

H. B. ROBINSON STEAM ELECTRIC PLANT

UNIT 2

INSERVICE INSPECTION PROGRAM

TECHNICAL EVALUATION REPORT

Submitted to:

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Science Applications, Inc.
McLean, Virginia 22102

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TECHNICAL EVALUATION REPORT
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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, Carolina Power and Light Company (CP&L), of the H. B. Robinson Steam

*Hereinafter referred to as Section XI or Code.

Electric Plant Unit 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.

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 12, 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 H. B. Robinson Steam Electric Plant Unit 2, the ISI program and the relief requests evaluated in this report cover the entire current 120-month inspection interval, i.e., from March 7, 1981 to March 7, 1991. This program was based upon the 1977 Edition of Section XI of the ASME Boiler and Pressure Vessel Code with Addenda through the Summer of 1978.

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. No such instances are required for 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. No such instances are required for this report.

References (1) to (9) listed at the end of this report pertain to previous transmittals on ISI between the licensee and the Commission. By letters of April 22 and November 17, 1976,^(1,3) the Commission provided

general ISI guidance to all licensees. Submittals in response to that guidance were made by the licensee on May 24, 1976,⁽²⁾ and May 10, 1977.⁽⁴⁾

On August 5, 1977,⁽⁵⁾ the Inservice Inspection Program was submitted by the licensee to the Commission. During meetings with the licensee on August 22 and 23, 1978,⁽⁶⁾ the Commission requested and obtained additional information to complete the review of that program. On October 25, 1978,⁽⁷⁾ the licensee submitted a revised ISI program to respond to the questions raised on its earlier program and included approximately 20 requests for relief.⁽⁵⁾ The Commission never granted CP&L interim approval for this program, which covered the inspection interval ending in March 1981. Since that program had ended by the time SAI was retained for this evaluation effort, it was decided that SAI should review whatever program the licensee would submit for the interval beginning in March 1981.

On March 22, 1982,⁽⁸⁾ the licensee submitted such a revised ISI program, updated to the 1977 edition of the ASME code through Summer 1978 addenda. This program included only two relief requests, compared to the twenty in the previous program. By letter dated May 10, 1982,⁽⁹⁾ the Commission requested additional information to complete the review of the March 22, 1982⁽⁸⁾, submittal including justification for the smaller number of relief requests.

During a telephone conversation on August 13, 1982,⁽¹⁰⁾ the licensee withdrew one relief request from the March 22, 1982, submittal and notified NRC that additional relief requests would be necessary. On September 17, 1982, the licensee submitted revised versions⁽¹¹⁾ of the Class 1 and Class 2 relief requests made in the October 25, 1978,⁽⁷⁾ submittal.

From the latest submittals^(8,11) a total of 19 requests for relief from code requirements were identified. These requests are evaluated in the following sections of this report.

On several of these relief requests, some essential information (particularly drawings supporting claims of inaccessibility) was not available to SAI for review. In these instances, preliminary recommendations are made, based on evaluations of other units of similar design, and subject to future



verification of the licensee's basis (by review of the drawings and/or by additional inquiry of the licensee).

Five other requests for relief are not evaluated in this report:

1. The licensee requested relief to substitute volumetric and surface examination of the reactor vessel closure studs upon removal during each refueling outage, for volumetric examination of the bolts in-place. Since either method is acceptable under the code, the licensee meets the intent of the code and no relief is necessary (Note 2, Table 3A, Reference 11).
2. The licensee is inspecting steam generator tubing in accordance with the Plant Technical Specifications and commitments that have been made to NRC. As with evaluations of other units, this item is not included in this TER (Note 14, Table 3A, Reference 11).
3. The licensee requested relief pertaining to the socket head bolts in the seal housing of the reactor coolant pumps. He proposed to substitute volumetric and surface examination of the bolts when the pump is disassembled for maintenance or examination of pump casing welds, for volumetric examination of the bolts in-place. Since either method is acceptable under the code, the licensee meets the intent of the code and no relief is necessary (Note 10, Table 3A, Reference 11).
4. The licensee requested relief from examination of the pressurizer and steam generator nozzles. Since these are integrally cast with the respective heads, there are no welds requiring examination so no code relief is necessary (Notes 4 and 6, Table 3A, Reference 11).
5. The licensee requested relief from code requirements for certain Class 1 piping welds where full examinations were not practical due to geometric configurations or accessibility (Notes 5 and 7, Table 3A, Reference 11). These requests apparently fall under the



blanket relief request for category B-J piping welds requested in Reference 8, Relief Request 1 and were included in that evaluation.

In conclusion, in the eighteen months since the start of the current 10-year inspection interval, the licensee has been unable to submit an integrated set of relief requests that provides adequate information for review. The licensee has not provided a summary of the extent to which the ISI program for the previous interval did not meet Code requirements. The limited information that forms the basis for this Technical Evaluation Report contains a number of potentially significant discrepancies.

I. CLASS 1 COMPONENTS

A. Reactor Vessel

1. Request for Relief, Note 1, Table 3A, Circumferential Weld in the Closure Head, Category B-A, Item B1.22

Code Requirement

Volumetric examination of circumferential and meridional head welds shall cover the accessible length (includes essentially 100% of the weld length) of all welds in the first inspection interval, and the accessible length of one weld in the successive 2nd, 3rd and 4th inspection intervals. Deferral of inspection of bottom head welds to the end of an interval is permissible.

Code Relief Request

Relief is requested from volumetric examinations of the closure head peel segment to disc weld.

Proposed Alternative Examination

Visual examination for leakage during leak testing after each refueling outage and during the hydrostatic test to be performed near the end of the 120-month interval.

Licensee's Basis for Requesting Relief

Accessibility for examination of this weld was not provided for in the original plant design which occurred prior to the issuance of Section XI inservice inspection requirements. This weld is considered inaccessible for volumetric examination due to physical space constraints. The closure head peel segment to disc weld is completely enclosed within the pattern of control rod drive mechanisms (CRDM) penetrations inside the shroud such that no portion of the weld is accessible to either surface or volumetric examination. This weld is shown in drawing CPL-101, Weld No. 1.*

Evaluation

The entire length of the closure head peel segment to disc weld is inaccessible so that this weld cannot be examined. Other welds in the closure head are apparently accessible. Relief from Code requirements is only necessary for the first interval, since only one weld is required to be examined in the successive intervals.

*Not available for review by SAI, but such inaccessibility has been encountered in evaluation of plants of similar design.



Conclusions and Recommendations

Since this unit is in its second inspection interval and other circumferential closure head welds are apparently accessible and can be examined, the closure head peel segment to disc weld does not have to be examined. Therefore relief is not required and should not be granted.

References

References 5, 6, 7, 10 and 11.

B. Pressurizer

(no relief requests)

C. Heat Exchanger

(no relief requests)

D. Piping Pressure Boundary

1. Request for Relief, Note 11B (Note 17 in Reference 7), Table 3A, Reactor Vessel Nozzle-to-Safe End Welds Category B-F, Item B5.10

Code Requirement

Examinations are required of each safe end weld in each loop and connecting branches of the reactor coolant system. For nominal pipe size less than 4 inches, surface only examinations are required. For larger pipe, surface plus volumetric examinations are required.

Code Relief Request

Relief is requested from examination of 100% of primary nozzle safe end welds. Examinations will be performed to the extent practical.

Proposed Alternative Examination

None.

Licensee's Basis For Requesting Relief

The "sandplug" access provided from the floor of the refueling cavity to the outside of the primary nozzle safe-ends is insufficient to permit surface examination to be performed on 100% of the safe-ends. Examinations will be performed to the extent practical to the limits of the available access.



Evaluation

Due to the physical limitations on access to these welds, it is impossible to perform the required examinations on 100% of the welds.* The initial design of the "sandplug" access did not allow sufficient space to perform the required examinations. The licensee has committed to perform the examinations to the extent practical to the limits of the available access. Based on SAI's evaluations of units with similar design, such examinations are likely to be able to cover a substantial portion of the welds.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for these welds, Code requirements are impractical. Therefore, it is recommended that relief from examination requirements for these welds be granted to the extent necessary due to inaccessibility, subject to establishing (from drawings and/or further inquiry of the licensee) that a substantial portion of these welds is accessible.

References

References 5, 6, 7, 10 and 11.

2. Request for Relief No. 1, Pressure Retaining Welds in Piping, Category B-J, Items B9.10 and B9.31

Code Requirement

For circumferential welds with nominal pipe size 4 inches and greater and branch pipe connections (greater than 2 inches), surface plus volumetric examinations shall cover the inner 1/3 of the pipe volume, shall be performed during each inspection interval and shall include the following:

- a. All terminal ends in each pipe or branch run connected to vessels.
- b. All terminal ends and joints in each pipe or branch run connected to other components where the stress levels exceed the following limits under loads associated with specific seismic events and operational conditions.
 - (1) primary plus secondary stress intensity range of $2.4S_m$ for ferritic steel and austenitic steel, and
 - (2) cumulative usage factor U of 0.4.

*SAI was unable to verify the lack of access for examination since drawings apparently showing this, CPL-107, 107A and 107B were unavailable for review.



- c. All dissimilar metal welds between combinations of:
 - (a) carbon or low alloy steels to high alloy steels;
 - (b) carbon or low alloy steels to high nickel alloys;
 - (c) high alloy steels to high nickel alloys.
- d. Additional piping welds so that the total equals 25% of the circumferential joints in the reactor coolant piping system. This total does not include welds excluded by IWB-1220. These additional welds may be located in one loop (one loop is currently defined for both PWR and BWR plants in the 1977 edition).

For longitudinal welds with nominal pipe size 4 inches and greater, surface plus volumetric examinations shall be performed for at least a pipe-diameter length but not more than 12 inches of each longitudinal weld intersecting the circumferential welds are required to be examined.

Code Relief Request

Relief is requested from the surface examination requirements for certain circumferential and longitudinal pipe welds for pipe sizes greater than 4 inches and for certain branch pipe connection welds greater than 2 inches in diameter.

Proposed Alternative Examination

Full volumetric examinations of the total weld area will be performed in lieu of the required volumetric examination of the inner 1/3 of the pipe volume plus outer surface examination.

Licensee's Basis for Requesting Relief

The Robinson Unit No. 2 was designed and constructed prior to the formalization of ASME Section XI. Therefore, in many cases, the surface examination is not practicable. CP&L will attempt to meet Code requirements but when impracticable to do so, will substitute the more stringent, full volumetric examination.

Evaluation

The licensee considers that at certain piping welds, surface examination is not practicable. As an alternative examination, the licensee has committed to perform full volumetric examinations of the volume bounded by positions ACFEDB such as in Figure IWB-2500-8. This full volumetric examination is at least equivalent to (a) the required surface only or (b) surface examination between positions A and B plus volumetric examination of the volume bounded by positions CFED. In accordance with IWA-2240, it is appropriate to



grant relief to perform this full volumetric examination on any B9.10 or B9.31 weld. The licensee has agreed to report each deviation from the Code under this relief on a case-by-case basis.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that the alternative examination proposed by the licensee is at least equivalent to the code requirements. Therefore, the following is recommended in accordance with IWA-2240:

Relief should be granted from the surface examination requirements for B9.10 and B9.31 pipe welds provided that full volumetric examinations of the volume bounded by positions ACFEDB in Figure IWB-2500-8 be performed and such deviations from the Code reported to the Commission on a case-by-case basis.

References

References 8 and 9.

3. Request for Relief, Note 12, Table 3A, Pressure Retaining Welds in Piping, Category B-J, Item B9.11

Code Requirement

Surface and volumetric examinations shall be performed during each inspection interval and shall include the following:

- a. All terminal ends in each pipe or branch run connected to vessels.
- b. All terminal ends and joints in each pipe or branch run connected to other components where the stress levels exceed the following limits under loads associated with specific seismic events and operational conditions:
 - (1) primary plus secondary stress intensity range of $2.4S_m$ for ferritic steel and austenitic steel, and
 - (2) cumulative usage factor U of 0.4.
- c. All dissimilar metal welds between combinations of:
 - (a) carbon or low alloy steels to high alloy steels;
 - (b) carbon or low alloy steels to high nickel alloys;
 - (c) high alloy steels to high nickel alloys.
- d. Additional piping welds so that the total equals 25% of the circumferential joints in the reactor coolant piping system. This total does not include welds excluded by

IWB-1220. These additional welds may be located in one loop (one loop is currently defined for both PWR and BWR plants in the 1977 edition).

Code Relief Request

Relief is requested from the volumetric examination requirements for the 90-degree elbows in the crossover leg of the reactor coolant legs.

Proposed Alternative Examination

Visual examination during system pressure tests.

Licensee's Basis for Requesting Relief

The 90-degree elbows in the crossover leg of the reactor coolant system are fabricated in two halves from austenitic stainless steel castings welded together by the electroslag process. The structure of the material is such that ultrasonic examinations cannot be performed as required by IWB-2500. These welds will be subject to visual examination during system pressure tests. The structure and nature of the electroslag weld in the cast austenitic 90-degree elbows is such that the material is opaque to ultrasonic transmissions utilizing currently available techniques. Radiography is the only other available technique for volumetric examination. It is not possible to obtain code acceptable radiographs with double wall "shots" on these components which are approximately 38 inches in diameter, 3 1/2 inches wall thickness, containing a 2-inch thick splitter plate and having radiation levels of up to 300 mr/hour on contact. Surface examination could be performed on these welds. Drawings CPL-107, 107A, and 107B.

Evaluation

For the longitudinal welds in the 90-degree elbows, the cast pieces are fabricated of austenitic stainless steel and a volumetric examination is impractical. A surface examination and visual examination for evidence of leakage are practical and satisfactory for determining the condition of the weld.

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:



circumferential butt piping weld attaching the pipe to the 15-degree elbow in each reactor coolant cold leg.

Proposed Alternative Examination

None, except code required hydrostatic testing. Adequate assurance of the weld integrity is verified by hydrostatic pressure tests.

Licensee's Basis For Requesting Relief

The circumferential butt weld attaching the pipe to the 15-degree elbow in each reactor coolant cold leg is completely enclosed within the biological shield and is not accessible for examination by either volumetric or surface techniques.

Evaluation

The identified welds are completely inaccessible* for volumetric or surface examination because the welds are located within the biological shield. 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 outside the biological shield should reflect service induced failures for that particular piping section. Thus the first pressure boundary weld outside the biological shield on each of these process pipes should be volumetrically examined, where practical, over 100% of its length during each inspection interval. Under a. of the Code Requirement, the licensee is already examining the next weld closer to the reactor vessel in each loop, i.e., the weld between the other end of the 15-degree elbow and the reactor vessel nozzle. Also, the licensee could conduct visual examinations at the shield penetrations.

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:

*SAI was unable to verify the lack of access since drawings apparently showing this, CPL-107, 107A and 107B, were unavailable for review.



- a. The first pressure boundary weld outside the biological shield on each of these process pipes should be volumetrically examined, where practical, over 100% of its length during each inspection interval.
- b. Visual examinations should be performed at the shield penetrations when leakage and hydrostatic tests are conducted in accordance with IWA-5000.

References

References 5, 6, 7, 10 and 11.

5. Request for Relief, Note 9, Table 3A, Miscellaneous Class 1 Piping Integrally Welded Attachments, Category B-K-1, Item B10.10

Code Requirement

Volumetric or surface examinations, as applicable, per Figures IWB-2500-13, 14 and 15, are required for all welded attachments of piping required to be examined by Examination Category B-J and the welded attachments of associated pumps and valves integral to such piping. Only those attachments whose base material design thickness is 5/8 inch or greater need to be examined.

Code Relief Request

Relief is requested from the volumetric examination requirements to the extent required by the Code for the piping system integrally welded supports that are attached to the pipe by fillet welds.

Proposed Alternative Examination

Volumetric examination techniques will be used to examine the base material of the pipe wall and surface examination will be performed on integrally welded attachments.

Licensee's Basis for Requesting Relief

The piping system integrally welded supports are attached to the pipe by fillet welds. The configuration of such welds is such that examinations cannot be performed to the extent required by IWB-2500 and only the base material of the pipe wall can be examined by ultrasonic techniques. The postulated failure for a fillet weld attachment is that cracking would initiate at the toe of the weld and as such would be most readily detected by surface examination.



Evaluation

The licensee has committed to subject those welds to surface examination and to volumetrically examine the base metal. Based on loading conditions of these types of welds, flaws would most likely generate at the weld surface and thus be detectable by surface examination. Ultrasonic examination of the base metal would provide assurance that flaws in the base metal do not exist. Due to component design the examination techniques to be employed by the licensee are considered acceptable in providing assurance that the pipe support's integrity will be maintained during the inspection interval.

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 examinations 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 above integrally welded attachments, provided that these welds are examined by surface and visual NDE methods according to the prescribed schedule.

References

References 5, 6, 7, 10 and 11.

E. Pump Pressure Boundary

1. Request for Relief, Note 15, Table 3A, Integral Attachments for Pumps, Category B-K-1, B10.20

Code Requirement

Volumetric or surface examination, as applicable, per Figures IWB-2500-13, 14 and 15, are required for all welded attachments of piping required to be examined by Examination Category B-J and the welded attachments associated with pumps and valves integral to such piping. Only those attachments whose base material design thickness is 5/8 inch or greater need to be examined.

Code Relief Request

Relief is requested from the volumetric examination of the integrally welded supports to the reactor coolant pumps.

Proposed Alternative Examination

A surface examination will be substituted in lieu of the required volumetric examination.

Licensee's Basis for Requesting Relief

The reactor coolant pump support members are fabricated from thick wall cast austenitic materials and the weld and adjacent material cannot be examined as required by IWB-2500 utilizing ultrasonic techniques.

Evaluation

Ultrasonic examination of these welds is impractical because of the heavy wall and cast material of the pump support. Surface examination of the pump supports is expected to provide an adequate indication of any developing problems.

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 surface examination above will provide the necessary added assurance of structural reliability. Therefore, it is recommended that relief should be granted from the volumetric examination of the identified welds if surface examination is performed instead.

References

References 5, 6, 7, 10 and 11.

F. Valve Pressure Boundary

(no relief requests)



II. CLASS 2 COMPONENTS

A. Pressure Vessels

1. Request for Relief, Note 4, Table 3B, Pressure Retaining Welds in Pressure Vessels, Category C-A, Item C1.30 and Possible Others*

Code Requirement

Volumetric examination of the tubesheet-to-shell weld.

Code Relief Request

Relief from volumetric examination requirements where support members provide geometrical interference.

Proposed Alternative Examination

Volumetric and surface examinations will be performed to the extent practical unless support components can be removed to provide additional access.

Licensee's Basis for Requesting Relief

The location of support members may prevent ultrasonic examinations being performed to the extent required by IWC-2500. Examination will be performed to the extent practical unless support components can be removed to provide additional access. Surface examination will be performed on those welds where 100% of the weld and heat affected zone cannot be examined ultrasonically.

Evaluation

In instances where the locations of pipe supports or hangers restrict the access for examination of welds to the extent required, examinations will be performed to the extent practical. If the supports can be removed without unduly stressing the system, examinations will conform to the requirements of IWC-2500. Where restrictions exist and volumetric examination cannot be performed over 100% of the weld and heat affected zone, surface examinations will be performed to supplement the volumetric examination. This substitution is acceptable for the identified welds, but blanket relief for other unspecified welds is not appropriate.

*The relief request does not specify the welds for which relief is requested. Examination of Reference 7 implies that relief is only requested for the tube sheet to shell welds of the regenerative heat exchanger (shell side).



Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the shell to tube sheet welds of the regenerative exchanger, 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:

- (1) Relief should be granted from the volumetric examination requirements of the identified welds provided best-effort volumetric and surface examinations are performed.
- (2) The licensee should submit specific relief requests on any other welds in this category.

2. Request for Relief No. 1, Pressure Retaining Nozzle Welds in Vessels, Category C-B, Item C2.20

Except for item number, this relief request is the same as the request to perform volumetric examinations of the total weld area for Class 1 pressure retaining welds in piping (see I.D.2 of this report). Therefore, the following is recommended in accordance with IWA-2240:

Relief should be granted from the surface examination requirements for Item C2.20 nozzle to vessel welds provided that full volumetric examinations of the volume bounded by positions ACFEDB in Figure IWC-2520-4 be performed and deviations from the Code reported to the Commission on a case-by-case basis.

3. Request for Relief, Note 1, Table 3B, Pressure Retaining Nozzle Welds in RHR Heat Exchangers, Category C-B, Item C2.20

Code Requirement

Surface and volumetric examination of all nozzles at terminal ends of piping runs shall be examined during each inspection interval.

Code Relief Request

Relief is requested from the volumetric examination requirements of the nozzle to vessel welds of the RHR heat exchangers.

Proposed Alternative Examination

Visual examination for leakage during system hydrostatic tests.

Licensee's Basis for Requesting Relief

The nozzle to vessel welds of the RHR heat exchangers are covered by a reinforcement ring and are not accessible for examination as required by IWC-2500. The geometric configuration is such that alternative NDE methods cannot be substituted. The reinforcement ring covering the RHR heat exchanger nozzle to vessel welds contains "tell-tale" holes such that visual examinations can be performed for evidence of leakage. Drawing CPL-204, Welds 3 and 4.

Evaluation

The welds required to be examined are completely covered by a reinforcing ring that prevents a volumetric examination as required by Code.* The ring is welded to the shell and nozzle. These welds are apparently completely accessible* for surface examination. Weld cracking would be detected by surface examination. The visual examinations of the welds during periodic hydrostatic testing proposed by the licensee 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 examinations 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) 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.

References

References 5, 6, 7, 10 and 11.

*SAI was unable to verify the lack of access since the drawing apparently showing this, CPL-204, was unavailable for review.



B. Piping

1. Request for Relief No. 1, Pressure Retaining Welds in Piping, Category C-F, Items C5.10 and C5.20

Except for item number, this relief request is the same as the request to perform full volumetric examinations of the total weld area for Class I pressure retaining welds in piping (see ID.2 of this report). Therefore, the following is recommended in accordance with IWA-2240:

Relief should be granted from surface examination requirements for Items C5.10 and C5.20 pipe welds provided that full volumetric examinations of the volume bounded by positions ACFEDB in Figure IWC-2520-7 be performed and deviations from the Code reported to the Commission on a case-by-case basis.

2. Request for Relief, Notes 2 and 3, Table 3B, Pressure Retaining Welds in Piping, Category C-F, Items C5.10, C5.20, C5.30

Code Requirements

Surface and volumetric examination (of the inner 1/3 of the pipe volume) according to Figure IWC-2520-7 for circumferential and longitudinal piping welds with nominal wall thickness over 1/2 inch. For piping welds with 1/2 inch or less nominal wall thickness, surface examinations only are required. For branch pipe connections, surface only examinations are required. The circumferential welds selected for examination shall include:

- a. all welds at locations where the stresses under the loadings resulting from Normal and Upset Plant conditions as calculated by the sum of Eqs. 9 and 10 in NC-3652 exceed $0.8 (1.2 S_H + S_A)$;
- b. all welds at terminal ends [see (e) below] of piping or branch runs;
- c. all dissimilar metal welds;
- d. additional welds, at structural discontinuities [see (f) below], such that the total number of welds selected for examination includes the following percentages of circumferential piping welds;
 - (1) none of the welds exempted by IWC-1220;
 - (2) none of the welds in residual heat removal and emergency core cooling systems [see (g) below];
 - (3) 50% of the main steam system welds;
 - (4) 25% of the welds in all other systems



- e. terminal ends are the extremities of piping runs that connect to structures, components (such as vessels, pumps, valves) or pipe anchors, each of which act as rigid restraints or provide at least two degrees of restraint to piping thermal expansion;
- f. structural discontinuities include pipe weld joints to vessel nozzles, valve bodies, pump casings, pipe fittings (such as elbows, tees, reducers, flanges, etc. conforming to ANSI Standard B16.9) and pipe branch connections and fittings;
- g. examination requirements are under development.

Longitudinal welds require examination for 2.5t at the intersecting circumferential weld.

Code Relief Request

Request to substitute visual or surface examination for the required volumetric and/or surface examinations.

Proposed Alternative Examinations

Visual and/or surface examinations to the extent practical.

Licensee's Basis for Requesting Relief

The arrangement and details of the Class 2 piping system and components were designed and fabricated before the examination requirements of Section XI of the Code were formalized and some examinations as required by IWC-2500 are limited or not practical due to geometric configuration or accessibility. Generally these limitations exist at all fitting to fitting welds such as elbow to tee, elbow to valve, reducer to valve, etc., where geometry and sometimes surface conditions preclude ultrasonic coupling or access for the required scan length. The limitations exist to a lesser degree at pipe to fitting welds where examination can only be fully performed from the pipe side because the fitting geometry limits or even precludes examination from the opposite site. Welds having such restrictions will be examined to the extent practical.

In instances where the location of pipe supports or hangers restrict the access available for the examination of pipe welds as required by IWC-2500, examinations will be performed to the extent practical unless removal of the support is permissible without unduly stressing the system.

Evaluation

Circumferential butt welds in Class 2 systems subject to examination are those that occur at geometric discontinuities such as pipe-to-vessel welds, pipe-to-fitting welds or fitting-to-fitting welds. For pipe-to-fitting or pipe-to-vessel nozzle welds, examinations can be performed, to the extent required, from the weld and pipe surfaces. Examination from the fitting side will be dependent upon the geometric configuration. Where elbows or tees are concerned, examination can be performed from the fitting side except where the intrados of the fitting prevents adequate ultrasonic coupling. No examination can be performed from the fitting side when it is a valve or a flange. In all cases 100% of the weld material can be examined.

In instances where welds occur at fitting-to-fitting, access restrictions as outlined above occur on both sides of the welds. In these instances surface examinations should be performed to supplement the limited ultrasonic examinations.

The configuration of branch pipe-to-pipe welds, Item C5.30, does not permit volumetric examination on fillet type branch connections. Where no meaningful volumetric examination can be performed, a 100% surface examination should be performed as an alternative.

Due to system design, the combination of volumetric and surface examinations will provide acceptable means for detecting flaws in these piping systems.

The licensee has not furnished a listing of those welds for which relief is required.

Conclusions and Recommendations

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

Once the licensee submits a listing of the applicable welds and the estimated extent of compliance, 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 as a supplement or alternative;
- (c) Visual examination of the welds should be performed during periodic hydrostatic testing in accordance with IWC-5000.

References

References 5, 6, 7, 10 and 11.

- C. Pumps
(no relief requests)
- D. Valves
(no relief requests)

III. CLASS 3 COMPONENTS

(no relief requests)

IV. PRESSURE TESTS

(no relief requests)

V. GENERAL

(no relief requests)

REFERENCES

1. R. W. Reid (NRC) To J. A. Jones (CP&L), Guidance to 10 CFR 50.55a, April 22, 1976.
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3. R. W. Reid (NRC) To J. A. Jones (CP&L), H. B. Robinson Unit No. 2, Further Guidance, November 17, 1976.
4. E. E. Utley (CP&L) to R. W. Reid (NRC), H. B. Robinson Steam Electric Plant, Unit No. 2, Request for License Amendment - Revision of Technical Specifications, May 10, 1977.
5. E. E. Utley (CP&L) to R. W. Reid (NRC), H. B. Robinson Steam Electric Plant, Unit No. 2, In-Service Inspection and Testing Program, August 5, 1977.
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8. P. W. Howe (CP&L) to S. A. Varga (NRC), H. B. Robinson Steam Electric Plant, Unit No. 2, In-Service Inspection and Test Program, March 22, 1982.
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10. Telephone call, CP&L and NRC staff, August 13, 1982.
11. Telecopy, D. Woods (CP&L) to G. Requa (NRC), Revised Tables 3A and 3B, September 17, 1982.