with three 40-month periods within each interval).

Code Relief Request

Relief is requested from volumetric examination.

Proposed Alternative Examination

Surface and visual examination and possibly visual examination only.

Licensee's Basis for Requesting Relief

The thickness of the materials utilized for the construction of this component (0.165 to 0.185 in.) is such that meaningful results could not be expected with ultrasonic examination as required by IWC-2600. Surface and visual examination of these welds will be performed as an alternative method.

Evaluation

The material used for construction of this component is too thin for a meaningful ultrasonic examination. This is recognized in the 1977 Edition, Summer 1978 Addenda, where in certain categories (i.e., C-B and C-F), only surface examination is required for anything less than 1/2-inch. The proposed surface and visual examination is an acceptable alternative.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, the Code requirements are impractical. It is further concluded that the alternative examination discussed above will provide necessary added assurance of structural reliability. Therefore, it is recommended that Code relief from the volumetric examination be granted, provided the proposed surface and visual examinations are done.

References

References 1 and 8.



3. Steam Generators, Steam Outlet Nozzle-to-Shell Weld and  
Feedwater Inlet Nozzle-to-Shell Weld, Category C-B, Item C1.2

Code Requirement

Volumetric examination of 100% of the nozzle-to-vessel attachment weld scheduled over the lifetime of the plant (four intervals and three periods within each interval) is required.

Code Relief Request

Relief is requested from performing 100% of the required volumetric examination.

Proposed Alternative Examination

Examination will be performed to the extent practical.

Licensee's Basis for Requesting Relief

The geometric configuration of the nozzle surface prevents ultrasonic examinations from being performed to the extent required. Examinations will be performed to the extent practical from the weld and vessel surfaces adjacent to the weld.

Evaluation

In a subsequent response to a request for information the licensee states the following:

The steam generator outlet nozzle-to-shell weld and adjacent base material will be examined from both sides by angle beam to the extent permitted by adjacent insulation support structures. Scanning will be limited to 3 inches from the edge of the weld. The extent of the ISI examination will be 95% of that required by Code.

The steam generator feedwater nozzle-to-shell weld and base material will be fully examined from the shell side of the weld. The geometric configuration of the nozzle inhibits examination from that surface. The extent of the ISI examination will be 85% of that required by Code.

Full volumetric examination required is impractical and the volumetric examination discussed above is adequate, provided it is supplemented with a surface examination and a visual inspection for leakage during pressure testing.



### Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, the Code requirements are impractical. It is further concluded that the alternative examination discussed above will provide necessary added assurance of structural reliability. Therefore, it is recommended that relief from the full volumetric examination be granted, provided the alternative surface examination and visual examination for evidence of leakage per IWC-5000 are performed.

### References

References 1, 2 and 3.



4. Residual Heat Exchanger (Tube Side), Nozzle-to-Vessel Welds,  
Category C-B, Item C1.2

Code Requirement

Volumetric examination of 100% of the nozzle-to-vessel attachment welds scheduled over the lifetime of the plant (four intervals and three periods within each interval).

Code Relief Request

Relief is requested from performing the volumetric examination required by Code.

Proposed Alternative Examination

None.

Licensee's Basis for Requesting Relief

The nozzle-to-vessel welds of the residual heat exchangers are covered by a reinforcement ring and are not accessible for examination as required by IWC-2600. The geometric configuration is such that alternative NDE methods cannot be substituted.

Evaluation

The existing component geometry makes the Code-required volumetric examinations impractical because the subject welds are entirely covered by a reinforcement ring. A visual examination for evidence of leakage during system pressure tests, should be performed.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, the code requirements are impractical. It is further concluded that the alternative examination discussed above will provide necessary added assurance of structural reliability. Therefore, it is recommended that code relief from the volumetric examination be granted provided visual examination for evidence of leakage during system pressure tests per IWC-5000 is performed.

References

References 1, 2 and 3.



## B. Piping

### 1. Branch Pipe-to-Pipe Welds, Categories C-F and C-G, Item C2.3

#### Code Requirement

Categories C-F and C-G require the 100% volumetric examination (including weld metal and base metal for one wall thickness) for those branch-to-pipe welds selected for inspection in IWC-2520. This inspection shall be scheduled over the lifetime of the plant (four intervals with three periods within each interval).

#### Code Relief Request

Relief is requested from performing the 100% volumetric examination of the branch pipe-to-pipe welds selected for inspection in IWC-2520.

#### Proposed Alternative Examination

Examination will be performed to the extent practical.

#### Licensee's Basis for Requesting Relief

The restrictions to most of the Class 2 systems are as shown in Figure S5.90-4. Surface examinations would be performed to supplement the limited volumetric examination. However, the Class 2 branch connections located on the main steam lines are all covered, except for 3- to 6-inch relief lines, with weldment reinforcement rings and are not accessible for either surface or volumetric examination.

#### Evaluation

(a) Partially Accessible Welds: From the sketch (Figure S5.90-4), it appears possible to make a full V-path ultrasonic examination of the weld from the nozzle forging side. This examination complies with the more recent 1977 Code, Summer 1978 Addenda, Article III-4420. The required angle beam calibration is given in Article III-3230.

The licensee has proposed to perform surface examinations to supplement the limited volumetric examination. This surface examination should meet the intent of Figure IWC-2520-9 of the Summer 1978 Addenda.

The proposed examinations are more than adequate as evidenced by the Summer 1978 Addenda, which no longer require a volumetric examination for piping branch connections (Item C5.30).



(b) Covered Welds: Examination of the welds that are covered is not practical, and visual examination for evidence of leakage during pressure tests is the only practical examination.

#### Conclusions and Recommendations

(a) Partially Accessible Welds: Based on the above evaluation, it is concluded that for the welds discussed above, the Code requirements are impractical. It is further concluded that the alternative examination discussed above will provide necessary added assurance of structural reliability. Therefore, the following is recommended:

Relief from performing 100% of the volumetric examination of accessible branch-to-pipe welds should be granted, provided, as proposed by the licensee, the volumetric examination is performed to the extent possible and is supplemented with a surface examination.

The full V-path ultrasonic examination described in the 1977 Edition, Summer 1978 Addenda, Articles III-3230 and III-4420 should be used. The surface examination should meet the intent of Figure IWC-2520-9 of the Summer 1978 Addenda.

(b) Covered Welds: Based on the above evaluation, it is concluded that for the welds discussed above, the Code requirements are impractical. It is further concluded that the alternative examination discussed in the above evaluation will provide necessary added assurance of structural reliability. Therefore, the following is recommended:

For the covered welds, relief should be granted and a visual examination for evidence of leakage during pressure tests per IWC-5000 should be performed.

#### References

References 1, 2 and 3.



## C. Pumps

### 1. Centrifugal Charging Pumps, Pump Casing Welds, Category C-F, Item C3.1

#### Code Requirement

A volumetric examination of 100% of the weld shall be made over the lifetime of the plant (four intervals with three 40-month periods within each interval) per Paragraph IWC-2411(e). The examination includes the weld metal and base metal for one wall thickness beyond the edge of the weld.

#### Code Relief Request

Relief is requested from the volumetric examination.

#### Proposed Alternative Examination

Visual examination of the weld with the pump disassembled is proposed.

#### Licensee's Basis for Requesting Relief

VEPCO will inspect the pump and casing weld on an interval basis and will require relief from the volumetric requirements. An ultrasonic test was attempted by VEPCO and found impractical because of geometric configuration, varied base metal thickness, and surface conditions which limited transducer coupling. Radiographic techniques would be impractical, even with the pump disassembled because of interference of a skirt weld.

#### Evaluation

The licensee has made a reasonable attempt to examine these welds and has established that a volumetric examination is impractical. The proposed visual examination of the weld with the pump disassembled would provide adequate information about weld condition.

#### Conclusions and Recommendations

Based upon the above evaluation, it is concluded that the Code requirements are impractical. It is further concluded that the alternative examination discussed above will provide added assurance of structural integrity. Therefore, it is recommended that Code relief from the volumetric examination be granted and the weld be visually examined with the pump disassembled.

#### References

References 1, 2, 3 and 8.



D. Valves

No relief requests.

III. CLASS 3 COMPONENTS

No relief requests.

IV. PRESSURE TESTS

A. General

No relief requests.

B. Class 1 System Pressure Tests

1. Piping Between Two Check Valves or Two Normally Closed Valves

Code Requirement

The pressure retaining components shall be subjected to a hydrostatic test at 1.10 times the system operating pressure at least once toward the end of each inspection interval and a leakage test at operating pressure following each outage.

Code Relief Request

Relief is requested from the pressure testing requirements for piping between two check valves or two normally closed valves. The portions of systems affected by this limitation are:

- (1) Cold leg injection from accumulators between check valves 875 A, B and C and 875 D, E and F, test lines to valves 850 B, D and F and RHR return lines to valves 720 A and B.
- (2) Hot leg low head injection between check valves 874 A, B and C and 876 A, B and C and high head injection to check valves 889 A and B.
- (3) Cold leg low head injection between check valves 874 D, E and F and 876 D, E and F and boron injection to check valves 854 A, B and C.
- (4) Loop fill header between normally closed valves 556 A, B and C and check valve 313.
- (5) Loop drain header between normally closed valves 557 A, B and C, 558 A, B and C and normally closed valves 201 and 376.
- (6) RHR take-off line between normally closed (with pressure interlock) valves 700 and 701.



### Licensee's Basis for Requesting Relief

Requirements for the visual examination of Class 1 systems and components for evidence of leakage during the performance of a system pressure test following each refueling are identified by IWB-5200. Exception is taken to the implementation of these requirements on those portions of Class I systems which are contained between two check valves or where pressure applied to the reactor coolant system will be retained at the first valve in the line.

### Evaluation

The licensee has not provided sufficient justification to establish that these pressure testing requirements are impractical. In the case of two normally closed valves in series, it should be possible to open the first valve by bypassing any interlocks and to pressurize the line to the second valve. In the case of two check valves in series, one or more options exist:

- (a) Pressurize in the direction of normal flow (such as with charging pumps) at the same time as the RCS hydrostatic test;
- (b) Improvise a test connection between the two valves;  
or
- (c) Remove the internals of one check valve.

### Conclusions and Recommendations

Based on the above evaluation, it is concluded that there is not presently enough justification for declaring the Code requirements impractical. Therefore, the following is recommended:

- (a) Relief should not be granted at this time from the system hydrostatic pressure tests.
- (b) If relief is still desired, the licensee should provide additional specific justification why the options discussed in the above evaluation are not practical.

### References

- Reference 1.



## C. Class 2 System Pressure Tests

### 1. Systems That Cannot Be Isolated from Class 1 Systems

#### Code Requirement

The pressure retaining components shall be subjected to a hydrostatic test at 1.25 times the system design pressure of 100°F at least once toward the end of each inspection interval.

#### Code Relief Request

Request relief from system pressure testing requirements of Class 2 piping that cannot be isolated from Class 1 piping.

Exception is taken to the performance of the hydrostatic test requirements as required by Article IWC-2412(a) on those portions of the Class 2 systems identified below:

- (1) R.C. pump seal bypass line from check valves 302 A, B and C to AO valve 307.
- (2) R.C. pump seal leak-off line to manually operated valves 301 A, C and E and 303 A, B and C.
- (3) R.C. pump seal injection line between check valves 298 A, B and C and 298 D, E and F.
- (4) Excess letdown from valve 201 to HCV 137.
- (5) Letdown line from valve LCV 460 B to orifice outlet valves 200 A, B and C.
- (6) Pressurizer steam space sampling line to valve SS 101B, pressurizer liquid space sampling line to valve SS 100B, and loop sampling lines to valves SS 102B and SS 106B.

#### Proposed Alternative Examination

Visual examination for evidence of leakage conducted on these portions of the systems at the system nominal operating pressure in accordance with the requirements of IWB-5221 for the adjoining Class 1 system.

#### Licensee's Basis for Requesting Relief

Subsections IWB and IWC contain differing requirements for the hydrostatic testing of Class 1 and Class 2 systems and components. The implementation of these requirements is impractical when the only means of pressurizing the Class 2 system is through the Class 1 system, or when the boundary between the two systems is a check valve arranged for flow from Class 2 to the Class 1 system.



The potential for inadvertent overpressurization of the reactor coolant system causes additional concerns on the advisability of pressurizing Class 2 systems to considerably higher pressures than the adjacent Class 1 system, and relief is requested from implementing the hydrostatic test requirements of IWC-2412(a) on the CVCS system where such potential exists. The chemical and volume control charging, seal injection and letdown systems are in continuous operation during normal plant operation and are continuously monitored to ensure continued integrity and performance.

#### Evaluation

The portions of Class 2 piping involved either cannot be isolated from the Class 1 systems or can only be pressurized through the Class 1 systems. The licensee has agreed to conduct visual examinations for evidence of leakage on these portions of the above systems at the system's nominal operating pressure in accordance with the requirements of IWB-5222 for the adjoining Class 1 system.

The alternative testing program proposed by the licensee is acceptable.

#### Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the portions of Class 2 systems discussed above, the Code requirements are impractical. It is further concluded that the alternative examination discussed above will provide necessary added assurance of structural reliability. Therefore, the following is recommended:

Relief should be granted from the requirements of Article IWC-2412(a) for Class 2 piping (listed above) that cannot be isolated from Class 1 piping, provided the requirements of IWB-5220 are substituted.

#### References

Reference 1.



## D. Class 3 System Pressure Tests

### 1. Systems in Continuous Use

#### Code Requirement

- (a) The system test pressure shall be at least 1.10 times the system design pressure.
- (b) In the case of storage tanks, the nominal hydrostatic pressure developed with the tank filled to its design capacity shall be acceptable as the system test pressure.
- (c) Open-ended portions of a system (e.g., suction line from a storage tank) extending to the first shutoff valve may be exempted from the test requirements of IWD-5200.

#### Code Relief Request

Request relief from system pressure test requirements for Class 3 system where the system is in continuous use.

#### Proposed Alternative Examination

Visual examination of these systems will be performed at normal operating pressures to verify leak-tightness.

#### Licensee's Basis for Requesting Relief

The examination requirements for Class 3 systems and components are in accordance with IWD-2410(c) which specifies that 100% of the components be examined as required by IWA-5240 and IWD-2600, either during normal operation or during system in-service testing. An additional requirement of IWD-2410(b) is for the examination of Class 3 systems and components for evidence of leakage during the performance of a system pressure test in accordance with IWD-5000. The code does not stipulate that certain amounts of these examination requirements be completed within each 40-month period such that the system pressure test requirements may be deferred until the end of the 10-year inspection interval. However, it should be noted that these system pressure tests, when required, are impractical in those systems, such as component cooling, service water, spent fuel pit cooling, and boric acid transfer and recirculation, which are in continuous operation during all modes of plant operation. The continuous functional operation serves to demonstrate the structural and leak-tight integrity of these systems. Visual examinations of these systems will be performed at normal operating pressures to verify leak-tightness.



### Evaluation

Subarticle IWC-5200 which provided the above Code requirement in the 1974 Edition, Summer 1978 Addenda, was significantly expanded in subsequent versions of Section XI. In the Summer 1978 Addenda of the 1977 Edition, Paragraph IWC-5210 in that subarticle required that pressure-retaining components within the boundaries of each Class 3 system undergo various pressure tests, including a system hydrostatic test. For purposes of pressure testing, Class 3 systems are divided into three examination categories, specified in Table IWD-2500-1. These categories involve supporting one of the following functions: reactor shutdown, emergency core cooling, containing heat removal, atmospheric cleanup, reactor residual heat removal, and residual heat removal from spent fuel storage pool. All of the systems cited in the licensee's basis for requesting relief fall into one of the three categories.

The 1977 Edition of Section XI has been referenced in 10 CFR 50.55a and inservice examinations may meet the requirements of this edition in lieu of those from previous editions with the following provisions:

- (a) Commission approval is required to update to the more recent edition (pursuant to 10 CFR 50.55a(g)(4)(iv));
- (b) When applying the 1977 Edition, all of the addenda through Summer 1978 Addenda must be used;
- (c) Any requirement of the more recent edition which is related to the one(s) under consideration must also be met.

In view of the detailed requirements in the Summer 1978 Addenda, it is not appropriate to grant the blanket code relief requested by the licensee. Instead, the requirements of Subarticle IWD-5200 in the Summer 1978 Addenda should be invoked. These requirements, while more specific than those in the Summer 1975 Addenda, do provide some relief; for example, the hydrostatic test pressure is lower. If the licensee finds specific technical justification for not being able to comply with any part of these requirements, relief requests for individual systems should be submitted.

### Conclusions and Recommendations

Based on the above evaluation, it is concluded that there is not enough justification for granting blanket relief from Code requirements. Therefore, the following is recommended:

- (a) Relief should not be granted from the system pressure test requirements for Class 3 systems in continuous use.



- (b) The licensee should update to the total requirements of Subarticle IWD-5200 in the 1977 Edition, Summer 1978 Addenda, pursuant to 10 CFR 50.55a(g)(4)(iv).
- (c) If any of the updated Code requirements are determined to be impractical, the licensee should submit specific relief requests for individual systems.

#### References

Reference 1.

#### V. GENERAL

No relief requests.



## REFERENCES

1. C. M. Stallings (VEPCO) to E. G. Case (NRC), August 9, 1977.
2. O. D. Parr (NRC) to W. L. Proffitt (VEPCO), Request for Additional Information, October 19, 1977.
3. C. M. Stallings (VEPCO) to E. G. Case (NRC), December 16, 1977.
4. C. M. Stallings (VEPCO) to H. R. Denton (NRC), October 27, 1978.
5. R. H. Leasburg (VEPCO) to H. R. Denton (NRC), December 29, 1981.
6. R. A. Clark (NRC) to R. H. Leasburg (VEPCO), Inservice Inspection Program for the North Anna Power Station Unit No. 1 (NA-1): Request for Additional Information, March 10, 1982.
7. R. H. Leasburg (VEPCO) to H. R. Denton (NRC), May 27, 1982.
8. R. H. Leasburg (VEPCO) to H. R. Denton (NRC), Response to Inservice Inspection Questions, North Anna Power Station Unit 1, August 12, 1982.

