

BROWNS FERRY NUCLEAR POWER PLANT  
UNITS 1, 2 AND 3

INSERVICE INSPECTION PROGRAM  
TECHNICAL EVALUATION REPORT --

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TECHNICAL EVALUATION REPORT  
BROWNS FERRY NUCLEAR PLANT UNITS 1, 2 AND 3  
INSERVICE INSPECTION PROGRAM

## 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, Tennessee Valley Authority (TVA), of the Browns Ferry Nuclear Plant Units 1, 2 and 3. 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 Browns Ferry Nuclear Plant Units 1, 2 and 3, the ISI program, and the relief requests evaluated in this report, cover the last 80 months of the current 120-month inspection interval, i.e., from July 1, 1980 to March 1, 1987. 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 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 (22) listed at the end of this report pertain to previous transmittals on ISI between the licensee and the Commission. By letters of September 15 and November 22, 1976,<sup>(1,3)</sup> the Commission provided general ISI guidance to all licensees. Submittals in response to that guidance were made by the licensee on October 20, 1976,<sup>(2)</sup> and January 28, 1977.<sup>(4)</sup> On February 25, 1977,<sup>(5)</sup> the Commission granted approval to postpone implementation of the ISI program for Unit #3 to July 31, 1977. Additional submittals<sup>(6,7)</sup> were made



by the licensee to the Commission. By letters of May 31, 1978,<sup>(8)</sup> and August 8, 1978,<sup>(9)</sup> the Commission requested additional information to complete the review of the ISI program submitted for Unit 3.<sup>(7)</sup> This information was furnished by the licensee on November 3, 1978,<sup>(10)</sup> and December 11, 1978,<sup>(11)</sup> respectively. Additional submittals were made by the licensee on March 29, 1979<sup>(12)</sup> and April 24, 1979.<sup>(13)</sup> On May 8, 1979,<sup>(14)</sup> the licensee submitted a revised ISI program for Unit 3. On July 11, 1979,<sup>(15)</sup> the licensee proposed to start Units 1, 2 and 3 on the same ISI interval and the same program. Additional submittals<sup>(16,17)</sup> were made for Unit 3 by the licensee. On December 24, 1980,<sup>(18)</sup> the licensee submitted a proposal for a common start date of July 1, 1980 for the second 40-month cycle for Units 1, 2 and 3. On November 16, 1981,<sup>(19)</sup> the licensee submitted a revised ISI program for Units 1, 2 and 3. On November 17, 1981,<sup>(20)</sup> the licensee submitted revised technical specifications for Units 1 and 2. By letter of February 24, 1982,<sup>(21)</sup> the Commission requested additional information to complete the review of the ISI program submitted for Units 1, 2 and 3.<sup>(19)</sup> This information was furnished by the licensee on April 14, 1982.<sup>(22)</sup>

From these submittals a total of 16 requests (a) for relief from code requirements, (b) for updating to a later code, and (c) for exemptions not necessarily acceptable to the Commission were identified. These requests are evaluated in the following sections of this report.



## I. CLASS 1 COMPONENTS

### A. Reactor Vessel

1. Request for Relief ISI-2; Pressure Retaining Welds, Categories B-A and B-B, Items B1.1 and B1.2

#### Code Requirement

##### Category B-A (In Reactor Vessel Beltline Region):

Volumetric examination of the shell longitudinal and circumferential welds during each inspection interval shall cover at least 10% of the length of each longitudinal weld, and 5% of the length of each circumferential weld, with the minimum length of weld examined equal to one wall thickness. The examination may be performed at or near the end of each inspection interval.

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##### Category B-B (In Vessels):

Volumetric examinations shall be performed during each inspection interval and shall cover at least 10% of the length of each longitudinal shell weld and meridional head weld and 5% of the length of each circumferential shell weld and head weld.

#### Code Relief Request

Relief is requested from the volumetric examination of the following reactor pressure vessel welds, for Units 1, 2 and 3:

<u>Weld Identification</u>	<u>Category</u>
C-S-BH (Circ. Seam approximately 54 feet long)	B-B
V-BH-2 (Long. Seam approximately 6.5 feet long)	B-B
V-BH-3 (Long. Seam approximately 6.5 feet long)	B-B
V-BH-4 (Long. Seam approximately 6.5 feet long)	B-B
V-BH-5 (Long. Seam approximately 6.5 feet long)	B-B
V-BH-6 (Long. Seam approximately 6.5 feet long)	B-B
V-BH-1 (Long. Seam approximately 6.5 feet long)	B-B
C-BH-1 (Circ. Seam approximately 69 feet long)	B-B
V-1-B (Long. Seam approximately 11 feet, 1 inch long)	B-A
V-1-A (Long. Seam approximately 11 feet, 1 inch long)	B-A
V-1-C (Long. Seam approximately 11 feet, 1 inch long)	B-A
C-1-2 (Circ. Seam approximately 69 feet long)	B-A
V-2-B (Long. Seam approximately 11 feet, 1 inch long)	B-A
V-2-A (Long. Seam approximately 11 feet, 1 inch long)	B-A
V-2-C (Long. Seam approximately 11 feet, 1 inch long)	B-A
C-2-3 (Circ. Seam approximately 69 feet long)	B-A
V-3-C (Long. Seam approximately 11 feet, 1 inch long)	B-B
V-3-B (Long. Seam approximately 11 feet, 1 inch long)	B-B



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Lower head bottom section to lower head center section circumferential seam weld (approximately 39 feet long), Category B-B. The lower head center section contains four longitudinal welds (approximately 2.5 feet long each), Category B-B.

#### Proposed Alternative Examination

None

#### Licensee's Basis for Requesting Relief

The Browns Ferry Nuclear Plant was designed and under construction before the issuance of Section XI. As a result, only those welds above the sacrificial shield are accessible for inservice inspection. Access has not been provided in the sacrificial shield area for external examinations nor does the BWR design permit internal examinations in this area. Only those welds above the sacrificial shield and portions of welds as may be accessible at nozzle access points will be examined during the inservice inspection intervals.

#### Evaluation

Imposition of the Code requirements would necessitate the removal of portions of the concrete biological shield and the permanently installed insulation to perform the required examination of the welds listed from the vessel exterior. The vessel internals, shroud and jet pumps preclude volumetric examination of almost all the beltline weld volume from the vessel interior.

The reactor vessel is presently monitored for radiation damage in the beltline region by a surveillance program in accordance with ASTM-E185-70 to the extent possible and therefore conforms to the intent of 10 CFR 50, Appendix H. In addition, the vessel was designed and fabricated in accordance with the rules of Section III of the 1965 Edition and Addenda through the Summer 1966 of the ASME Boiler and Pressure Vessel Code.

This examination requirement is impractical due to the existing design and geometry for the above welds. Certain longitudinal and circumferential welds, not in the core region, are partially or wholly accessible for inservice examination. In response to a request for additional information, the licensee has summarized the weld accessibility as follows:



<u>Code Category</u>	<u>Code Required Weld Length Accessible</u>	<u>Code Required Weld Length Inaccessible</u>	<u>Accessible Length Not Required By Code</u>
B-A	None	6.6 ft. Long. Seam 6.9 ft. Circ. Seam	None
B-B	5.9 ft. Long. Seam 7.0 ft. Circ. Seam	7.1 ft. Long. Seam 8.1 ft. Circ. Seam	31.9 ft. Long. Seam 24.5 ft. Circ. Seam

To maintain the extent of examination, an alternative inservice inspection program would be required. The examination of the accessible Category B-B welds could be increased to achieve an examination sample equivalent to the Category B-A and B-B welds for which relief was requested. Based on the above summary, examination of 13.7 ft of longitudinal welds (of the 31.9 ft not required by the Code), and 15.0 ft of circumferential welds (of the 24.5 ft not required by the Code) would meet this augmented program. In addition, visual inspections of the identified welds for which code relief was requested, to the extent possible, could be performed during system leakage and hydrostatic tests. Such examinations should furnish sufficient information to evaluate the structural reliability of the welds.

#### 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:

Relief should be granted from the volumetric examination of the identified welds with the following provisions:

- The examinations of the accessible Category B-B welds are increased to achieve an examination sample equivalent to the Category B-A and B-B welds for which relief is requested.
- Visual inspection of the accessible portions of the identified welds are conducted for evidence of leakage during system hydrostatic tests when performed as required by IWB-5000.

#### References

References 19, 21 and 22.





2. Request for Relief ISI-3; Reactor Pressure Vessel Support Skirt, Category B-H, Item B1.12

Code Requirement

For vessel support skirts, volumetric examination shall be performed during each inspection interval and shall cover at least 10% of the circumference of the weld to the vessel.

Code Relief Request

Relief is requested from performing 100% of the required volumetric examination of the support skirt attachment weld to the reactor pressure vessel. Approximately 67% of the required examination can be completed.

Proposed Alternative Examination

None

Licensee's Basis for Requesting Relief

Approximately 6 feet of the attachment weld would require examination to meet Code requirements. However, nonremovable reactor-vessel insulation limits inservice examination. Two access ports, approximately 180 degrees apart, provide access for examination of two 2-foot lengths. Four feet of the support skirt-to-reactor vessel weld will be ultrasonically examined during each inspection interval.

Evaluation

Access to this weld is limited by the nonremovable vessel insulation. The licensee, however, is able to perform the examinations required to a limited extent (approximately 67% of the requirement).

Surface examinations can be performed only on the same 4 feet of weld that will be volumetrically examined. Hence, supplemental surface examinations would not contribute any additional information.

Examination of 4 feet of the weld should furnish sufficient information to enable a judgment to be made on the structural reliability of the weld.



### 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 partial examination discussed above will provide necessary assurance of structural reliability. Therefore, the following is recommended:

Relief should be granted to limit the required volumetric examination to the accessible 4 feet of the circumference of the skirt-to-vessel weld.

### References

References 19, 21 and 22.

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3. Request for Relief ISI-6; Pressure Retaining Welds in  
Control Rod Drive Housings, Category B-0, Item B1.18

Code Requirement

Volumetric weld examinations shall be performed during each inspection interval and shall include 100% of the welds in 10% of the peripheral control rod drive (CRD) housings. The examinations may be performed at or near the end of the inspection interval.

Code Relief Request

Relief is requested from the volumetric examination of the peripheral CRD housing welds.

Proposed Alternative Examination

All peripheral CRD housing welds shall be visually examined during the system hydrostatic pressure tests in accordance with IWB-1220(c).

Licensee's Basis for Requesting Relief

Should the CRD housing weld fail, the leakage path to the failure meets the makeup exclusion criteria, maximum 3 in. diameter pipe, and is therefore excluded from volumetric examination in accordance with IWB-1220(b)(1). The makeup supply system is equivalent to 4-in. nominal pipe size. The largest leakage path area would be realized between the guide cap and thermal sleeve. The total leakage path area is 0.83 sq. in., which is substantially less than 7.39 sq. in. (flow path area of a 3-in. diameter pipe).

Evaluation

The licensee has shown that the maximum flow path resulting from a complete failure of the CRD housing weld is less than that of a pipe of 3 in. diameter and has stated that the makeup system has sufficient capacity to shut down and cool the reactor in an orderly manner. The control rod drive weld is greater than 3 in. diameter but, due to the internal housing mechanisms and the stop on each housing, the unobstructed flow path is much smaller. The requirements of paragraph IWB-1220(b)(1) are satisfied and the examinations required for Code-exempted components will be performed by the licensee.



### Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, the code requirements for exemption of volumetric examinations have been satisfied. 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 volumetric examination of 100% of the welds in 10% of the peripheral CRD housings, with the following provision:

All peripheral CRD housing welds are visually examined during the system hydrostatic pressure tests in accordance with IWB-1220(c), as proposed by the licensee.

### Reference

Reference 19.



B. Pressurizer

Does not apply to BWRs.

C. Heat Exchangers and Steam Generators

No code relief requests.

D. Piping Pressure Boundary

1. Request for Relief ISI-7; Pressure Retaining Welds in Piping;  
Category B-J, Item B4.5

Code Requirement

Volumetric weld examinations shall be performed during each inspection interval and shall cover all the area of 25% of the circumferential joints including the adjoining 1 ft. sections of longitudinal joints and 25% of the pipe branch connection joints.

Code Relief Request

Relief is requested from the volumetric examination of the following pressure retaining welds:

- (a) Penetration Flued Head to Process Pipe Welds  
(Units 1, 2 and 3)

<u>No. Welds</u>	<u>System</u>
2	Feedwater
4	Main Steam
4	Residual Heat Removal (RHR)
2	Core Spray
1	Reactor Water Cleanup
1	High Pressure Coolant Injection (HPCI)

- (b) Main Steam Welds (Units 1, 2 and 3)

KMS- 1  
KMS-29  
KMS-56  
KMS-81

- (c) Feedwater Welds (Units 1, 2 and 3)

KFW- 4  
KFW-22



(d) Feedwater Welds (Unit 3)

KFW-41  
KFW-42  
KFW-43  
KFW-45

Proposed Alternative Examination

A "best effort" visual examination will be performed during system leakage and hydrostatic pressure tests.

Licensee's Basis for Requesting Relief

The penetration flued head to process pipe welds are inaccessible for any type of examination. The four main steam welds and the two feedwater welds on each unit are located under rigid pipe restraints and are inaccessible for volumetric examination. The four feedwater welds on Unit 3 are located under pipe supports.

Evaluation

The identified welds are completely inaccessible for volumetric or surface examination because the welds are either located inside a containment penetration or are covered by rigid pipe restraints.

(a) Penetration Flued Heat to Process Pipe Welds,  
Units 1, 2 and 3

Each primary containment penetration assembly, due to its design, leaves one pressure retaining piping weld inaccessible for examination by either surface or volumetric means. The welds can only be examined by inspecting for evidence of leakage during system hydrotests.

The initial design of the assemblies did not provide for accessibility for inservice examinations. If it is assumed, though, that the workmanship and quality assurance of the welding as well as the preservice examinations were adequate, then an examination of the first pressure boundary weld (process piping to flued head) outside the containment should reflect service-induced failures for that particular piping section. Thus, the first pressure boundary weld outside the containment on each of these process pipes would be volumetrically examined, where practical, over 100% of its length during each inspection interval. Such an examination would maintain sample size. The licensee could also conduct visual examinations at these penetrations as proposed.



- (b) Main Steam Welds (Units 1, 2 and 3)  
Feedwater Welds (Units 1, 2 and 3)  
Feedwater Welds (Unit 3)

Because these welds are completely inaccessible, examination is not practical and relief from the examination could be granted on that basis. However, the number of inaccessible welds is sufficiently small and random, compared with the total number of welds in Category B-J (or in either of the two affected systems) that none of these welds needs to be included in the 25% sample to be examined during this inspection interval.

For subsequent inspection intervals, the licensee has the option of updating to subsequent code versions or of staying with the 1974 Edition and addenda through the Summer 1975 Addenda, pursuant to 10 CFR 50.55a(b)(2)(ii). Updating would allow the licensee to examine the same 25% sample, if the provisions of the Summer 1978 Addenda of the 1977 Edition continue to prevail (see Footnote (2) of Category B-J in Table IWB-2500-1). By adopting 10 CFR 50.55a(b)(2)(ii) the Commission was offering an option whereby "operating facilities with ongoing inservice inspection programs would have continuity in the extent and frequency of examinations for pipe welds" (see 44 FR 57913).

Based on these considerations, relief from these requirements is not required at this time for these welds. It is preferable to defer a decision until the next inspection interval after the licensee has determined which of the above options he wishes to exercise.

In addition, visual examination of the welds for which code relief is requested could be performed in the interim. Those welds covered by the pipe restraints could also be examined if the pipe restraints need to be disassembled for maintenance.

#### Conclusions and Recommendations

- (a) Penetration Flued Head to Process Pipe Welds,  
Units 1, 2 and 3

Based on the above evaluation, it is concluded that for these welds, 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 volumetric examination of the identified welds, with the following provisions:



- The first pressure boundary weld outside the containment on each of these process pipes should be volumetrically examined, where practical, over 100% of its length during each inspection interval.
- The proposed visual examinations should be performed on the containment penetration assemblies when leakage and hydrostatic tests are conducted in accordance with IWB-1220(c).

- (b) Main Steam Welds (Units 1, 2 and 3)  
Feedwater Welds (Units 1, 2 and 3)  
Feedwater Welds (Unit 3)

Based on the above evaluation, it is concluded that for these welds, there is not presently enough justification for granting relief from the impractical code requirements. Therefore, the following is recommended:

- (a) Relief from volumetric examination should not be granted at this time.
- (b) The identified welds should be visually examined during the system hydrostatic pressure tests in accordance with IWB-1220(c).
- (c) In the event that the pipe restraints are disassembled for maintenance and the welds are accessible for examination, the code-required examination should be performed.

#### References

References 19 and 22.





2. Request for Relief ISI-12; Pressure Retaining Longitudinal Welds in Piping, Category B-J, Item B4.5

Code Requirement

Volumetric weld examinations shall be performed during each inspection interval and shall cover all of the area of 25% of the circumferential joints including the adjoining 1-ft sections of longitudinal joints and 25% of the pipe branch connection joints.

Code Relief Request

Relief is requested from performing 100% of the required volumetric examination of the following pressure-retaining longitudinal welds in piping (Unit 3):

<u>Longitudinal Seam Adjacent to Weld</u>	<u>% Inspection</u>	<u>Limitation</u>
GR-3-62	0	Prohibited by support lug
KR-3-51	50	Scan limited to 6" by support
DCS-3-4	25	Scan limited to 5" by support
DCS-3-5	65	Scan limited to 8" by support
DCS-3-13	50	Scan limited to 6" by penetration
GMS-3-2	16	Scan limited to 2" by penetration
GMS-3-3	50	Scan limited to 6" by support
GMS-3-9	50	Scan limited to 6" by penetration
GMS-3-10	15	Scan limited to 2" by penetration
GMS-3-11	50	Scan limited to 6" by penetration
GMS-3-15	15	Partial scan limited by insulation ring
GMS-3-32	15	Partial scan limited by insulation ring
GMS-3-18	50	Scan limited to 6" by penetration
GMS-3-19	25	Scan limited to 3" by penetration
GMS-3-20	15	Scan limited to 2" by penetration
GMS-3-27	50	Scan limited to 6" by penetration





<u>Longitudinal Seam Adjacent to Weld</u>	<u>% Inspection</u>	<u>Limitation</u>
GMS-3-28	15	Scan limited to 2" by penetration
GMS-3-29	50	Scan limited to 6" by penetration
DSRHR-3-9	35	Scan limited to 4" by support
DSRHR-3-7	35	Scan limited to 4" by support
DSRHR-3-6	35	Scan limited to 4" by support
DSRHR-3-5A	10	Scan limited to 1" by elbow radius
DSCS-3-4	75	Scan limited by elbow curvature
DRHR-3-18	75	Scan limited to 9" by support
DRHR-3-13	50	Scan limited to 6" by penetration
KMS-3-105	75	Partial scan limited by support lug

#### Proposed Alternative Examination

A surface examination will be performed on the accessible Code-required length of the weld.

#### Licensee's Basis for Requesting Relief

These are longitudinal pipe welds only partly accessible for inservice examination. The limitations to performing a full volumetric examination of each weld are listed above with the identified weld.

#### Evaluation

Because of the design of the components or locations of the circumferential weld, it is considered impossible to obtain meaningful examination results on 100% of the longitudinal seam required to be examined by the Code. This request involves welds on only one unit. In essentially all instances, at least some portion of the seam adjacent to the circumferential weld is accessible to volumetric examination.

For these welds, a best-effort volumetric examination could be maintained to the volume percentages estimated in the relief request. Surface examination would augment the volumetric examination. Visual examinations should be performed during system leakage and hydrostatic tests.



### 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:

Relief should be granted from the volumetric examination of the identified welds provided that the following examinations are performed:

- a best effort volumetric examination of the volumes estimated in the relief request;
- a surface examination, as proposed by the licensee; and
- visual examinations during system hydrostatic pressure tests in accordance with IWB-1220(c).

### References

References 19 and 22.



3. Request for Relief ISI-8; Pressure Retaining Welds in Piping, Category B-J; Pressure Retaining Dissimilar Metal Welds, Category B-F; and Pressure Retaining Welds in Valve Bodies, Category B-M-1

Code Requirement

- Category B-J; Items B4.5 and B4.6

Volumetric weld examinations shall be performed during each inspection interval and shall cover all of the area of 25% of the circumferential joints including the adjoining 1-ft sections of longitudinal joints and 25% of the pipe branch connection joints.

- Category B-F

Volumetric and surface examinations shall be performed during each inspection interval and shall cover the circumference of 100% of the welds.

- Category B-M-1; Item B6.6

Volumetric weld examinations shall be performed during each inspection interval and shall include 100% of the pressure-retaining welds in at least one valve within each group of valves that are of the same constructional design, (e.g., globe, gate, or check valve), manufacturing method and manufacturer and that are performing similar functions in the system (e.g., containment isolation, system overpressure protection, etc.).

The examinations may be performed at or near the end of the inspection interval.

Code Relief Request

Relief is requested from performing 100% of the required volumetric examination of the following pressure retaining welds:

Class 1 Welds

Unit 1

<u>Weld Identification</u>	<u>% Inspection</u>	<u>Limitation</u>
DCS-1-8	65	Valve Configuration - Branch Conn.
DCS-1-15	70	Valve Configuration - Support
DCS-1-17	65	Valve Configuration - Branch Conn.
DRWC-1-3	70	Valve Configuration - Branch Conn.



<u>Weld Identification</u>	<u>% Inspection</u>	<u>Limitation</u>
TRWC-1-3	65	Valve/Bonnet Configuration
TRWC-1-4	70	Valve Configuration - Branch Conn.

#### Unit 2

<u>Weld Identification</u>	<u>% Inspection</u>	<u>Limitation</u>
KR-2-1	25	Branch Conn. Weld Configuration
KR-2-4	50	Branch Conn. Weld Configuration
GMS-2-19	50	Valve Configuration - Penetration
DHS-2-6	65	Valve Configuration - Elbow Curvature
KFW-2-26	75	Support Lug on Weld
KMS-2-25	75	Support Lug on Weld
KMS-2-63	50	Branch Conn. Weld Configuration
KMS-2-76	80	Support Lug
KMS-2-105	75	Support Lug on Weld
RWC-2-3	70	Nozzle Configuration - Support Lug
TCS-2-406	65	Valve Configuration - Support Lug
DRWC-2-2	40	Valve Configuration - Support Lug and Branch Conn.
DRWC-2-3	60	Valve Configuration - Branch Conn.
RCRD-2-31	50	Valve Configuration - Support
DSRHR-2-4	50	Support on Weld
DSRHR-2-9	50	Support on Weld
RCRDS-2-2	50	Branch Conn. Weld Configuration
RCRDS-2-3	80	Tee - Reducer Configuration
THPCI-2-72	65	Valve Configuration - Support Lug
THPCI-2-82	50	Valve Configuration - Penetration

#### Unit 3

<u>Weld Identification</u>	<u>% Inspection</u>	<u>Limitation</u>
N4C-S/E	70	Nozzle Configuration - Branch Conn.
N4D-S/E	70	Nozzle Configuration - Branch Conn.
N4F-S/E	70	Nozzle Configuration - Branch Conn.
N5A-S/E	25	Nozzle Configuration - Metallurgical Properties



<u>Weld Identification</u>	<u>% Inspection</u>	<u>Limitation</u>
N5B-S/E	25	Nozzle Configuration - Metallurgical Properties
GR-3-56	70	Valve Configuration - Support Lug
DCS-3-8	70	Valve Configuration - Branch Conn.
DCS-3-17	70	Valve Configuration - Branch Conn.
GFW-3-7	50	Fitting Configuration (Both Sides)
GFW-3-23	70	Fitting Configuration - Branch Conn.
GFW-3-24	50	Fitting Configuration (Both Sides)
KMS-3-25	85	Support Lug
KMS-3-63	50	Branch Conn. Configuration
TCS-3-421	80	Duct Work
TCS-3-423	80	Duct Work
DRWC-3-1A	60	Valve Configuration - Branch Conn.
DRWC-3-3	70	Drain Line Conn.
DSCS-3-8	70	Elbow Curvature - Branch Conn.
DSCS-3-10	65	Hanger - Elbow Curvature
RCRD-3-22	70	Valve Configuration - Branch Conn.
TSCS-3-424	80	Duct Work

#### Proposed Alternative Examination

In addition to the visual examination performed during system leakage and hydrostatic pressure tests, a "best effort" ultrasonic examination will be performed. Also, a surface examination will be performed on accessible areas of the weld(s).

#### Licensee's Basis for Requesting Relief

In some cases it will be impractical to inspect all welds in accordance with paragraph T-532 of Article 5, Section V, of the ASME Code, i.e., nonremovable hanger interference or valve and pump casings adjoining the welds.

#### Evaluation

Because of the geometric configuration of the fittings, or location of the welds, it is considered impossible to obtain meaningful examination results on 100% of the volume required to be examined by the Code. No more than 20 partially inaccessible welds are involved in any of the three units and no more than a small percentage of the welds in any one system. On essentially all these welds, more than half the weld volume is accessible to ultrasonic examination.



As proposed by the licensee, a best-effort ultrasonic examination and surface examination on the accessible areas of the welds is practical for the above Category B-F, B-J, and B-M-1 welds. The ultrasonic examination should cover the estimated weld volume percentages given in the relief requests. (The proposed surface examination is code-required for the Category B-F welds, but not for the other two categories.) Visual examinations could also be performed during system leakage and hydrostatic tests.

#### Conclusions and Recommendations

Based on the above evaluation, it is concluded that for certain Category B-F, B-J, and B-M-1 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 should be granted from the volumetric examination of the identified welds provided that the following alternative examinations (proposed by the licensee) are performed:

- (a) a best-effort ultrasonic examination of the accessible weld volume percentages estimated in the relief request
- (b) a surface examination
- (c) visual examinations during system hydrostatic pressure tests in accordance with IWB-1220(c).

#### References

References 19 and 22.





4. Request for Relief ISI-9; Support Members for Piping and Valves, Category B-K-1, Item B<sup>A</sup>.9

Code Requirement

The volumetric examination performed during each inspection interval shall cover 25% of the integrally welded supports. The areas 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.

Code Relief Request

Relief is requested from the volumetric examination of all integrally welded external support attachments for piping, and valves, except welds KR-1-54 and KR-1-55 (Unit 1).

Proposed Alternative Examination

Class 1 integrally welded supports will be liquid penetrant examined in place of ultrasonic examinations. The liquid penetrant examinations performed during each inspection interval will cover 25% of the integrally welded supports.

Licensee's Basis for Requesting Relief

During the first Browns Ferry baseline inspection, the ultrasonic examinations of the integrally welded Class 1 supports were meaningless because of the lack of penetration indications that existed for the full length of the support welds. The supports were fabricated to ANSI B31.1.0 and General Electric Company specification 21A2100. The GE specification required a full penetration weld and surface examination requirements, which would not verify penetration. The TVA Division of Engineering Design has taken actual weld dimensions of randomly-chosen piping supports and compared the load capabilities of these welds as installed to the loads based on design the supports would see during operation. As indicated in this analysis, all supports studied have high factors of safety in their load-carrying capability; therefore, the licensee feels that the integrally welded supports on the primary coolant piping are acceptable as installed. Future ultrasonic examinations of these supports would be meaningless.

Evaluation

Because of the weld design, ultrasonic examination required





by the Code is impractical as determined during the baseline inspection. As an alternative examination, the licensee has committed to surface examination of these welds. Based on the loading conditions of these types of welds, any flaws would most likely be generated at the weld surface and thus be detectable by surface examination.

The licensee analyzed a selection of integral supports and found that the welds would tolerate a substantially higher stress than that predicted to be required. A minimum safety factor of 8.3 was calculated.

Welds KR-1-54 and KR-1-55 will be fully inspected per the Code.

#### 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:

Relief should be granted from the volumetric examination of all integrally welded external support attachments for piping and valves, except welds KR-1-54 and KR-1-55, provided that:

- the welds be liquid penetrant examined
- such examinations cover 25% of the integrally welded supports during each inspection interval, as proposed by the licensee.

#### References

Reference 19.



Science Applications, Inc.

## E. Pump Pressure Boundary

1. Request for Relief ISI-4; Reactor Recirculation Pumps, Category B-L-2, Item B5.7

### Code Requirement

Visual examination of pump internal pressure boundary surfaces.

One pump in each of the group of pumps performing similar functions in the system shall be examined during each inspection interval. The examinations may be performed at or near the end of the inspection interval.

### Code Relief Request

Relief is requested from the visual examination of the internal surfaces of the reactor recirculation pump at the pressure boundary.

### Proposed Alternative Examination

The internal surfaces of the recirculation pump casing will be visually examined whenever the surfaces are made accessible when a pump from any unit is disassembled for maintenance purposes. If during the 10-year interval a pump from any unit is not disassembled, a pump from one unit shall be examined from the exterior. This shall be accomplished by taking ultrasonic thickness measurements of the pump casing.

### Licensee's Basis for Requesting Relief

In absence of required maintenance, disassembly of a recirculation pump solely to perform a visual examination of internal surfaces is impractical. This would represent unnecessary exposure of employees to high radiation and contamination areas and excessive expense to TVA.

Disassembly of this pump could require transport of the motor outside of containment; consequently, a possibility of damage to the pump, pump motor, or other safety-related equipment exists. The time required for this major task of disassembly, examination, and reassembly would consume at least three weeks of 24-hours-per-day work. Radiation dose rates of the pump exterior will average 100-300 mrem/hour, and pump internal dose rates will average 10-20 rem/hour. This would result in a cumulative dose of between 100 and 300 man-rem.

The benefit received from this major effort is minimal considering employee exposure, potential damage to safety-related equipment, and cost in dollars.



In addition, the multiple units at Browns Ferry Nuclear Plant operate under similar conditions. Therefore, we feel that if a pump from one of the multiple units is disassembled for maintenance during a 10-year interval, the visual examination performed will be representative of the pump condition for each unit. This would avoid unnecessary exposure of employees to high radiation dose rates noted. We conclude that if one pump is disassembled for maintenance during the 10-year interval, the visual examination performed satisfies Examination Category B-L-2 requirements for the three multiple units. Disassembly of the pump solely for visual examination is marginal.

#### Evaluation

The visual examination is to determine whether unanticipated severe degradation of the casing is occurring due to phenomena such as erosion, corrosion, or cracking. However, previous experience during examinations of pumps at other plants has not shown any significant degradation of casings.

The disassembly of the reactor recirculation pumps to the degree necessary to inspect the internal pressure retaining surfaces is a major effort, involving large personnel exposures and the generation of large amounts of radioactive waste. In view of the effort required to disassemble a pump, the information returned from visual examination of its internal surfaces would be marginal.

The licensee has committed to the concept of visual examination if the pump is disassembled for maintenance. Meanwhile, pressure and flow are monitored during pump operation to assess performance.

The licensee contends that if a pump from one of the three Browns Ferry units is disassembled for maintenance during the 10-year interval, the visual examination performed will satisfy the examination requirements of all three units at the site. This contention is not consistent with the requirements of 10 CFR 50.55a(g). Each licensed unit at the plant site must meet the requirements of 10 CFR 50.55a(g). The inservice inspection performed at a specific unit cannot be used to fulfill examination requirements of another similar unit.

In the event that a recirculation pump is not disassembled for maintenance during the interval, the licensee proposes to perform ultrasonic wall thickness measurements. Such measurements, using the minimum wall thickness requirements of Section III of the ASME Code as the acceptance standard and done to paragraph T-560, Section V, 1977 Edition, Winter 1978 Addenda, are potentially an acceptable alternative examination. However, detailed procedures establishing such parameters as frequency and location of measurements would have to be developed.



The visual examination of the internal pressure boundary may be performed at or near the end of the 10-year inspection interval. Therefore, relief from examination requirements is not necessary until then because the licensee will be in compliance with the Regulation up to that time. The Code committee and the Electric Power Research Institute (EPRI) are undertaking a program to assemble and evaluate results of visual examination of internal pump casing surfaces. Within the next two years, this program should provide a more definitive basis for the Code committee and NRC for upholding or modifying this Code requirement. Since so many licensees consider this requirement impractical and an undue burden, it is reasonable to postpone a decision to grant relief until that program is completed. The licensee could submit a new relief request at that time.

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#### Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the Code-required internal visual examination discussed above, a more definitive technical basis is needed. Therefore, the following is recommended:

- (a) Relief should not be granted at this time from the visual examination of the internal surfaces of the reactor recirculation pump at the pressure boundary.
- (b) The licensee's proposal to perform a visual examination whenever the surfaces are made accessible because a pump is disassembled for maintenance purposes should be accepted.
- (c) A decision on the licensee's proposal to perform ultrasonic thickness measurements on pump casings should be deferred pending development of detailed procedures.

#### References

Reference 19.



F. Valve Pressure Boundary

1. Relief Request ISI-9; Support Members for Valves, Category B-K-1, Item B6.4

The request for relief from volumetric examination of integrally welded external support attachments for valves (see I.D.4 of this report) applies here. Therefore, the following is recommended:

Relief should be granted from the volumetric examination of all integrally welded external support attachments for valves, provided that:

- the welds be liquid penetrant examined
- such examinations cover 25% of the integrally welded supports during each inspection interval, as proposed by the licensee.

2. Relief Request ISI-8; Pressure Retaining Welds in Valve Bodies, Category B-M-1, Item B6.6

The request for relief from volumetric examination of valve body welds (see I.D.3 of this report) applies here. Therefore, the following is recommended:

Relief should be granted from the volumetric examination of the identified welds provided that the following alternative examinations (proposed by the licensee) are performed:

- (a) a best-effort ultrasonic examination of the accessible weld volume percentages estimated in the relief request
- (b) a surface examination
- (c) visual examinations done during system hydrostatic pressure tests in accordance with IWB-1220(c).





3. Request for Relief ICI-5; Valve Bodies, Category B-M-2,  
Item B6.7

Code Requirement

Visual inspection of the internal pressure boundary surfaces, on valves exceeding 4 in. nominal pipe size.

One valve in each group of valves of the same constructional design, e.g., globe, gate, or check valve, manufacturing method and manufacturer that performs similar functions in the system shall be examined during each inspection interval.

The examinations may be performed at or near the end of the inspection interval.

Code Relief Request

Relief is requested from the visual examination of the internal surfaces at the pressure boundary of the Class 1 valves exceeding 4 inch diameter nominal pipe size.

Proposed Alternative Examination

If a valve from a particular classification has not been disassembled as the end of the inspection interval approaches, a case-by-case study will be made to determine the practicality of disassembling a valve from one of the multiple units solely for visual examination (determine if draining the vessel would be required, etc.). If necessary, a request for relief will be issued at that time.

Licensee's Basis for Requesting Relief

During routine maintenance, visual examinations of valve body internal pressure boundary surfaces are performed and documented under existing plant administrative procedures. Most Class 1 valves, particularly containment isolation valves, are disassembled frequently for maintenance. In addition, the multiple units at Browns Ferry operate under similar conditions. If a valve from one of the multiple units is disassembled for maintenance within a 10-year interval, the visual examination performed would be representative of all three units and would be sufficient to satisfy the examination requirements for all three units for that particular valve classification as defined in Examination Category B-M-2.



There are 26 groups of valves which are of the same design and manufacturer and perform similar functions on each unit. To meet the code requirement would require one valve from each of the 26 groups to be disassembled. It is estimated that it would take an average of 30 man-hours to disassemble, examine, and reassemble each valve with a total dose of three man-rem per valve. The time and exposure involved would be much greater for valves (such as the recirculation valves) which require unloading the core and draining the vessel before they can be disassembled.

#### Evaluation

The disassembly of large valves to the degree necessary to inspect the internal pressure retaining surfaces (casing) is a major effort, involving large personnel exposures. To do this disassembly solely to perform a visual examination of the internal casing is impractical.

The licensee has committed to the concept of visual examination if the valve is disassembled for maintenance. The visual examination specified is to determine whether unanticipated severe degradation of the casing is occurring due to phenomena such as erosion or corrosion.

The visual examination of the internal pressure boundary may be performed at or near the end of the 10-year inspection interval.

The licensee contends that the intent of Category B-M-2 is met if one valve in each group of valves of the same constructional design and manufacture from any unit is examined during the inspection interval. This contention is not consistent with the requirements of 10 CFR 50.55a(g). Each licensed facility at the plant site should meet the requirements of 10 CFR 50.55a(g). The inservice inspection performed at a specific facility cannot be used to fulfill the examination requirements of another similar plant. In addition, for this contention to be valid, the operating histories of the three units would have to be identical. This cannot be guaranteed by the licensee.

Under the terms of 10 CFR 50.55a(g)(5)(iv), the licensee may, as he has requested, postpone specific relief requests from internal surface inspection on any of the 26 Code-required valves in each unit until near the end of the inspection interval. Submitting such relief requests as soon as possible after the next-to-last scheduled outage of the inspection interval and at least six months before the scheduled start of the last outage would minimize delays and outage time.

For those inspection periods when valve maintenance does not occur, visual examinations could be performed when the





system pressure tests (IWA-5000) are conducted in accordance with the requirements for Category B-P.

#### Conclusions and Recommendations

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

- (a) Relief should not be granted at this time from visual examination of the internal pressure boundary surfaces on valves exceeding 4-in. nominal pipe size.
- (b) The licensee's proposal to perform the Code-required examinations whenever the valves are opened because of maintenance should be accepted.
- (c) During other inspection periods, the licensee should perform visual examinations for leakage when the system pressure tests (IWA-5000) are conducted in accordance with the requirements for Category B-P.
- (d) The licensee should submit specific relief requests as the end of the inspection interval approaches for each valve classification for which a valve has not been disassembled and examined in each unit.

#### References

References 19 and 22.



## II. CLASS 2 COMPONENTS

### A. Pressure Vessels

1. Request for Relief ISI-13; Pressure Retaining Nozzle Welds in the RHR Heat Exchangers, Category C-B, Item C1.2

#### Code Requirement

Volumetric examination of 100% of the nozzle-to-vessel attachment welds for the equivalent of one Residual Heat Removal (RHR) heat exchanger, among four, shall be performed over the 40-year service lifetime of the system.

#### Code Relief Request

Relief is requested from the volumetric examination of two nozzle-to-vessel welds among each of four RHR Heat Exchangers for Units 1, 2 and 3.

#### Proposed Alternative Examination

There are four Residual Heat Removal Heat Exchangers for each unit. There are two reinforcement ring welds on each of the RHR Heat Exchangers. These welds are accessible and can be given a surface examination. Two reinforcement ring welds among the four RHR Heat Exchangers for each unit will be surface examined over the 40-year service lifetime in accordance with IWC-2411 of ASME Section XI.

#### Licensee's Basis for Requesting Relief

The RHR Heat Exchangers nozzle-to-vessel attachment weld is covered by a reinforcement ring which does not allow access to any of the attachment weld.

#### Evaluation

The welds required to be examined are completely covered by a 1 1/2-in.-thick reinforcing ring that prevents a volumetric examination as required by the Code. The ring is welded to the shell and to the nozzle with fillet welds. The licensee proposes to perform a surface examination on the reinforcing ring welds which are completely accessible. Weld cracking would be detected by the surface examination.

Visual examinations of the welds during periodic hydrostatic testing would provide additional assurance that an adequate level of safety will be maintained.



### 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:

Relief should be granted from performing volumetric examination of two nozzle-to-vessel welds among the RHR heat exchangers for each unit, provided that:

- (a) The proposed alternative surface examination is performed on the reinforcement ring welds that make the nozzle-to-vessel welds inaccessible.
- (b) Visual examination of the welds for leakage is performed during periodic hydrostatic testing in accordance with IWC-5000.

### Reference

Reference 19.



2. Request for Relief ISI-14; Pressure Retaining Bolting  
Exceeding 1-Inch in Diameter, Category C-D (all items)

Code Requirement

Visual 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. Surface or volumetric examinations shall be performed on 10% of the bolting in each joint, but not less than two bolts or studs per joint.

Code Relief Request

Licensee requests permission to use the 1977 Edition, Summer 1979 Addenda of Section XI.

Proposed Alternative Examination

Licensee would comply with the more recent edition of the code.

Licensee's Basis for Requesting Relief

Examination of Class 2 pressure-retaining bolting in accordance with the Summer 1975 Addenda of Section XI exceeds inspection requirements for class 1 pressure-retaining bolting. An examination program for class 2 pressure-retaining bolting similar to that for class 1 would be desirable. This type of examination has been incorporated in the 1977 Edition, Summer 1978 and Summer 1979 Addenda of Section XI.

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 50.55a(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.

Updating to the 1977 Edition, Summer 1978 Addenda for Category C-D items exempts all Class 2 bolting, 2-in. in diameter or less, from examination but substitutes volumetric for visual examination of bolts and studs of larger diameters. On this



provision, the Summer 1978 Addenda is identical to the Summer 1979 Addenda (version licensee requests updating to).

#### Recommendations

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 Category C-D items. This approval would exempt all Class 2 bolting, 2-in. in diameter or less, from examination.

#### References

Reference 19.



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## B. Piping

### 1. Request for Relief ISI-14; Bolting, Category C-D

The request to update to the Summer 1978 Addenda applies here (see II.A.2 of this report). 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 Summer 1978 Addenda for Category C-D items. This approval would exempt all Class 2 bolting, 2-in. in diameter or less, from examination.

### 2. Request for Relief ISI-8; Pressure-Retaining Welds in Piping, Category C-F, Items C2.1, C2.2 and C2.3 (Unit 3 only)

#### Code Requirement

Volumetric weld examinations shall cover 100% of the welds. This examination 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 100% of the required volumetric examination of the following pressure-retaining welds:

#### Unit 3

<u>Weld Identification</u>	<u>% Inspection</u>	<u>Limitation</u>
DMS-3-9	70	Valve Configuration - Branch Conn.
DMS-3-17	70	Valve Configuration - Branch Conn.
TRHR-3-53	90	Support Lugs
TRHR-3-204	95	Support Lugs

#### Proposed Alternative Examination

In addition to the visual examination performed during system leakage and hydrostatic pressure tests, a "best effort" ultrasonic examination will be performed. Also, a surface examination will be performed on accessible areas of the weld(s).





### Licensee's Basis for Requesting Relief

In some cases it will be impractical to inspect all welds in accordance with paragraph T-532 of Article 5, Section V, of the ASME Code, i.e., nonremovable hanger interference or valve and pump casings adjoining the welds. These welds will be noted on the ultrasonic examination data sheets.

### Evaluation

Because of the geometric configuration of the fitting or location of the weld, meaningful examination results cannot be obtained on the entire code-required volume of just four welds in this category.

For Category C-F welds, a best effort volumetric examination to the volume percentage estimated in the relief request seems practical. Surface examination would augment the volumetric examination. Visual examinations could also be performed during system leakage and hydrostatic tests.

### 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:

Relief should be granted from the volumetric examination of the identified welds with the following provisions:

- (a) A best effort volumetric examination should be performed to the volume percentage estimated in the relief request;
- (b) A surface examination should be performed;
- (c) Visual examination of the welds should be performed during periodic hydrostatic testing in accordance with IWC-5000.

### References

References 19 and 22.



3. Request for Relief ISI-11; Support Members for Piping,  
Category C-E-1, Item C2.5

Code Requirement

Surface examination shall be performed of the external support attachments including the welds to the pressure-retaining boundary and along the support attachment member for a distance of two support thicknesses. The examination performed during each inspection interval shall cover 100% of the major load-bearing elements of the support structure and hanger.

Code Relief Request

Relief is requested from the surface examination of 12 guide lugs which are welded to the process pipe of the main steam system in each of four special restraints.

Proposed Alternative Examination

None.

Licensee's Basis for Requesting Relief

The main steam system includes four special restraints, each of which is partly embedded in a wall. Each embedded restraint includes 12 guide lugs which are welded to the process pipe. These welds are inaccessible for examination. Each restraint also includes 12 stop plates welded to the process pipe which are accessible for examination, and they will be surface examined during the inspection intervals.

Evaluation

The design of the component makes the surface examination of the 12 guide lugs on each steam line impractical. Examination of the lugs can only be done by dismantling the restraint. The accessible welds on the 12 stop plates will be examined. Forces developed in the restraint will tend to stress the stop plate welds rather than the guide lug welds. Hence, any stress-induced weld failures in the restraints should be detectable by the planned surface examinations. If any of the restraints are dismantled for maintenance, the lug welds could be examined.

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:



Relief should be granted from the surface examination of the identified welds, with the provision that whenever the restraints are dismantled for maintenance, the guide lug-to-pipe welds should be examined.

#### References

Reference 19.

#### C. Pumps

##### 1. Request for Relief ISI-14; Bolting, Category C-D

The request to update to the Summer 1978 Addenda applies here (see II.A.2 of this report). 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 Summer 1978 Addenda for Category C-D items. This approval would exempt all Class 2 bolting, 2-in. in diameter or less, from examination.

#### D. Valves

##### 1. Request for Relief ISI-14; Bolting, Category C-D

The request to update to the Summer 1978 Addenda applies here (see II.A.2 of this report). 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 Summer 1978 Addenda for Category C-D items. This approval would exempt all Class 2 bolting, 2-in. in diameter or less, from examination.

### III. CLASS 3 COMPONENTS

(No code relief requests)

### IV. PRESSURE TESTS

(No code relief requests)



Science Applications, Inc.

## V. GENERAL

### A. Ultrasonic Examination Techniques

#### 1. Request for Relief ISI-10; Ultrasonic Calibration Standards Class 1 and 2

##### Code Requirement

IWA-2232: Ultrasonic examination shall be conducted in accordance with the provisions of Appendix I. Where Appendix I (I-1200) is not applicable, the provisions of Article 5 of Section V shall apply.

##### Code Relief Request

Relief is requested from the calibration block requirements of the 1974 Edition including Addenda through Summer 1975 for ultrasonic examinations of Class 1 and 2 piping and vessel welds.

##### Proposed Alternative Examination

Future examinations which require fabrication of new calibration blocks will be performed using calibration blocks which will meet the 1974 Edition, Summer 1975 Addenda of Section XI, except for piping blocks which will as a minimum meet the 1977 Edition, Summer 1978 Addenda of ASME Section XI.

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

Ultrasonic calibration blocks employed for the Browns Ferry baseline examination were fabricated to the 1971 Edition of Section XI. These blocks will continue to be used for future examinations to ensure the repeatability of data. The pipe blocks have 5% T sawtooth notches running circumferentially around the inside and outside diameters. One side-drilled hole is placed in the side of the block parallel to the longitudinal axis of the curved blocks. Pipeblock curvature is within 0.9 to 1.5 times the diameter of the pipe examined; and thickness and hole size are according to ASME Section III, Figure IX-3432.1 of the 1971 Edition, Summer 1971 Addenda. Material for all blocks was the same or equivalent "P" number except as discussed in the file note and shown in the mill test report submitted by the licensee.

##### Evaluation

The licensee has provided test data that demonstrates the similarity in acoustic velocity and identifies differences in attenuation between the basic calibration blocks used for the



preservice ultrasonic examinations and either the actual component or the material from which the component was manufactured. The data were presented for blocks fabricated from materials that were not the same or equivalent "P" number. Based on the data, the licensee provided assurance that the calibration, based on attenuation considerations, provided an examination at least equivalent to that required by the applicable Code.

The licensee has utilized 5% T sawtooth notches as the reference reflectors for basic calibration for piping examinations. The 5% T sawtooth notches were used rather than drilled holes specified in Article 5 of ASME Section V. With the use of sawtooth notches, approximately 10% T is considered acceptable in later Editions of Section XI (Appendix III, 1977 Edition). The use of the 5% T notch, providing calibration is conducted from the direction shown in Figure III-3430-1 of Appendix III of Section XI (1977 Edition), is considered an acceptable alternative.

The use of the baseline calibration blocks for in-service inspections fabricated to the 1971 Edition of Section XI, will provide a level of sensitivity equivalent to that obtained if the calibration blocks met the exact requirements of the applicable Code, i.e., Section XI, 1974 Edition, including Summer 1975 Addenda.

#### Conclusions and Recommendations

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

Relief should be granted from the calibration block requirements of the 1974 Edition, including addenda through Summer 1975 of Section XI, for ultrasonic examinations of Class 1 and 2 piping and vessel welds.

The following alternative proposed by the licensee should be approved: Future examinations requiring fabrication of new calibration blocks would be performed using calibration blocks which would meet the 1974 Edition, Summer 1975 Addenda of Section XI, except for piping blocks which would, as a minimum, meet the 1977 Edition, Summer 1978 Addenda of Section XI.

#### References

Reference 19.



2. Request for Relief ISI-15; Ultrasonic Examination Technique of Piping Welds, Class 1 and 2

Code Requirement

IWA-2232:	Ultrasonic Examination
Appendix III:	Ultrasonic Examination
IWA-3000:	Evaluations

Code Relief Request

Licensee requests approval to update the ultrasonic examination and evaluation of piping welds to the 1977 Edition, Summer 1978 Addenda of Section XI to provide state-of-the-art methods for both.

Proposed Alternative Examination

Perform ultrasonic examination of piping welds according to IWA-2232(b), IWA-2232(c), and Appendix III and evaluate according to IWA-3000, all of the 1977 Edition, Summer 1978 Addenda.

Licensee's Basis for Requesting Relief

In accordance with 10 CFR 50.55a(g)(4)(iv), the licensee requests approval to update the ultrasonic examination and evaluation of piping welds to the 1977 Edition, Summer 1978 Addenda of Section XI to provide state-of-the-art methods for both. There are existing requests for relief (addressed to the 1974 Edition of the ASME Code) from the requirements of III-3410, III-3430 and III-4450 of Appendix III. The licensee does not believe that the existing requests for relief (ISI-8 and ISI-10) affect the overall purpose of updating the examination and evaluation techniques.

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 50.55a(g)(4)(iv));
- (b) When applying the 1977 Edition, all of the addenda through Summer 1978 Addenda must be used;





## B. Exempted Components

### 1. Code Exemption per IWC-1220(a), Components Exempted from Examination Based on Pressure and Temperature

#### Code Requirement

1974 Edition Section XI (Summer 1975 Addenda)-IWC-1220(a):

The following components may be exempted from the examination requirements of IWC-2520:

- (a) Components in systems where both the design pressure and temperature are equal to or less than 275 psig and 200°F, respectively.

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1977 Edition Section XI (Summer 1978 Addenda) - IWC-1220(b):

The following components shall be exempted from the inservice examination requirements of IWC-2500:

- (b) Components of systems or portions of systems other than Residual Heat Removal Systems and Emergency Core Cooling Systems, that are not required to operate above a pressure of 275 psig (1900 KPa) or above a temperature of 200°F (93°C).

#### Exemption

Exemption from examination of Class 2 piping welds is claimed according to IWC-1220(a), 1974 Edition of Section XI.

#### Evaluation

Paragraph IWC-1220(b) of Section XI, Summer 1978 Addenda, does not permit the exemption from examination of components in the ECCS and the RHRS that operate below 275 psig or below 200°F. Hence, low operating pressure and temperature are not acceptable as a basis for exempting ECCS and RHRS components from inservice examination.

Components in the RHRS and the ECCS cannot be exempted under IWC-1220(a). It is required that a representative sample of welds on these components be examined.

#### Conclusions and Recommendations

Based on the above evaluation, it is concluded that components in the RHRS and the ECCS should not be exempted. The licensee should include a representative sample of welds on the RHRS and ECCS components in the Inservice Inspection Program.

#### References

Reference 19.



Science Applications, Inc.

2. Class 2 Components and Piping Exemptions Based on Chemistry Control per IWC-1220(c)

Code Requirement

IWC-1220(c) Exempted Components: Components which perform an emergency core cooling function, provided the control of the chemistry (to minimize corrosive effects) of the contained fluid is verified by periodic sampling and testing.

Exemption

Licensee claims exemption from inspection of Class 2 Emergency Core Cooling System (ECCS) components and piping based on IWC-1220(c).

Evaluation

The chemistry control provision was deleted from paragraph IWC-1220 in the 1977 Edition of Section XI because practical evaluation, review, and acceptance standards could not be defined. Hence, water chemistry control to minimize stress corrosion described in Paragraph IWC-1220(c) of Section XI, 1974 Edition, is not an acceptable basis for exempting ECCS components from inservice examination.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for Class 2 ECCS components and piping systems claims for exemption from examination per IWC-1220(c) should not be allowed. It is recommended that the licensee revise the inservice inspection program for Browns Ferry Nuclear Plant to include examination of those portions of the ECCS that were deleted from the current ISI program based on exemptions allowed by IWC-1220(c).

References

Reference 19.

C. Other

(None)



## REFERENCES

1. J. F. Stolz (NRC) to G. Williams (TVA), Docket #50-296, Browns Ferry Nuclear Plant, Unit 3, Conformance to 10 CFR 50.55a(g), September 15, 1976.
2. J. E. Gilleland (TVA) to J. F. Stolz (NRC), October 20, 1976.
3. J. F. Stolz (NRC) to G. Williams (TVA), Docket #50-296, Compliance with 10 CFR 50.55a(g) for Brown Ferry Unit 3, November 22, 1976.
4. G. Williams (TVA) to B. Rusche (NRC), License Amendment to Change Technical Specifications, January 28, 1977.
5. R. S. Boyd (NRC) to G. Williams (TVA), Browns Ferry Unit 3 - Exemption from 10 CFR 50.55a(g), February 25, 1977.
6. J. E. Gilleland (TVA) to E. G. Case (NRC), Technical Specifications Change for Browns Ferry Nuclear Plant, Unit 3, July 29, 1977.
7. J. E. Gilleland (TVA) to E. G. Case (NRC), Revised Browns Ferry Unit 3 Inservice Inspection Program, July 29, 1977.
8. G. Lear (NRC) to N. B. Hughes (TVA), Request for Additional Information, Browns Ferry Nuclear Plant Unit 3, May 31, 1978.
9. T. A. Ippolito (NRC) to N. B. Hughes (TVA), Hydrostatic Pressure Testing, Browns Ferry Nuclear Plant Unit 3, August 8, 1978.
10. J. E. Gilleland (TVA), to T. A. Ippolito (NRC), Hydrostatic Pressure Testing, Browns Ferry Nuclear Plant Unit 3, November 3, 1978.
11. J. E. Gilleland (TVA) to T. A. Ippolito (NRC), Relief Request, Browns Ferry Nuclear Plant Unit 3, December 11, 1978.
12. J. E. Gilleland (TVA) to T. A. Ippolito (NRC), March 29, 1979.
13. J. E. Gilleland (TVA) to T. A. Ippolito (NRC), Termination of TVA BFNP TS 77, Continuation of TVA BFNP TS 89, April 24, 1979.
14. J. E. Gilleland (TVA) to T. A. Ippolito (NRC), Revised ISI of July 29, 1977, May 8, 1979.
15. L. M. Mills (TVA) to T. A. Ippolito (NRC), Proposal Allowing TVA to Start All Browns Ferry Units on January 1, 1980 ISI Interval, July 11, 1979.
16. L. M. Mills (TVA) to H. R. Denton (NRC), Further Revisions to Technical Specifications, Browns Ferry Nuclear Plant Unit 3, July 20, 1979.
17. L. M. Mills (TVA) to T. A. Ippolito (NRC), Additional Relief Request ISI-9, October 16, 1979.



18. L. M. Mills (TVA) to T. A. Ippolito (NRC), Request to Establish Concurrent Cycles for ASME Section XI Inservice Inspections and Tests, December 24, 1980.
19. L. M. Mills (TVA) to H. R. Denton (NRC), Complete Inservice Inspection Program, Browns Ferry Nuclear Plant Units 1, 2 and 3, November 16, 1981.
20. L. M. Mills (TVA) to H. R. Denton (NRC), Technical Specification Changes for Browns Ferry Nuclear Plant Units 1 and 2, November 17, 1981.
21. D. B. Vassallo (NRC) to H. G. Parris (TVA), Inservice Inspection Program, Browns Ferry Nuclear Plant, Units 1, 2 and 3, February 24, 1982.
22. L. M. Mills (TVA) to D. B. Vassallo (NRC), Reply to Request for Additional Information, April 14, 1982.

