

TECHNICAL EVALUATION REPORT  
CALVERT CLIFFS NUCLEAR POWER PLANT  
UNITS 1 AND 2  
INSERVICE INSPECTION PROGRAM

Submitted to:

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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, Baltimore Gas and Electric Company (BG&E), of the Calvert Cliffs Nuclear Power Plants Units 1 and 2. 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 Calvert Cliffs Nuclear Power Plant Unit 1, 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 September 8, 1978, to May 8, 1985. For Unit 2, they cover the entire current 120-month inspection interval, i.e., from April 1, 1977, to March 31, 1987.\* These programs were 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.

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\*In Reference 11, the licensee proposed to extend the Unit 1 first interval to April 1, 1987, "in order to insure updating of both plants' ISI programs to the same year and addenda for the remaining service lifetime". He requests approval for this proposal.

References (1) to (11) listed at the end of this report pertain to previous transmittals on ISI between the licensee and the Commission. By letters of April 28 and November 24, 1976,<sup>(1,3)</sup> the Commission provided general ISI guidance to all licensees. Relief requests in response to that guidance were made by the licensee on December 5, 1978,<sup>(4)</sup> March 29, 1980,<sup>(6)</sup> November 19, 1980,<sup>(7)</sup> and May 29, 1981.<sup>(8)\*</sup> On May 19, 1976, in response to the initial guidance, the licensee identified the start of the next 40-month inspection period for Unit 1.<sup>(2)\*\*</sup> On October 24, 1979, the Commission requested the overdue description of the ISI program for Unit 1.<sup>(5)</sup> Descriptions of programs for both units were submitted with Reference 6.<sup>(5)</sup> The Commission requested additional information on March 12, 1982,<sup>(9)</sup> which was submitted by the licensee on July 22, 1982.<sup>(11)</sup>

From these submittals a total of 9 requests\* for relief from Code requirements or for updating to a later code were identified. These requests are evaluated in the following sections of this report.

In addition, the licensee has withdrawn<sup>(11)</sup> the following three relief requests previously submitted:

- (1) Relief Request D on Pressure Retaining Welds in Mainsteam and Feedwater Piping, because "Calvert Cliffs Technical Specification 4.4.10.1.2, Unit 1 and 2, prescribes an Augmented Inservice Inspection Program which requires the unencapsulated welds greater than 4 in. in nominal diameter in the mainsteam and main feedwater piping runs located outside the containment and traversing safety related areas or located in compartments adjoining safety related areas be inspected 100% every 10-year inspection interval".
- (2) Relief Request H on Containment Penetrations of Non-Nuclear Systems, because "a non-class system penetrating the containment remains non-class, although it is subject to special testing as required by 10 CFR 50 Appendix J".

\*The relief request in Reference (8) is for a one-time repair and is not evaluated in this report.

\*\*No correspondence equivalent to References (1) to (3) has been found in NRC files for Unit 2.

\*\*\*No copy of the description for Unit 2 has been located in the NRC files, so a copy was obtained directly from the licensee (Reference 10) (including Change 1, dated February 1979).



(3) Relief Request J on Hydraulic Actuator Lines for Main Steam Isolation Valves because Regulatory Guide 1.26 applies only to components containing radioactive material, water or steam, and the mainsteam isolation valves are tested in accordance with Subsection IWV and the Calvert Cliffs Technical Specifications.

An additional relief request dated August 30, 1982<sup>(12)</sup> was received too late for evaluation in this report, which was by then ready for final publication.



## I. CLASS 1 COMPONENTS

### A. Reactor Vessel

#### 1. Relief Request C, Circumferential Seal Weld in Closure Head, Category B-B, Item B1.2

##### Code Requirement

The volumetric examinations performed during each inspection interval 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. The areas shall include the longitudinal and circumferential welds in the vessel shell and meridional and circumferential welds in vessel heads. This includes weld metal and base metal for one plate thickness beyond the edge of the weld. Examinations may be performed at or near the end of each inspection interval.

##### Code Relief Request

The licensee requests relief from volumetric examination of the circumferential weld (6-209B) in the reactor pressure vessel closure head.

##### Proposed Alternative Examination

The licensee intends that the integrity of the vessel head be verified during the system pressure test which follows each refueling and by the visual examinations of the head interior clad surface required by this Code during each interval.

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

This would entail access to at least 5% of the entire weld and should be done once during each inspection interval. However, the cluster of control element drive mechanisms penetrating the vessel head makes this examination impractical. (The licensee submitted C.E. drawings 233-415 and 233-427 and Transco Drawing DR3854-71 in support of this contention.) Unsuccessful attempts have been made in past inspection outages to access this weld for examination. Later editions of ASME Code Section XI permit deletion of inaccessible reactor vessel head welds.

##### Evaluation

The design of the closure head and control element drive penetration locations prevent volumetric examination of the closure head circumferential weld.

To maintain the extent of examination, an augmented in-service inspection program of both volumetric and visual examination should be required. The volumetric examination





of accessible Category B-B welds should be increased to achieve an examination sample whose total weld length is equal to that required for the Category B-B weld for which relief was requested. The priority in selecting the welds for additional examination should be as follows:

- (a) other welds in the same head; and
- (b) other Category B-B welds.

In addition, visual examination for gross leakage should be required during each system pressure test in accordance with IWB-1220(c). The visual examination of the head interior clad surface, proposed as an alternative by the licensee, is no longer required by the Code (see I.A.3 of this report).

#### 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 volumetric examination of the identified welds for the 10-year inspection interval, provided that:

- (a) The examination of the accessible Category B-B welds should be increased to achieve an examination sample whose total weld length includes that required for the Category B-B weld for which relief was requested.
- (b) As proposed by the licensee, general visual examinations per IWB-1220(c) should be made during each system pressure test for evidence of leakage in the areas of the closure head.

The licensee's proposed visual examination of the head interior clad surface is not necessary (see also I.A.3 of this report).

#### References

Reference 6 and 11.



2. Relief Request B, Primary Nozzle-to-Vessel Welds and Nozzle Inside Radiused Section, Category B-D, Item B1.4

Code Requirement

Category B-D of Table IWB-2500 requires that 100% of nozzles be examined each inspection interval. Paragraph IWB-2411 further stipulates that at least 25% but no more than 33-1/3% of the required examinations be complete within the first one-third of an interval; at least 50% but no more than 66-2/3% be complete within the second one-third of an interval; and that the remainder of the examinations be completed by the end of the inspection interval.

Code Relief Request

Relief is requested from schedule in Paragraph IWB-2411, and schedule the examination of two inlet nozzle welds from the second to the third period.

Proposed Alternative Examination

Since the core barrel will not be removed until near the end of the interval, the two outlet nozzles will be examined during the first period, and the four inlet nozzles will be examined during the third period by mechanized methods from the I.D. when the core barrel is removed.

Licensee's Basis for Requesting Relief

There are six nozzles, four inlet and two outlet, and of these, only the two outlet nozzles are accessible to examine when the core barrel is installed.

Evaluation

To conform with Code, the licensee would have to remove the core barrel during both the second and third periods, which is not practical. The increase in personnel exposure is not warranted by the marginal increase in safety. This is recognized in the Code for the reactor vessel Category B-A and B-B welds which are covered by the core support assembly and are only examined at or near the end of the interval. The schedule proposed by the licensee is acceptable. The total volume of weld examined during the 10-year interval meets Code requirements.

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 schedule given in Paragraph IWB-2411 be granted, provided the schedule proposed by the licensee is adhered to.

References

Reference 6.



3. Relief Request A, Reactor Vessel Cladding, Category B-I-1,  
Item 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 (36 sq. in.) evenly distributed in the accessible sections of vessel shell. The examination shall be visual for the vessel cladding. Paragraph IWB-2411 requires that this examination be distributed evenly over the three 40-month inspection periods in an interval.

Code Relief Request

The licensee proposes to delay visual inspection until core barrel is removed.

Proposed Alternative Examination

None.

Licensee's Basis for Requesting Relief

Since these areas are inaccessible unless the core barrel is removed, it is intended that this examination requirement be fulfilled near the end of the interval when the core barrel is scheduled for removal, utilizing a remote visual method. Continued cladding integrity can be verified during the visual inspection of the reactor vessel head cladding during each interval since the vessel and head surfaces are exposed to similar service environments and were manufactured under similar processes by the same vendor.

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 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. The licensee's proposed examinations of these items then become unnecessary.

#### Conclusions and 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 B-K-1 items. This approval would delete the requirement to examine these items. The licensee's proposed examinations are unnecessary.

#### References

Reference 6.

- B. Pressurizer  
No relief requests.
- C. Heat Exchangers and Steam Generators  
No relief requests.
- D. Piping Pressure Boundary  
No relief requests.
- E. Pump Pressure Boundary  
No relief requests.
- F. Valve Pressure Boundary  
No relief requests.



## II. CLASS 2 COMPONENTS

No relief requests.

## III. CLASS 3 COMPONENTS

No relief requests.

## IV. PRESSURE TESTS

### A. General

#### 1. Relief Request K, Hold Time

##### Code Requirement

IWA-5210(a) of the 1974 Edition, Summer 1975 Addenda, states that the test pressure and temperature shall be maintained for at least four hours prior to the performance of the examinations.

##### Code Relief Request

Relief is requested to lower hold time to 10 minutes on uninsulated pipes.

##### Proposed Alternative Examination

The licensee proposes to use the 1977 Edition, Winter 1977 Addenda, IWA-5213, to define test condition hold time.

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

The 1977 Edition of Section XI, through the Summer 1978 Addenda, has been approved for use per the October 19, 1979, revision to 10 CFR 50.55a. In this edition, Paragraph IWA-5213 requires a four-hour hold time for insulated systems, but permits a hold time of 10 minutes for uninsulated systems. Also, this shorter hold time will provide for a reduced exposure to test personnel when working in controlled areas.



### 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.

IWA-5213 of the 1977 Edition, Winter 1977 Addenda of the Code was included in the Summer 1978 Addenda. IWA-5213 refers to types of tests and to pressure and temperature conditions that are defined in other paragraphs of Subsubarticle IWA-5210. The entire subsubarticle needs to be adopted to comply with requirements of (c) above.

### Recommendations

Pursuant to 10 CFR 50.55a(g)(4)(iv), approval should be granted to update from the requirements of Paragraph IWA-5210 of the 1974 Edition, Summer 1975 Addenda to the requirements of Subsubarticle IWA-5210 in the 1977 Edition, Summer 1978 Addenda. This approval would permit the licensee to carry out its proposed alternative examination.

### References

Reference 6.

- B. Class 1 System Pressure Tests  
No relief requests.
  
- C. Class 2 System Pressure Tests  
No relief requests.



D. Class 3 System Pressure Tests

1. Relief Request E, Diesel Generator Components

Code Requirement

IWD-2410:

(a) Inservice examinations may be performed during system operation or plant outages.

(b) 100% of the components shall have been tested and examined in accordance with IWA-5000, IWD-5000, and IWD-2600 by the expiration of each inspection interval.

(c) In addition, 100% of the components shall have been examined in accordance with IWA-5240 and IWD-2600 while in operation or during system inservice testing, by the expiration of every one-third of each inspection interval.

IWD-5200(a): The system test pressure shall be at least 1.10 times the system design pressure.

Code Relief Request

Relief is requested from hydrostatic tests of Class 3 associated components of the diesel generator.

Proposed Alternative Examination

Monitoring of critical parameters, weekly load test of diesel, and inservice leak test each inspection period.

Licensee's Basis for Requesting Relief

Paragraph IWD-2410 requires a hydrostatic test of Class 3 systems once every inspection interval. This would require that lines associated with the diesel generators, i.e., HB-4, Fuel Oil; Lube HB-5, Lube Oil; HB-22, Cooling Water; HB-51, Diesel Starting Air; be examined while at a hydrostatic pressure of 1.10 x design pressure. Such a test could not only place the diesel, which is intended as an emergency power source, out of service, but could also contaminate air and oil lines.

However, instrumentation exists to monitor the critical parameters and is recorded at the frequencies listed:

Starting Air Receiver Pressure:	6 times per day
11 and 21 Fuel Oil Tank Levels:	6 times per day
Fuel Oil Temperature and Specific Gravity:	6 times per day





Additionally, the diesels are run a minimum of once per week under load for at least one hour. During this condition, the following readings are also recorded (in addition to readings 15 minutes and one hour after start):

Generator Bearing Temperature:	6 times per day
Coolant Pump Discharge Pressure:	6 times per day
Lube Oil Pressure:	6 times per day
Jacket Cooling Inlet Temperature:	6 times per day
Jacket Cooling Outlet Temperature:	6 times per day
Lube Oil Inlet Temperature:	6 times per day
Lube Oil Outlet Temperature:	6 times per day

The monitoring of the above parameters in addition to the inservice leak test required every 40 months which will be performed on all piping which is not underground or internal to the diesel will provide a high degree of confidence in the integrity of the diesel generator systems. This will eliminate the need for the hydrostatic pressure test required every interval.

### Evaluation

The licensee's proposed alternative examination is inadequate to provide the same information given by a hydrostatic test as to the integrity of these components. This is recognized in the 1977 Code, Summer 1978 Addenda, which makes a clear distinction between leak tests at normal operating pressures and hydrostatic tests at higher than normal pressures.

Updating to the 1977 Code, Summer 1978 Addenda, however, allows (a) the use of air or oil as the pressure test working fluid (IWD-5210(b)) and (b) the use of the lowest relief valve setting in determining the test pressure (IWD-5223(a)). The various components can be pneumatically or hydraulically tested using the above Code requirements without introducing water into the systems and using less restrictive test pressures. Diesels are typically taken out of service for preventive and other maintenance from time to time. Performing the Code hydrostatic tests at such times should not significantly affect the total downtime of the engine. There should then be no need for relief from any Code requirements.

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 pressure testing diesel generator components.

### References

Reference 6.



## 2. Relief Request F, Salt Water Cooling Systems

### Code Requirement

#### IWD-2410:

(a) Inservice examinations may be performed during system operation plant outages.

(b) 100% of the components shall have been tested and examined in accordance with IWA-5000, IWD-5000, and IWD-2600 by the expiration of each inspection interval.

(c) In addition, 100% of the components shall have been examined in accordance with IWA-5240 and IWD-2600 while in operation or during system inservice testing, by the expiration of every one-third of each inspection interval.

IWD-5200(a): The system test pressure shall be at least 1.10 times the system design pressure.

### Code Relief Request

Relief is requested from hydrostatic testing.

### Proposed Alternative Examination

The inservice leak test required every 40-month inspection period will be performed on a yearly basis on above-ground portions to verify continued system integrity.

### Licensee's Basis for Requesting Relief

On installed Salt Water Cooling Systems (Pipe Classes LC-2, LJ-1, and MC-6), only butterfly valves are installed. These valves are insufficient to maintain a satisfactory pressure boundary to sustain the increased pressure. Therefore, the hydrostatic-pressure test at elevated pressure cannot be completed.

### Evaluation

The licensee's proposed alternative examination is inadequate to provide the same information given by a hydrostatic test as to the integrity of this water system. This is recognized in the 1977 Code, Summer 1978 Addenda, which makes a clear distinction between leak tests at normal operating pressures and hydrostatic tests at higher than normal pressures.

Updating to the 1977 Code, Summer 1978 Addenda, however, allows the use of the lowest relief valve setting in determining the test pressure (IWD-5223(a)). The whole system can be hydrostatically tested using the above Code requirements with a less



restrictive test pressure. This would eliminate the need for relief from any code requirements.

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 pressure testing salt water cooling systems.

#### References

Reference 6.



### 3. Relief Request G, Service Water System Main Headers

#### Code Requirement

##### IWD-2410:

(a) Inservice examinations may be performed during system operating plant outages.

(b) 100% of the components shall have been tested and examined in accordance with IWA-5000, IWD-5000, and IWD-2600 by the expiration of each inspection interval.

(c) In addition, 100% of the components shall have been examined in accordance with IWA-5240 and IWD-2600 while in operation or during system inservice testing, by the expiration of every one-third of each inspection interval.

IWD-5200(a): The system test pressure shall be at least 1.10 times the system design pressure.

#### Code Relief Request

Relief is requested from hydrostatic testing.

#### Proposed Alternative Examination

The inservice leak test required in every 40-month period will be accomplished and will serve to verify continued system integrity. This inspection will, however, be performed at an increased frequency such that the system is examined on a once a year rather than once per 40 months basis.

#### Licensee's Basis for Requesting Relief

On the Service Water System (HB-22) main headers, where butterfly valves are installed, sufficient seal to maintain pressure on an isolated portion of the system cannot be achieved. For this reason, the elevated pressure hydrostatic test cannot be completed.

#### Evaluation

The licensee's proposed alternative examination is inadequate to provide the same information given by a hydrostatic test as to the integrity of this water system. This is recognized in the 1977 Code, Summer 1978 Addenda, which makes a clear distinction between leak tests at normal operating pressures and hydrostatic tests at higher than normal pressures.

Updating to the 1977 Code, Summer 1978 Addenda, however, allows the use of the lowest relief valve setting in determining the test pressure (IWD-5223(a)). The whole system can be



hydrostatically tested using the above Code requirements with a less restrictive test pressure. This would eliminate the need for relief from any code requirements. However, if any undesirable effects on valves are identified under the updated test procedure, they would provide the basis for future relief requests.

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 pressure testing Service Water System Main Headers.

#### References

Reference 6.



## V. GENERAL

### A. Ultrasonic Examination Technique

#### 1. Relief Request I, Recording Levels for Piping Welds

##### Code Requirements

ASME Code Section XI (1974 Edition), Paragraph IWA-2232, Ultrasonic Examination: "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."

ASME Code Section V (1974 Edition), Paragraph T-537, Evaluation of Indications: "All indications which produce a response greater than 20% of the reference level shall be investigated to the extent that the operator can evaluate the shape, identity, and location of all such reflectors in terms of the acceptance-rejection standards of the referencing Code section."

##### Code Relief Request

Relief is requested from Paragraph T-537 above.

##### Proposed Alternative Examination

The licensee proposes the following alternative criteria to Article 5 of Section V of the Code:

All evaluations which exceed 100% of reference level will be evaluated, and all indications which exceed 50% of reference level will be recorded for future reference, as necessary. For vessels with greater than 2-1/2 in. of wall thickness, the evaluation requirements of Appendix I, Section XI of the ASME Code will continue to apply.

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

The Code requirement becomes burdensome due to the number of irrelevant indications which could occur in this region due to noise. Additional difficulties arise because extra examination teams with examiners who are qualified to Level II (or better) must be utilized. The use of these highly qualified examiners to record and evaluate indications which are not associated with true defects results in two undesirable conditions:

- (1) The examiners are not available time-wise to conduct meaningful inspections;
- (2) The examiners are unnecessarily exposed to radiation which increases their total man-rem burden and reduces their ultimate availability for future examinations in high radiation areas.



## Evaluation

Recording and evaluating indications at 20% of the reference level is impractical for the following reasons:

- (a) The welded joints in nuclear piping frequently contain Code-allowable wall thickness differences (12% of nominal thickness) as well as some weld drop-through, counterbore taper, crown height, etc. These conditions generate an extremely large number of geometric reflectors that produce UT indications greater than 20% of the reference level.
- (b) Weld metal in stainless steel piping contains reflectors due to the metallurgical structure that produces a large number of UT indications.
- (c) All examination personnel experience radiation exposure during inservice examinations. The Section V requirement to record and evaluate UT indications at the 20% level places an unnecessary burden on the limited number of experienced and qualified examiners available to the licensee.

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.

Appendix III was incorporated into Paragraph IWA-2232 of the 1977 Edition through Summer 1978 Addenda of Section XI. To meet the requirements of (c) above, the entire Paragraph IWA-2232 in the Summer 1978 Addenda should be adopted by the licensee. This paragraph includes the following:

- (1) For examination of welds, reflectors that produce a response greater than 50% of the reference level shall be recorded. (IWA-2232(c)(1))
- (2) For examination of welds, all reflectors which produce a response greater than 100% of the reference level shall be investigated to the extent that the operator can determine the shape, identity, and location of all such reflectors in terms of the acceptance-rejection standards of IWA-3100(b). (IWA-2232(c)(2))





(3) The size of reflectors shall be measured between points which give amplitudes equal to 100% of the reference level. (IWA-2232(c)(3))

In addition, indications of 20% of reference level or greater which are interpreted to be a crack must be identified and evaluated according to the rules of Section XI.

#### Recommendations

Pursuant to 10 CFR 50.55a(g)(4)(iv), approval should be granted to update from the requirements of Paragraph IWA-2232 of the 1974 Edition, Summer 1975 Addenda to the requirements of the same paragraph in the 1977 Edition, Summer 1978 Addenda, with the additional requirement that indications 20% of reference level or greater that are interpreted to be a crack must be identified and evaluated according to the rules of Section XI.

#### References

References 4 and 6.

#### B. Exempted Components

None.



C. Other

1. Repair and Hydrostatic Testing Procedures for Small Steam and Feedwater Piping, Class 2

Code Requirements

IWA-4210: After repairs by welding on the pressure retaining boundary of components (except repairs on cladding), a pressure test shall be performed in accordance with the provisions of IWA-5000.

IWC-5220(a): The system hydrostatic test pressure shall be at least 1.25 times the system design pressure ( $P_D$ ) and conducted at a test temperature not less than 100°F except as may be required to meet the test temperature requirements of IWA-5230.

IWB-4423(4)(a): During the weld repair, a magnetic particle examination shall be performed on each layer.

Code Relief Request

It is proposed that repair welds and new welds on piping and components that are 5 in. nominal pipe size and smaller and cannot be isolated from the secondary side of the steam generators not be examined under hydrostatic pressure testing in accordance with ASME Code, Section XI.

The request involves portions of the steam and feedwater systems extending from, but not including, the secondary side of steam generators 11, 12, 21, and 22 up to and including the first outermost containment isolation valve that is either normally closed or capable of automatic closure during all modes of normal reactor operation. Those Class 2 lines involved are:

<u>Piping Line Number</u>	<u>Original Design Class</u>	<u>Description</u>
CB-1	B31.1	Feedwater Pump Discharge to Steam Generators
DB-3	B31.7 Class 2	Feedwater Penetration Piping
EB-1	B31.1	Mainsteam to Mainsteam Isolation Valves
EB-5	B31.3	Auxiliary Feedwater
EB-6	B31.1	Steam Generator Blowdown Piping
EB-12	B31.7 Class 2	Mainsteam Penetration Piping
EB-13	B31.7 Class 2	Auxiliary Feedwater Penetration Piping



<u>Piping Line Number</u>	<u>Original Design Class</u>	<u>Description</u>
EB-14	B31.7 Class 2	Steam Generator Blowdown Penetration Piping
Miscellaneous		Associated Instrument Pipe and Tubing Connected to Steam Generators and Regulatory Guide 1.26 Class 2 Portions of Above Piping

#### Proposed Alternative Examination

- A. Examination of the components under normal operating pressure corresponding to 100% rated reactor power.
- B. Surface examination meeting ASME Code, Section XI requirements after completing removal of half the first weld layer by grinding. Surface examination will be performed by the liquid penetrant method.
- C. Surface examination meeting ASME Code Section XI requirements after completing the weld. Surface examination will be performed by the liquid penetrant or magnetic particle methods.
- D. Volumetric examination on component butt welds greater than 1-in. nominal pipe size. Ultrasonic and/or radiographic examination methods will be performed.

#### Licensee's Basis for Requesting Relief

Only repairs, modifications, replacements, additions or alteration to steam generator associated piping that cannot be isolated from the steam generator and are 5 in. and smaller in nominal pipe size are requested for exemption from the hydrostatic pressure testing requirements of IWC-5000 prior to being placed into service. This is not an exemption from the interval requirement of hydrostatic pressure testing of these components, nor is it an exemption from hydrostatic testing of direct steam generator pressure boundary welding.

Calvert Cliffs steam generators are currently limited by design to only 10 hydrostatic pressure tests on the secondary side. Of the 8 remaining hydrostatic pressure tests (as of November 1980), 4 hydrostatic tests will be performed over the 40-year life to meet the once per interval required hydrostatic pressure test in accordance with ASME Code, Section XI requirements for Class 2 components. The remaining four hydrostatic tests will be reserved for repairs, modifications, replacements, additions, and alterations not being requested for exemption as specified herein.



As an added requirement for welds exempted from hydrostatic pressure testing requirements, a surface examination shall be performed after completing removal of half the first weld layer by grinding. Another surface examination will be performed after the final weld pass. Also, a 100% volumetric examination of completed butt welds on branch connections and associated piping and components greater than 1-in. nominal pipe size will be performed. It is felt that these, in lieu of ASME Code, Section XI requirements will insure the integrity of the components requested for exemption from the hydrostatic pressure testing requirements.

### Evaluation

The licensee's proposed alternative pressure test examination does not provide the same information that is given by a hydrostatic test as to the integrity of these lines. This is recognized in the 1977 Code, Summer 1978 Addenda which makes a clear distinction between leak tests at normal operating pressures and hydrostatic tests at higher than normal pressures. The proposed surface examinations are already required for welding repairs. The proposed volumetric examination is part of the Code-required examination for Category C-G lines.

Updating to the 1977 Code, Summer 1978 Addenda, allows the use of the lowest relief valve setting in determining the test pressure (IWD-5223(a)). The steam generators could be tested using a less restrictive test pressure. This could significantly increase the number of hydrostatic pressure tests permitted by design.

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.

### Conclusions and Recommendations

Based upon the above evaluation, it is concluded that there is presently not sufficient justification to grant the code relief requested by the licensee. 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 for pressure testing the secondary side of the steam generators. The licensee should determine whether the lower test pressure in this Code version makes the above relief request unnecessary.

References

Reference 7.



## REFERENCES

1. D. L. Ziemann (NRC) to A. E. Lundvall, Jr. (BG&E), April 28, 1976.
2. A. E. Lundvall, Jr. (BG&E) to D. L. Ziemann (NRC), Compliance with 10 CFR Part 50.55a, May 19, 1976.
3. D. L. Ziemann (NRC) to A. E. Lundvall, Jr. (BG&E), November 24, 1976.
4. A. E. Lundvall, Jr. (BG&E) to R. W. Reid (NRC), Inservice Inspection (ISI) Program, December 5, 1978.
5. R. W. Reid (NRC), to A. E. Lundvall, Jr. (BG&E), October 24, 1979.
6. A. E. Lundvall, Jr. (BG&E) to R. W. Reid (NRC), Inservice Inspection (ISI) Program, March 29, 1980.
7. A. E. Lundvall, Jr. (BG&E) to R. W. Reid (NRC), Inservice Inspection (ISI) Program Request for Relief from ASME Code Section XI Requirements Determined to be Impractical, November 19, 1980.
8. A. E. Lundvall, Jr. (BG&E) to R. A. Clark (NRC), Inservice Inspection (ISI) Program, Relief from ASME Code Requirements Determined to be Impractical, May 29, 1981.
9. R. A. Clark (NRC) to A. E. Lundvall, Jr. (BG&E), March 12, 1982.
10. B. C. Rudell (BG&E) to G. A. Freund (SAI), Long Term Inservice Inspection Plan for CCNPP, Unit 2, March 19, 1982.
11. A. E. Lundvall, Jr. (BG&E) to R. A. Clark (NRC), Inservice Inspection Program, July 22, 1982.
12. A. E. Lundvall, Jr. (BG&E) to R. A. Clark (NRC), Inservice Inspection Program Request for Relief from ASME Code Section XI Requirements Determined to be Impractical, Calvert Cliffs Nuclear Power Plant Unit No. 2, Docket No. 50-318, August 30, 1982.

