10 CFR 50.55a

CP&L
A Progress Energy Company

Serial: RNP-RA/02-0166

OCT 3 0 2002

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23

RELIEF REQUEST NO. 18 REGARDING EXAMINATION OF
THE REACTOR PRESSURE VESSEL HEAD PENETRATION CANOPY SEAL
WELD REPAIRS FOR THE FOURTH TEN-YEAR INSERVICE INSPECTION INTERVAL

Ladies and Gentlemen:

In accordance with 10 CFR 50.55a(a)(3)(ii), H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2, is requesting relief from American Society of Mechanical Engineers (ASME) Code requirements for the Fourth Ten-Year Inservice Inspection (ISI) Interval. Specifically, the performance of enhanced visual examinations is proposed as an alternative to surface examinations for repair of canopy seal welds on three reactor pressure vessel head penetrations. This relief is requested on the basis that the Code-required examinations would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety. In this regard, please find attached the supporting details and technical information associated with Relief Request No. 18.

The requested relief, if approved, will be implemented during the HBRSEP, Unit No. 2, Fourth Ten-Year ISI Interval, and is needed for completion of ISI activities that are in progress as part of a scheduled refueling outage. In support of the required repairs and unit restart from the refueling outage, verbal approval of this relief is requested on or before November 5, 2002.

A similar relief request was granted for HBRSEP, Unit No. 2, for repairs made to a reactor pressure vessel head penetration canopy seal weld during the previous refueling outage (TAC No. MB1753).

If you have any questions concerning this matter, please contact Mr. C. T. Baucom.

Sincerely,

Chuck Baucom for

B. L. Fletcher III
Manager - Support Services - Nuclear

Robinson Nuclear Plant
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Hartsville SC 29550

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CAC/cac

Attachment

c: Mr. L. A. Reyes, NRC, Region II
Mr. R. Subbaratnam, NRC, NRR
NRC Resident Inspector, HBRSEP

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

10 CFR 50.55a RELIEF REQUEST NO. 18

PROPOSED ALTERNATIVE
IN ACCORDANCE WITH 10 CFR 50.55a(a)(3)(ii)

- HARDSHIP OR UNUSUAL DIFFICULTY WITHOUT COMPENSATING INCREASE IN LEVEL OF QUALITY OR SAFETY -

1. ASME Code Components Affected

   The components applicable to this relief request are the H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2, reactor pressure vessel head penetration canopy seal welds for penetration numbers 10, 14, and 30 (see Figure 1). The reactor pressure vessel head penetrations are American Society of Mechanical Engineers (ASME) Code Class 1 attachments to the HBRSEP, Unit No. 2, reactor pressure vessel. The reactor pressure vessel head penetration tube and associated attachment are the pressure-retaining components. The threaded connection between these two components carries the structural loads and establishes the pressure boundary. Any leakage through the threaded connection is normally contained by the canopy seal weld (see Figure 2). The canopy seal welds are nonstructural.

2. Applicable Code Edition and Addenda

   The Code of record for the HBRSEP, Unit No. 2, Fourth Ten-Year Inservice Inspection (ISI) Interval is the ASME Boiler and Pressure Vessel (B&PV) Code, Section XI, 1995 Edition with 1996 Addenda.

3. Applicable Code Requirement

   The ASME B&PV Code, Section XI, 1995 Edition with 1996 Addenda, Paragraph IWA-4221, requires that repairs meet the Owner's Requirements and the applicable Construction Code to which the original item was constructed, or later editions and addenda of the Construction Code. The reactor pressure vessel head penetrations were designed and fabricated in accordance with the ASME B&PV Code, Section III, 1965 Edition, as Class A components. Pursuant to 10 CFR 50.55a(a)(3)(ii), relief is requested from the surface examination requirements of the ASME B&PV Code, 1995 Edition with 1996 Addenda, Section III, Paragraph NB-5271, "Welded Joint of Specially Designed Seals," which states that welded joints of this type shall be examined by either the magnetic particle or liquid penetrant method. The requested relief is for the Fourth Ten-Year ISI Interval that began on February 19, 2002.

4. Reason for Request

HBRSEP, Unit No. 2, requests relief in accordance with 10 CFR 50.55a(a)(3)(ii) from the required surface examination on the basis that compliance with the Code would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety.

During Refueling Outage (RO)-21 activities to detension the reactor pressure vessel head closure studs, boric acid crystals were found on the surface of the reactor pressure vessel head, insulation, and control rod drive mechanism (CRDM) housings. Although the exact location of the canopy seal weld leakage could not be determined, the three canopy seal welds being repaired were identified based on the spray pattern of residual boric acid near these penetrations. The canopy seal welds will be repaired using a weld overlay technique prior to completion of RO-21. The weld overlay is considered a repair in accordance with the ASME B&PV Code, Section XI, Article IWA-4000, because the weld is performed on an appurtenance to a pressure-retaining component. A confirmed leak on the canopy seal weld for penetration number 50 was repaired using a canopy seal weld clamp. This repair was determined to be in accordance with applicable Code requirements.

The general dose rate averages approximately 700 millirem/hour near the canopy seal welds. Installation of temporary shielding is not feasible, as it would interfere with the required inspections. Based on an estimated total time of two hours to perform the surface examination, the occupational exposure from the required surface examination will add approximately 1.4 rem to the total repair dose for each repair, which results in a total additional dose of approximately 4.2 rem.

The proposed alternative examination provides a means that can detect flaws that are similar in size to those detectable by the Code-required surface examination technique. Therefore, the required surface examination does not provide a sufficient increase in quality or safety to compensate for the expected increase in radiation exposure.

5. Proposed Alternative and Basis for Use

HBRSEP, Unit No. 2, requests relief from the ASME B&PV Code, Section III, 1995 Edition with 1996 Addenda, Paragraph NB-5271, and proposes to perform an enhanced visual examination technique (VT-1 with visual acuity sufficient to discern a 0.001 inch wire) using a camera to facilitate observation of weld flaws for examination of the canopy seal weld repairs.

Industry experience regarding failure analyses performed on leaking canopy seal welds removed from service at other plants has attributed the majority of cases to transgranular stress corrosion cracking. The size of the opening where leakage occurs has been extremely

small, normally a few thousandths of an inch. The crack orientations vary, but often radiate outward such that a pinhole appears on the surface, as opposed to a long crack. The stress corrosion cracking results from exposure of a susceptible material to residual stress, which is often concentrated by weld discontinuities, and to a corrosive environment, such as trapped water in the cavity behind the seal weld that was mixed with air initially in the cavity, resulting in a higher oxygen content than is in the bulk primary coolant.

The enhanced VT-1 examination will use a video camera with approximately 8X magnification to view the welds. The weld repair uses a Gas Tungsten Arc Welding (GTAW) process that is controlled remotely. Alloy 52 nickel-based material will be utilized for repairs, rather than austenitic stainless steel, because of its resistance to stress corrosion cracking.

The threaded connection between the penetration attachment and the reactor pressure vessel head adapter will resist bending moments and secondary stresses applied to the connection. The canopy seal weld is not required to resist such loadings. The canopy seal weld design requirements specified in Paragraph NB-3227.7 of Section III, "Requirements for Specially Designed Welded Seals," are used to determine if the overlay design will withstand the operating pressure applied at operating temperatures.

The GTAW overlay weld repair method results in lower radiation exposure because the equipment is remotely operated after setup. The enhanced VT-1 examination system eliminates the need for an inspector to place himself within two feet of the CRDM for a cumulative period of approximately two hours during the three phases of the required surface examinations.

By use of the remote viewing system for the welding process, potential flaws resulting from contamination of the weld deposit, burn-through, or blowback can be seen as soon as they occur, and welding can be stopped to permit correction of the problems immediately. After each bead is applied in one direction, the machine is rotated back in the other direction to permit viewing of the entire bead, including overlaps. No additional radiation exposure is received beyond that required for welding equipment setup.

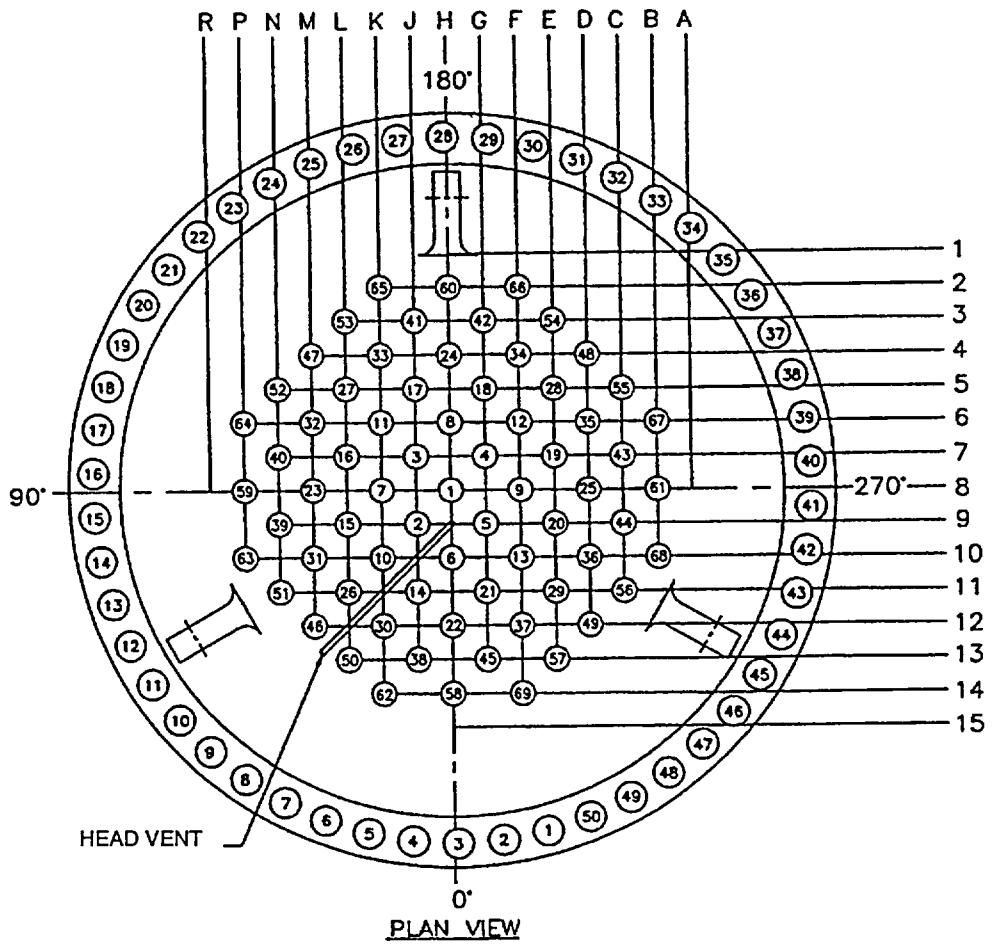
6. Duration of Proposed Alternative

This relief is requested for and will be implemented in the HBRSEP, Unit No. 2, Fourth Ten-Year ISI Interval, which began on February 19, 2002.

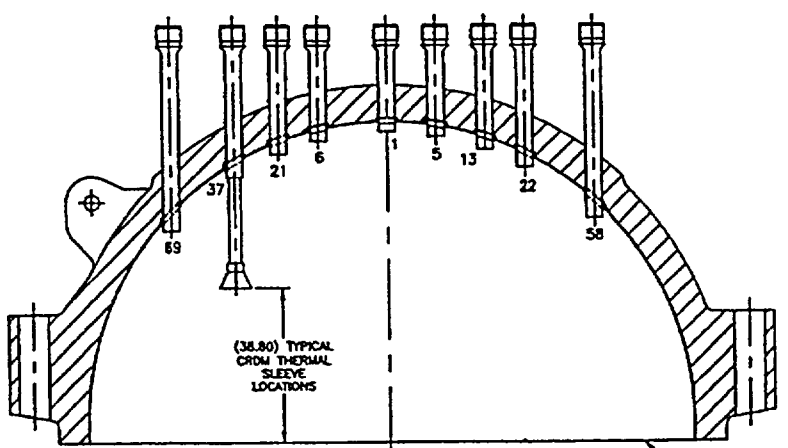
7. Precedents

This relief request is consistent with Relief Request No. 33 that was approved on July 30, 2001, for the Third Ten-Year ISI Interval for HBRSEP, Unit No. 2 (TAC No. MB1753). Relief Request No. 33 involved similar relief for repair of a canopy seal weld on reactor pressure vessel head penetration number 68 during RO-20.

FIGURE 1. HBRSEP, UNIT NO. 2, REACTOR PRESSURE VESSEL HEAD PENETRATIONS



PLAN VIEW



ELEVATION CROSS SECTION

NOTE: PENETRATIONS DEPICTED IN CROSS SECTION ARE REPRESENTATIVE OF DIFFERENT RADIAL LOCATIONS

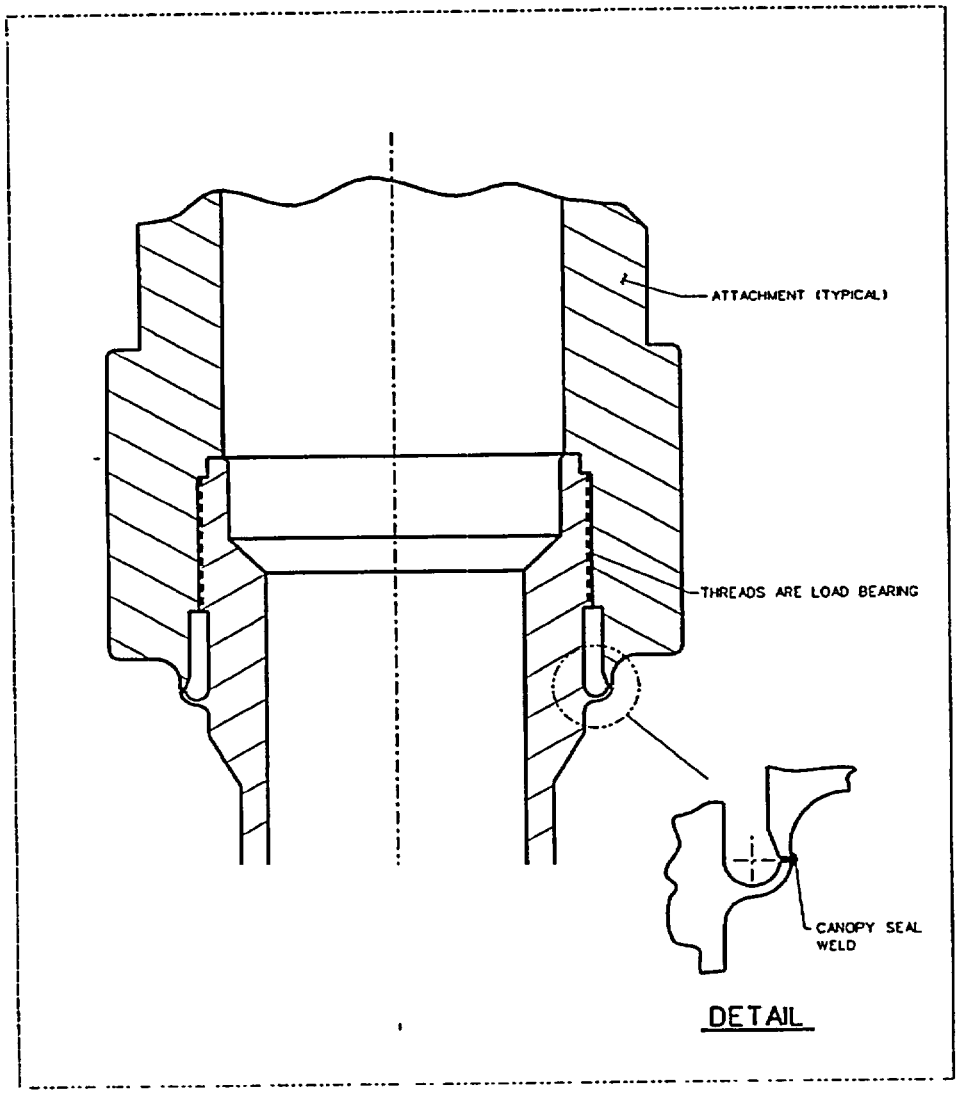



FIGURE 2. TYPICAL REACTOR PRESSURE VESSEL HEAD PENETRATION CONSTRUCTION ILLUSTRATING FLANGE, TUBE, AND ATTACHMENT RELATIONSHIP