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H. B. ROBINSON STEAM ELECTRIC PLANT

UNIT 2

INSERVICE INSPECTION PROGRAM

TECHNICAL EVALUATION REPORT

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TECHNICAL EVALUATION REPORT
INSERVICE INSPECTION PROGRAM
H. B. Robinson Steam Electric Plant
Unit No. 2

INTRODUCTION

This report evaluates requests for relief from Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code* by the licensee, Carolina Power & Light Company (CPL), for the H. B. Robinson Steam Electric Plant, Unit No. 2. The relief requests cover the second 120-month inspection interval starting March 7, 1981. The requests are based upon the 1977 Edition of Section XI, with addenda through the summer of 1978, as specified in the applicable revision of 10 CFR 50.55a.

The rest of this introduction summarizes (a) the scope of this report, (b) the previous review of relief requests by Science Applications, Inc. (SAI)[1], and (c) the history of H. B. Robinson 2 since the earlier review[2-5].

The current revision to 10 CFR 50.55a requires that Inservice Inspection (ISI) programs be updated each 120 months to meet the requirements of newer editions of Section XI. Specifically, each program is to meet the requirements (to the extent practical) of the edition and addenda of the Code incorporated in the regulation by reference in paragraph (b) 12 months prior to the start of the current 120-month interval.

The regulation recognizes that the requirements of the later editions and addenda of the Code might not be practical to implement at facilities because of limitations of design, geometry, and materials of construction of components and systems. It, therefore, permits exceptions to impractical examination or testing requirements to be evaluated. Relief from these requirements can be granted, provided the health and safety of the public are not endangered, giving due consideration to the burden placed on the licensee if the requirements were imposed. This report only evaluates requests for relief dealing with inservice examinations of components and with system pressure tests. Inservice test programs for pumps and valves (IST programs) are being evaluated separately.

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*Hereinafter referred to as Section XI or Code.

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 the Nuclear Regulatory Commission (NRC) or are only acceptable with restrictions. As appropriate, these instances are also discussed in this report.

In its previous report dated September 30, 1982, SAI[1] evaluated relief requests for H. B. Robinson Unit 2 covering the second 120-month interval beginning March 7, 1981. The previous evaluation was based on submittals from the licensee dated August 5, 1977[6], October 25, 1978[7], March 22, 1982[8], and September 17, 1982[9]. A Safety Evaluation Report[3] based on the submittals was transmitted to the licensee. On January 18, 1983, CPL submitted a new ISI program for the second 120-month interval which superseded all previous transmittals. The relief requests contained in the January 18, 1983, submittal were based upon the 1977 Edition of Section XI of the Code, with addenda through the summer of 1978. The Code edition and inspection intervals were in accordance with the revision of 10 CFR 50.55a applicable at the time.

Additional information was required to evaluate the revised CPL ISI plan, and a request for additional information was submitted to the licensee[4]. The licensee responded to the request by submitting a complete set of revised relief requests plus two new relief requests[5]. The relief requests contained in Reference 5 are evaluated in this report.

I. CLASS 1 COMPONENTS

A. Reactor Vessel

1. Request for Relief No. 3, Circumferential Weld in the Closure Head, Category B-A, Item B1.21

Code Requirement

Volumetric examination of circumferential head welds in accordance with IWB-2500-3 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 peel segment to disc weld in the closure head.

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 peel segment to disc weld in the closure head 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 closure head peel segment to disc weld is completely within the pattern of the CRDM penetrations. This configuration precludes the Code-specified volumetric examination from either the inside or outside surface of the closure head for the entire length of the weld with currently available equipment. The severely limited access also precludes alternate surface examination. These limitations are typical of this generation and type of reactor vessel design.

The Code specifies that the accessible length of one circumferential head weld is to be volumetrically examined in the second inspection interval. Only one circumferential weld exists in the H. B. Robinson closure head, and it is inaccessible for volumetric or alternate surface examination over its entire length

with present-day equipment. The Code acknowledges that accessibility may be limited with respect to volumetric examination of closure head circumferential welds, but the intent of the Code is clearly to encourage some volumetric examination 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 will provide the necessary added assurance of structural reliability. Therefore, the following is recommended: Relief should be granted from the volumetric examination of the peel segment to disc weld in the closure head for the second inspection interval with the following provision:

a. The licensee should reevaluate available inspection methods before the end of the second interval to determine if new inspection equipment has been developed that will permit partial volumetric examinations of the weld.

References

References 2, 3, and 5.

B. Pressurizer

1. Request for Relief No. 10, Nozzle Inner Radii, Category B-D, Item B3.120

Code Requirement

The nozzle inside radius section of category B-D nozzles in the pressurizer must be examined volumetrically in accordance with IWB-2500-7 during each inspection interval.

Code Relief Request

Relief is requested from the volumetric examination requirements of the nozzle inner radii.

Proposed Alternative Examination

None.

Licensee Basis for Requesting Relief

The pressurizer nozzles inner radius areas are inaccessible from the inside. The nozzles are integrally cast with the vessel heads. Radiation levels are extremely high in the pressurizer making entry impractical. Based on the inaccessibility and radiation levels, volumetric examination of the pressurizer nozzles inner radius section will not be attempted.

Evaluation

The licensee has stated that the inner radius areas of the pressurizer nozzles are inaccessible from the inside without

providing further explanation or drawings to illustrate the nature or cause of the inaccessibility. The licensee has also stated that radiation levels in the pressurizer are extremely high and that entry is impractical. However, the licensee has not indicated specifically what radiation exposure would result from activities associated with entry into the pressurizer for conducting inspections of the nozzle inner radius areas. In addition, the licensee has not addressed the possibility of volumetrically examining the pressurizer nozzle inner radius sections from outside the pressurizer.

The practicality of conducting examination of the nozzle inner radius areas on the pressurizer was also evaluated by reviewing the inservice inspection relief requests for eight other Westinghouse plants, and none of the other plants has required relief from this examination.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that the information supplied by the licensee is insufficient to grant unconditional relief from examination of the inner radius area on the pressurizer nozzles. Therefore, the following is recommended: Relief should not be granted. Instead, the licensee should be required to reevaluate the examinations. Should the licensee conclude that relief is required after reevaluation, a detailed relief request should be submitted clearly illustrating the impracticality of conducting the examinations.

References

Reference 5.

C. Heat Exchanger and Steam Generators

1. Request for Relief No. 9, Nozzle to Vessel Welds, Category B-D, Item B3.150

Code Requirement

All full penetration nozzle-to-vessel welds (includes nozzle-to-vessel weld and adjacent areas of nozzle and vessel) on the primary side of heat exchangers must be volumetrically examined in accordance with IWB-2500-7 during each inspection interval.

Code Relief Request

Relief is requested from 100% volumetric examination of the regenerative heat exchanger nozzle-to-vessel welds.

Proposed Alternative Examination

The licensee proposes visual and surface.

Licensee's Basis for Requesting Relief

The geometric configuration of the weld surface prevents ultrasonic examinations from being performed to the extent required by IWB-2500-7. Examinations will be performed to the extent

practical from the pipe and nozzle surfaces adjacent to the weld. Surface examination of the weld will be performed to supplement the volumetric examination.

These welds are shown on drawing CPL-106, Welds 13-18.

Evaluation

The joint configuration of the nozzle-to-vessel welds on the primary side of the regenerative heat exchanger is such that complete examinations of the nozzle-to-vessel welds in accordance with IWB-2500-7 cannot be accomplished with currently available UT equipment. The licensee has committed to perform UT examinations from the pipe and nozzle surfaces to the extent practical and to provide surface examinations of the nozzle-to-vessel welds. The supplemental surface examination will provide increased assurance of the structural reliability of the joint.

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 will provide the necessary added assurance of structural reliability. Therefore, the following is recommended:

Relief should be granted from complete volumetric examination of regenerative heat exchanger nozzle welds in accordance with IWB-2500-7, provided that:

a. Best effort volumetric examinations of the nozzle areas are conducted.

b. Alternate surface and visual examinations are conducted as proposed.

References

References 2, 3, and 5.

2. Request for Relief No. 10, Nozzle Inner Radii, Category B-D, Items B3.140 and B3.160.

Code Requirement

The nozzle inside radius section of category B-D nozzles in the steam generators and regenerative heat exchangers must be examined volumetrically in accordance with IWB-2500-7 during each inspection interval.

Code Relief Request

Relief is requested from the volumetric examination requirements of the nozzle inner radii for the steam generator and regenerative heat exchangers.

Proposed Alternate Examination

None.

Licensee Basis for Requesting Relief

The steam generator nozzles are integrally cast with the vessel heads. The inner radius area is covered by weld deposited stainless steel cladding which is in an "as welded" condition. Additionally, radiation levels inside the primary channel head are in the range of 10 R/hr. In view of the cast nozzle design, rough clad surface, and radiation levels, volumetric examinations in this area will not be attempted.

The regenerative heat exchanger is a vessel of all welded construction, rendering the nozzle inner radius section inaccessible from inside the vessel. Therefore, the nozzle inner radius volumetric examination will not be attempted.

The configurations of these nozzles are different from that shown in Section XI, Figure IWB-2500-7. The possibility of performing volumetric examinations of these areas from the vessel outside surface has been evaluated as impractical due to the configuration.

Evaluation

The steam generator nozzles are integrally cast with the vessel heads and are covered by weld deposited stainless steel cladding in the "as-welded" condition. The radiation levels inside the primary channels are in the range of 10 R/hr. Presumably the surface of the weld deposited cladding would have to be smoothed to permit ultrasonic examination of the nozzle inner radius area. The licensee implies that the radiation exposure to workers during the smoothing and inspection would be excessive, that is, in the 10 R/hr field typical of the primary piping. The licensee also states that examination of the steam generator nozzles from the external surface was evaluated and determined to be impractical due to the configuration.

The regenerative heat exchanger vessel is of all welded construction, and no access to the interior is provided so the nozzle inner radius sections cannot be examined from the inside surface. A drawing of the nozzle configuration provided by the licensee shows that the inner nozzle radius is shadowed by two welds with respect to ultrasonic examination of the inner radius area. There appears to be no practical method for examining the regenerative heat exchanger inner radius area.

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 will provide the necessary added assurance of structural reliability. Therefore, the following is recommended: Relief should be granted from the volumetric examination of the steam generator nozzle inner radii with the following provision:

a. The licensee should visually inspect the nozzle inner radii if it is necessary to enter the steam generator inlet and outlet plenums for maintenance or other inspection activities.

References

Reference 5.

D. Piping Pressure Boundary

1. Request for Relief No. 2, Reactor Vessel Nozzle-to-Safe-End Welds Category B-F, Item B5.10 - Piping Safe-End Welds Category B-F, Item 5.50

Code Requirement

Examinations are required for each safe-end weld in each loop and connecting branches of the reactor coolant system during each inspection interval in accordance with IWB-2500-8. For nominal pipe size less than 4 inches, surface-only examinations are required. For larger pipe, surface plus volumetric examinations are required. Includes 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, and (c) high alloy steels to high nickel alloys.

Code Relief Request

Relief is requested from surface examination of 100% of the 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 surface 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 evaluations of units with similar design, such examinations are likely to cover a substantial portion of the welds. The primary nozzle safe-end welds will be examined volumetrically in accordance with the Code.

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. It is further concluded that the required volumetric examination, in conjunction with partial surface examinations, will provide the necessary assurance of structural reliability.

The licensee should be required to report to NRC the fraction of the required surface examination actually completed.

References

References 2, 3, 4, and 5.

2. Request for Relief No. 4, 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 in accordance with IWB-2500-8, 9, 10, and 11 shall be performed over essentially 100% of the weld length 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; and
   (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 (305 mm) of each longitudinal weld intersecting the circumferential welds are required to be examined. The initially selected welds shall be reexamined during each inspection interval.

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 impractical 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 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 be reported to the Commission on a case-by-case basis.

References

References 2, 3, 4, and 5.

3. Request for Relief No. 5, Pressure Retaining Welds in Piping, Category B-J, Item B9.12

Code Requirement

Surface and volumetric examinations shall be performed during each inspection interval in accordance with IWB-2500-8 and shall

include at least a pipe diameter length, but not more than 12 inches (305 mm) of each longitudinal weld intersecting the circumferential welds required to be examined. The initially selected welds shall be reexamined during each inspection interval.

Code Relief Request

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

Proposed Alternative Examination

Visual examination during system pressure tests. The surface exam will be performed as required.

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 surface examination and 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. These welds are shown on drawings CPL-107, 107A, and 107B; welds 7 thru 10 (including adjacent long seams).

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 the 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. Surface examinations should be performed on each of the longitudinal welds in the 90-degree elbows.

b. The proposed visual examinations should be performed on the 90-degree elbows when leakage and hydrostatic tests are conducted in accordance with IWA-5000.

References

References 2, 3, 4, and 5.

4. Request for Relief No. 8, Pressure Retaining Welds in Piping, Circumferential Butt Weld, Category B-J, Items B9.11 and B9.12

Code Requirement

Surface and volumetric examinations of essentially 100% of circumferential welds shall be performed during each inspection interval in accordance with IWB-2500-8 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; and
(c) high alloy steel 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 (305 mm) of each longitudinal weld intersecting the circumferential welds are required to be examined. The initially selected welds shall be reexamined during each inspection interval.

Code Relief Request

Relief is requested from the surface and volumetric examination requirements for one pressure retaining 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.

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.

These welds are shown on drawings CPL-107, 107A, and 107B, weld 13.

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

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 2, 3, and 5.

5. Request for Relief No. 6, 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

In accordance with Figure IWB-2500-15, only surface examination is required for piping integrally welded supports attached by a fillet weld. 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.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the welds discussed above, no relief is required and should not be granted.

References

References 2, 3, and 5.

E. Pump Pressure Boundary

1. Request for Relief No. 1, Pump Casing Welds, Category B-L-1, Item B12.10

Code Requirement

The volumetric and surface examinations performed during each inspection interval in accordance with IWB-2500-16 shall include 100% of the pressure-retaining welds in at least one pump in each group of pumps performing similar functions in system (e.g., recirculating coolant pumps). The examinations may be performed at or near the end of the inspection interval.

Code Relief Request

Relief is requested from surface examination of the casing welds in the reactor coolant pumps. Volumetric examination will be performed.

Alternative Examination

None.

Licensee's Basis for Requesting Relief

A reactor coolant pump casing is a weldment of four type 316 SS cast rings. These castings do not lend themselves to surface examination due to the number of indications that would be present due to surface roughness. Also, the time required to clean the surface for adequate surface examination and the inspection time would result in extremely high personnel exposures. To put this in the proper perspective, below are listed exposures received during insulation removal and replacement activities on B reactor coolant pump during the 1982 outage.

Insulation removal - 730 mR
Insulation replacement - 6.07 R

These exposures are indicative of those that would be received during a surface examination.

Therefore, due to the above and the fact that volumetric examination will be performed, a surface examination is considered impractical for reactor coolant pump casing welds. These welds are shown on drawing CPL-144A; Welds A, B, and C.

Evaluation

The castings from which the pump casing weldment is fabricated and the weld itself are not suitable for surface examination. Preparation of the weld and casting surfaces to permit meaningful surface examination would result in significant radiation exposure and considerable cost without an offsetting increase in assurance of structural reliability.

The Code-required full volumetric examination of the pump casing welds will be conducted.

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 will provide the necessary added assurance of structural reliability. Therefore, the following is recommended: Relief should be granted from surface examination of the pump casing welds, provided the Code-required full volumetric examination of the welds is conducted.

References

References 2, 3, and 5.

2. Request for Relief No. 7, Integral Attachments for Pumps, Category B-K-1, B10.20

Code Requirement

Volumetric or surface examination of 100% of the weld, as applicable, per Figures IWB-2500-13, 14, and 15 is 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 of 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. These supports are shown on drawing CPL-144

References

References 2, 3, and 5.

F. Valve Pressure Boundary

No relief requests.

II. CLASS 2 COMPONENTS

A. Pressure Vessels

1. Request for Relief No. 1, Pressure Retaining Welds in Pressure Vessels, Category C-A, Item C1.30

Code Requirement

Volumetric examination of 100% of the weld length of the tubesheet-to-shell weld in accordance with IWC-2520-2 is required.

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. Surface examinations will be supplemented where 100% volumetric examinations are not performed.

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.

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, it is recommended that relief be granted from the volumetric examination requirements of the identified welds provided best-effort volumetric and surface examinations are performed.

2. Request for Relief No. 2, Pressure Retaining Nozzle Welds in RHR Heat Exchangers, Category C-B, Item C2.20

Code Requirement

Surface and volumetric examination of all nozzles over 1/2-inch thickness at terminal ends of piping runs shall be examined during each inspection interval in accordance with IWC-2520-4.

Code Relief Request

Relief is requested from the volumetric examination requirements of the nozzle-to-vessel welds of the residual heat removal (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 the Code. The ring is welded to the shell and nozzle. These welds are apparently completely accessible for surface examination, and surface examinations should be conducted to provide the necessary assurance of structural reliability. 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 2, 3, 4, and 5.

B. Piping

1. Request for Relief No. 3, Pressure Retaining Welds in Piping, Category C-F, Item C5.21

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 1 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 Item C5.21 pipe welds provided that full volumetric examinations of the volume bounded by positions ACFEDB in Figure IWC-2520-7 are performed and deviations from the Code are reported to the Commission on a case-by-case basis.

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

1. Request for Relief No. 11, Reactor Vessel and Pressurizer Calibration Blocks Material

Code Requirement

In accordance with IWA-2232 and Section V, Article 4, the material from which the basic calibration block is fabricated shall be one of the following:

(a) nozzle dropout from the component;

(b) a component prolongation; or

(c) material of the same material specification, product form, and heat treatment as one of the materials being joined.

Code Relief Request

Relief is requested to use SA-533 Grade B material in lieu of SA-302 Grade B, and SA-508 material in lieu of SA-336 for fabrication of reactor vessel calibration blocks and SA-533 Grade B in lieu of SA-302 Grade B in the pressurizer calibration blocks.

Proposed Alternative Examination

Not applicable.

Licensee Basis for Requesting Relief

Because the required materials, SA-302 Grade B and SA-336, are not available, use of replacement materials is requested. Based on chemical and physical properties, the materials SA-533 Grade B and SA-302 Grade B are considered essentially equivalent. This parity is also evident when the properties of SA-336 and SA-508 material are reviewed. The materials are considered to be acoustically equivalent thereby meeting the intent of Article 5 of Section V, ASME Code.

The materials used in the reactor vessel are as follows:

Closure Head - SA 302 Grade B
Closure Head Flange - SA-336
Vessel Flange - SA-336
Vessel Nozzles - SA-336
Vessel Shell - SA-302 Grade B
Vessel Bottom Head - SA-302 Grade B

The material used in the pressurizer shell courses is SA-302 Grade B.

Evaluation

Based on a review of the material properties of the as fabricated materials and the requested substitute materials, SA-533 Grade B and SA-302 Grade B are equivalent for the purpose of fabricating ultrasonic calibration blocks. SA-508 and SA-336 are also acoustically equivalent materials for calibration blocks.

Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the calibration blocks discussed above, the Code requirements are impractical. The alternative calibration blocks discussed above will provide the necessary assurance of structural reliability. Therefore, the following is recommended: Relief should be granted to use SA-533 Grade B for calibration blocks in conjunction with examinations of components fabricated from SA-302, Grade B and SA-508 for calibration blocks in conjunction with examinations of components fabricated from SA-336. The use of the specified materials will permit the examinations to be conducted with the necessary level of calibration.

References

Reference 5.

REFERENCES

1. Science Applications, Inc., H. B. Robinson Steam Electric Plant, Unit 2, Inservice Inspection Program, Technical Evaluation Report, SAI Report No. 186-028-01, September 30, 1982.

2. S. R. Zimmerman (CP&L) to S. A. Varga (NRC), H. B. Robinson Steam Electric Plant Unit No. 2, ASME Section XI Component Test Program, January 18, 1983.

3. S. A. Varga (NRC) to E. E. Utley (CP&L), Transmittal of Safety Evaluation by the Office of Nuclear Reactor Regulations Related to Requests for Relief from Inservice Inspection Requirements, August 31, 1983.

4. Telecopy, NRC to CP&L, Request for Additional Information, January 27, 1984.

5. S. R. Zimmerman (CP&L) to S. A. Varga (NRC), Supplement to Inservice Inspection and Relief Requests, April 30, 1984.

6. E. E. Utley (CP&L) to R. W. Reid (NRC), H. B. Robinson Steam Electric Plant, Unit No. 2, Inservice Inspection and Testing Program, August 5, 1977.

7. E. E. Utley (CP&L) to A. Schwencer (NRC), H. B. Robinson Steam-Electric Plant, Unit No. 2, Inservice Inspection--Revised Program Submittal, October 25, 1978.

8. P. W. Howe (CP&L) to S. A. Varga (NRC), H. B. Robinson Steam-Electric Plant, Unit No. 2, Inservice Inspection and Test Program, March 22, 1982.

9. Telecopy, D. Woods (CP&L) to G. Requa (NRC), Revised Tables 3A and 3B, September 17, 1982.

SUPPLEMENTARY COMMENTS

1. Page 4

Category B-D in the 1977-S78 code specifically includes the nozzle inside radius section as an identified item to be examined on reactor vessel, pressurizer, steam generator and heat exchanger nozzles. Although category B-D is entitled full penetration welds of nozzles in vessels, the requirement to examine the nozzle inside radius section has been interpreted as applying to all nozzles including those that are integrally cast. The intent of the code was clarified in the Winter 1980 addenda by the inclusion of Figure IWB-2500-7(d) (attached) which specifically addresses examination of the inside radius section of integrally cast nozzles. The examination is included under category B-D in the 1980 code which is still titled "full penetration welds of nozzles in vessels". Even though the category B-D title identifies full penetration nozzle welds, the intent of the code has been interpreted to apply to the nozzle inner radius section of all nozzles.

2. Page 5

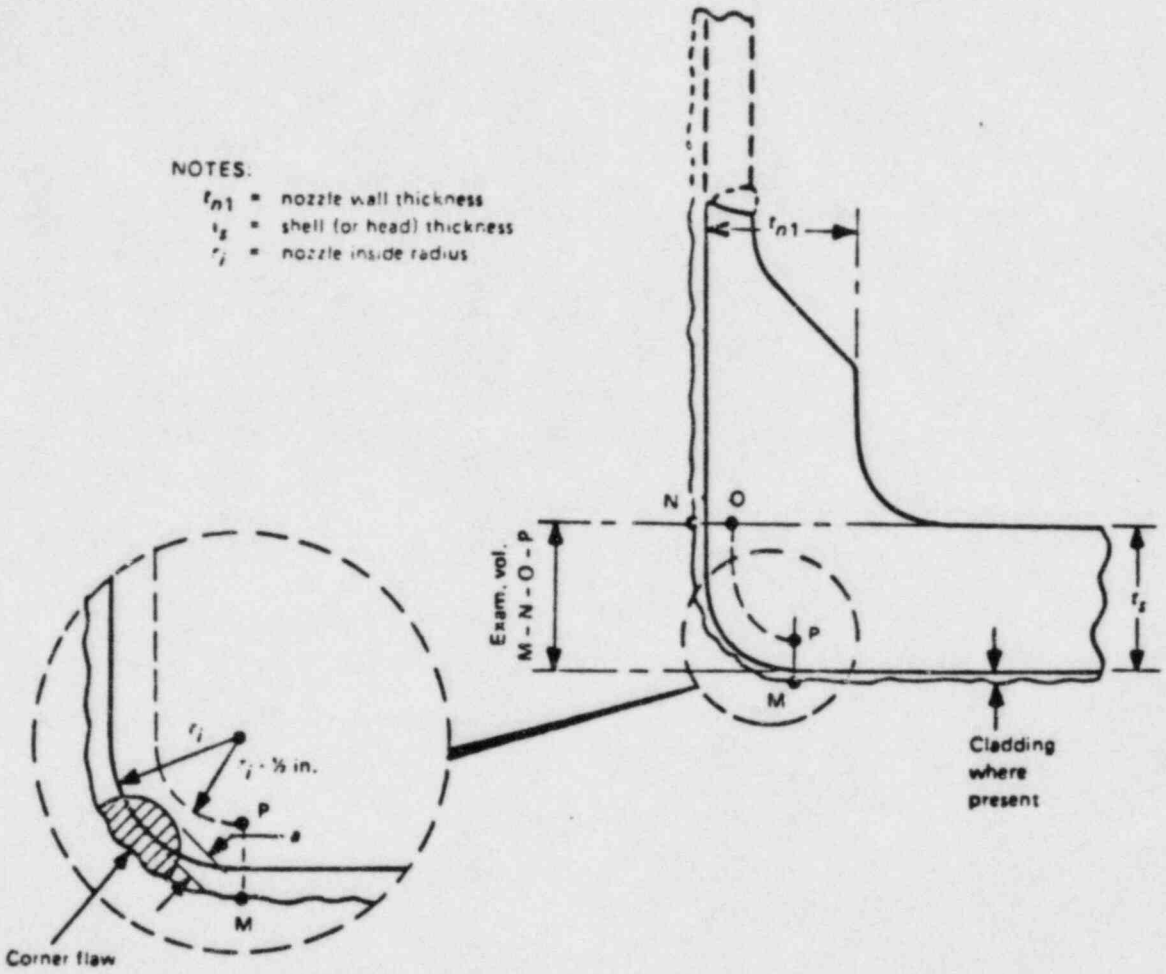
The only additional information supplied by the licensee was a simplified drawing of the Pressurizer. This drawing provided little clarification beyond the drawing originally supplied in the plan. The evaluation included in the TER is valid based on the information available to the reviewer. Additional explanation by the licensee would be required before the TER could be revised.

3. Page 6

See 1 above.

4. Page 15

The examination requirements for pump casing welds included under category B-L-1 in the Summer 1978 addenda (attached) include requirements for both volumetric and surface examination.



EXAMINATION REGION[1]	EXAMINATION VOLUME[2]
Nozzle inside corner region	M-N-O-P

NOTES:
(1) Examination regions are identified for the purpose of differentiating the acceptance standards in IWB-3512.
(2) Examination volumes may be determined either by direct measurements on the component or by measurements based on design drawings.

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FIG. IWB-2500-7(d) NOZZLE IN SHELL OR HEAD
(Examination Zone in Nozzles Integrally Cast or Formed in Shell or Head)

TABLE IWB-2500-1 (CONT'D)
EXAMINATION CATEGORIES

EXAMINATION CATEGORY B-L-1, B-M-1 PRESSURE RETAINING WELDS IN PUMP CASINGS AND VALVE BODIES B-L-2, B-M-2, PUMP CASINGS AND VALVE BODIES							
					Extent and Frequency of Examination		
Item No.	Parts Examined	Examination Requirements Fig. No.	Examination Method	Acceptance Standard	1st Inspection Interval	Successive Inspection Intervals, 2nd, 3rd, 4th	Deferral of Inspection to End of Interval
	Pumps						
B12.10	Pump Casing Welds	IWB-2500-16	Volumetric and Surface	IWB-3518	All welds[1],[4]	Same as for 1st interval	Permissible
B12.20	Pump Casing	Internal Surfaces	Visual, VT-1	*	Internal Surface[1],[3]	Same as for 1st interval	Permissible
	Valves						
B12.30	Valve Body Welds	IWB-2500-17	Volumetric and Surface	IWB-3518	All welds[1],[4]	Same as for 1st interval	Permissible
B12.40	Valve Body, exceeding 4 in. Nominal Pipe Size	Internal Surfaces	Visual, VT-1	*	Internal Surface[1],[3]	Same as for 1st interval	Permissible

NOTES:

(1) Examinations are limited to welds in at least one pump in each group of pumps performing similar functions in the system; e.g., recirculating coolant pumps.

(2) Examination may be performed on same pump or valve selected for volumetric examination of welds.

(3) Examinations are limited to one valve within each group of valves that are of the same constructional design, e.g. globe, gate or check valve, manufacturing method and that are performing similar functions in the system, e.g. containment isolation, system overpressure protection.

(4) Includes essentially 100% of weld length.

*In course of preparation.