FPL Energy
Seabrook Station

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NOV 9 2004

SBK-L-04065

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Seabrook Station
ASME Section III and Section XI Relief Request PR 04-01
For the Repair of CRDM Canopy Seal Welds

FPL Energy Seabrook, LLC (FPL Energy Seabrook) requests relief, in accordance with 10 CFR 50.55.a(a)(3)(ii), from the ASME Section III Code (Subsection NB paragraph NB-5271) required surface examination of the canopy seal welds on the basis that compliance with this ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety. FPL Energy Seabrook also requests relief in accordance with 10 CFR 50.55.a(a)(3)(ii), from the ASME Section XI Code (paragraph IWA-4611) requirement to remove the defect or reduce the size of the defect to at least the minimum design thickness on the basis that compliance with this ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety.

During the next refueling outage, FPL Energy Seabrook plans to perform repairs on reactor pressure vessel closure head penetrations no. 20 and no. 26. These penetrations showed signs of leakage during OR09 and were repaired by the installation of Canopy Seal Clamp Assemblies (CSCA). FPL Energy Seabrook intends to remove the two CSCA that were installed in OR09 and repair the CRDM canopy seal welds using a weld overlay technique. As a conservative initiative to minimize the possibility of future leakage in spare CRDM canopy seal welds, FPL Energy Seabrook also intends to provide weld overlays to the CRDM canopy seal welds on the remaining twenty (20) spare penetrations in the reactor pressure vessel closure head. Industry experience has shown that the spare CRDM penetrations are more susceptible to leakage. No repairs to the remaining fifty-six (56) penetrations that have a full length, active CRDM installed are planned for this Outage.

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The NRC has approved a similar relief requests for the

- H.B Robinson Steam Electric Plant, Unit 2 by letter dated November 26, 2002 [TAC No. MB6622]
- Comanche Peak Steam Electric Station, Unit 1, by letter dated January 3, 2003 [TAC No. MB6667]
- Comanche Peak Steam Electric Station, Unit 2, by letter dated March 21, 2003 [TAC No. MB7742]

FPL Energy Seabrook requests the NRC to review and approve the subject relief request by March 31, 2005 to support the upcoming refueling outage.

Should you have any questions concerning this issue, please contact Mr. James M. Peschel, Regulatory Programs Manager, at (603) 773-7194.

Very truly yours,
FPL Energy Seabrook, LLC

Mark E. Warner
Site Vice President

cc: S. J. Collins, NRC Regional Administrator
V. Nerses, NRC Project Manager, Project Directorate I-2
G.T. Dentel, NRC Senior Resident Inspector

Enclosure to SBK-L-04065

FPL Energy Seabrook, LLC

Seabrook Station
Unit No. 1

ASME SECTION XI

RELIEF REQUEST

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1. ASME Code Components Affected

The components affected by this relief request are the Seabrook Station, Unit No.1, reactor pressure vessel Control Rod Drive Mechanism (CRDM) canopy seal welds for twenty-two (22) penetrations in the reactor pressure vessel closure head (Figure 1). The reactor pressure vessel CRDMs are American Society of Mechanical Engineers (ASME) Code Class 1 components that are mechanically attached to the reactor vessel closure head penetrations by a threaded connection (Figure 2). The reactor vessel closure head penetrations and the CRDMs are ASME Code pressure boundary components. The threaded connection between these two components carries the structural loads and establishes the ASME Code pressure boundary. The canopy seal weld (see Figure 2) is not a structural load carrying weld nor a pressure retaining weld but provides a membrane seal to contain any leakage through the threaded connection between the CRDMs and the reactor pressure vessel closure head penetrations.

2. Applicable ASME Code Edition and Addenda

ASME Section III, Nuclear Power Plant Components, Subsection NB, 1974 Edition through Summer 1974 Addenda is the original code of construction for the Seabrook Station CRDMs. ASME Section III, Nuclear Power Plant Components, Subsection NB, 1971 Edition through Winter 1972 Addenda is the original code of construction for the Seabrook Station reactor pressure vessel. ASME Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, 1995 Edition with 1996 Addenda is the applicable Code of record for the Seabrook Station Second Ten Year Inservice Inspection Interval.

3. Applicable ASME Code Requirement Which Relief Is Requested

The ASME Boiler & Pressure Vessel Code (B&PV), 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 different

Editions and Addenda of the Construction Code or of Section III. The canopy seal weld is an ASME Section III Code seal weld as described in paragraph NB-3227 of Section III and per paragraph NB-5271 requires examination by either magnetic particle or liquid penetrant method. Pursuant to 10 CFR 50.55a(a)(3)(ii), relief is requested from the surface examination requirements of the ASME B&PV Code, 1974 Edition through Summer 1974 Addenda, Section III Subsection NB, paragraph NB-5271, "Welds of Specially Designed Seals" which states that welds of this type be examined by either the magnetic particle or liquid penetrant method.

Also, pursuant to 10 CFR 50.55a(a)(3)(ii), relief is requested to the ASME B&PV Code, Section XI, 1995 Edition with 1996 Addenda, paragraph IWA-4611 "Metal Removal" which states that defects shall be removed or reduced in size such that the resultant section thickness created by the cavity is at least the minimum design thickness.

4. **Reason for Request**

FPL Energy Seabrook, LLC, (FPL Energy Seabrook) requests relief in accordance with 10 CFR 50.55.a(a)(3)(ii) from the ASME Section III Code required surface examination of the canopy seal welds (NB-5271) on the basis that compliance with this ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety. FPL Energy Seabrook also requests relief in accordance with 10 CFR 50.55.a(a)(3)(ii) from the ASME Section XI Code requirement (IWA-4611) to remove the defect or reduce the size of the defect to at least the minimum design thickness on the basis that compliance with this ASME Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety.

During OR09, the CRDM canopy seal welds on reactor pressure vessel closure head penetration no. 20 and no. 26 showed signs of leakage. Penetration no. 20 has a full length, active CRDM installed and penetration no. 26 has a Dummy Can Assembly bolted on the top of the penetration. In lieu of a Code weld repair, the CRDM canopy seal welds on these two penetrations were repaired by the installation of a Canopy Seal Clamp Assembly (CSCA) that was designed and provided by the NSSS supplier. The CSCA provided a non-welded, mechanical method of stopping leakage in the CRDM canopy seal welds. The CSCA seals the leaking weld by the introduction of a compressive load into the canopy seal weld, which closes the leak path and prevents crack propagation.

During OR10, FPL Energy Seabrook intends to remove the two CSCAs and repair the CRDM canopy seal welds using a weld overlay technique (Figure 3). As a conservative initiative to minimize the possibility of future leakage in spare CRDM canopy seal welds, FPL Energy Seabrook intends to provide weld overlays to the CRDM canopy seal welds on the remaining twenty (20) spare penetrations in the reactor pressure vessel closure head. Industry experience has shown that the spare CRDM penetrations are more

susceptible to leakage. No repairs to the remaining fifty-six (56) penetrations that have a full length, active CRDM installed are planned for this Outage.

The CRDM canopy seal welds are located above the reactor pressure vessel closure head in a highly congested area and subjected to high radiation levels. An ASME Code weld repair to penetrations no. 20 and no. 26 would involve excavation of the defects and restoration of the weld to the original configuration. An ASME Code weld repair requires manual excavation of the defects and manual repair welding which has a high risk of failure due to the difficulty of making a quality weld on the canopy seal accompanied by the required cleaning. In addition to the difficulty and time required to remove the defect and manually re-weld the canopy seal, a similar level of difficulty and resultant time is required for a liquid penetrant (LP) examination of the repair welds. The high radiological dose associated with strict compliance with these repair requirements would be contrary to the intent of the ALARA radiological control program. During OR09, dose rates were recorded at 600 – 800 mR/hr in the CRDM canopy seal area. Installation of temporary radiation shielding is not feasible in this area, as it would interfere with the welding process and LP examination process. Based on an estimated total time of two (2) hours per seal weld to perform the LP examination, the occupational exposure from the required LP examination will add approximately 1.6 rem to the total repair dose for each repair which results in a total additional dose of approximately 35.2 rem.

5. Proposed Alternative and Basis for Use

FPL Energy Seabrook requests relief from the requirements of the ASME B&PV Code, Section III, Subsection NB paragraph NB-5271 and the ASME B&PV Code, Section XI, paragraph IWA-4611 in accordance with 10 CFR 50.55a(a)(3)(ii) by proposing an alternative method of repair and alternative surface examination due to hardship and unusual difficulty without a compensating increase in quality or safety.

ASME Code Case N-504-2, "Alternate Rules for Repair of Classes 1, 2, and 3 Austenitic Stainless Steel Piping," Section XI, Division 1, March 1997, will be used as guidance for repair by weld overlay which increases the weld thickness to establish the acceptability of the defect in accordance with IWB-3640. In addition, alloy 52 nickel-based weld repair material will be used rather than austenitic stainless steel as required by Code Case N-504-2. In lieu of performing LP examinations of CRDM canopy seal weld repairs or weld overlays as required by NB 5271, an enhanced 8X visual examination (VT-1) will be performed after welding is completed.

The alternative method of repair and the alternative surface examination are requested to facilitate the weld repairs to the two canopy seal welds and the weld overlays for twenty (20) additional CRDM canopy seal welds planned during OR10 and if required, for future weld repairs and weld overlays during the Second Ten Year Inservice Inspection interval.

Industry experience with failure analysis performed on leaking canopy seal welds removed from service at other plants has determined that in a majority of the cases the CRDM canopy seal welds developed cracks as the result of transgranular stress corrosion cracking (TGSCC). 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 TGSCC results from exposure of a susceptible material with residual stress which is often concentrated by weld discontinuities, and to a corrosive environment such as borated water trapped in the cavity behind the canopy seal weld that is combined with air initially in the cavity, resulting in higher oxygen content than is in the bulk primary system coolant.

As permitted by ASME Code Case N-504-2 "Alternative Rules for Repair of Class 1,2 and 3 Austenitic Stainless Steel Piping", the CRDM canopy seal weld flaws will not be removed, but an analysis of the repaired weldment has been performed by Westinghouse using paragraph (g) of the Code Case as guidance to assure that the remaining flaw will not propagate unacceptably. This analysis established the critical flaw size used to qualify the VT-1 examination method to assure capability of detecting a flaw sufficiently small to assure an adequate margin of safety is maintained. The canopy seal weld is not a structural load carrying weld nor a pressure retaining weld but provides a membrane seal to contain any leakage through the threaded connection between the CRDMs and the reactor pressure vessel closure head penetrations. A remote viewing system will also be used during the welding process to monitor the quality of the welds. By use of the remote viewing system, 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 problems immediately. After each weld bead is deposited in one direction, the remote viewing camera is rotated back in the reverse direction to permit viewing of the entire as-deposited weld bead including weld overlaps.

The alternative CRDM canopy seal weld repairs and weld overlays will consist of a minimum of two weld layers and will use a Gas Tungsten Arc Welding (GTAW) process and VT-1 examinations both controlled remotely. The VT-1 examinations will use a video camera within several inches of the weld with 8X magnification. The examiner will be qualified to assure identification of a flaw significantly smaller than the analyzed critical flaw size. Based on the capability of the remote visual examination system to resolve flaws of a size 0.001-inch in width, reasonable assurance of the weld integrity will be provided. The examination technique will be demonstrated to resolve a 0.001-inch thick wire against the surface of the weld. The proposed alternative is an enhanced visual examination technique with resolution and consistency much greater than that provided by the requirements of a Code (visually unaided) VT-1 and comparable to flaw sizes detectable using liquid penetrant method.

The alloy 52 nickel-based weld repair material will be used rather than austenitic stainless steel as required ASME Code Case N-504-2. Alloy 52 nickel-based weld repair material was selected rather than austenitic stainless steel as required by the Code Case N-504-2,

paragraph (b) because Alloy 52 is highly resistant to stress corrosion cracking. Thus, the ferrite requirements of Code Case N-504-2, paragraph (e) do not apply. The weld repairs and weld overlays will be documented on NIS-2 forms, reviewed by the Authorized Nuclear Inservice Inspector and maintained in accordance with the plants archival records system.

The GTAW weld repairs, weld overlays and VT-1 surface examination method results in significantly lower radiation exposure because the equipment is remotely operated after setup. The use of remote visual examination will assure weld quality and integrity for the multiple layer, canopy seal weld repairs and weld overlays. The radiation exposure associated with the performance of an ASME Code repair and ASME Code required surface examination would not result in a compensating increase in the level of quality and safety.

6. Duration of Proposed Relief Request

FPL Energy Seabrook, requests this relief for the Second Ten Year Inservice Inspection Interval of the plant.

7. Similar Precedents

Letter from Allen G. Howe (NRC) to Mr. J.W. Moyer (CP&L) dated 26 November, 2002 for H.B. Robinson Steam Electric Plant, Unit 2, Relief Request no. 18 [TAC No. MB6622]

Letter from Robert A. Gramm (NRC) to Mr. C. Lance Terry (TXU Energy) dated 3 January, 2003 for Comanche Peak Steam Electric Station, Unit 1, Relief Request B-3 [TAC No. MB6667]

Letter from Robert A. Gramm (NRC) to Mr. C. Lance Terry (TXU Energy) dated 21 March, 2003 for Comanche Peak Steam Electric Station, Unit 2, Relief Request B-10 [TAC No. MB7742]

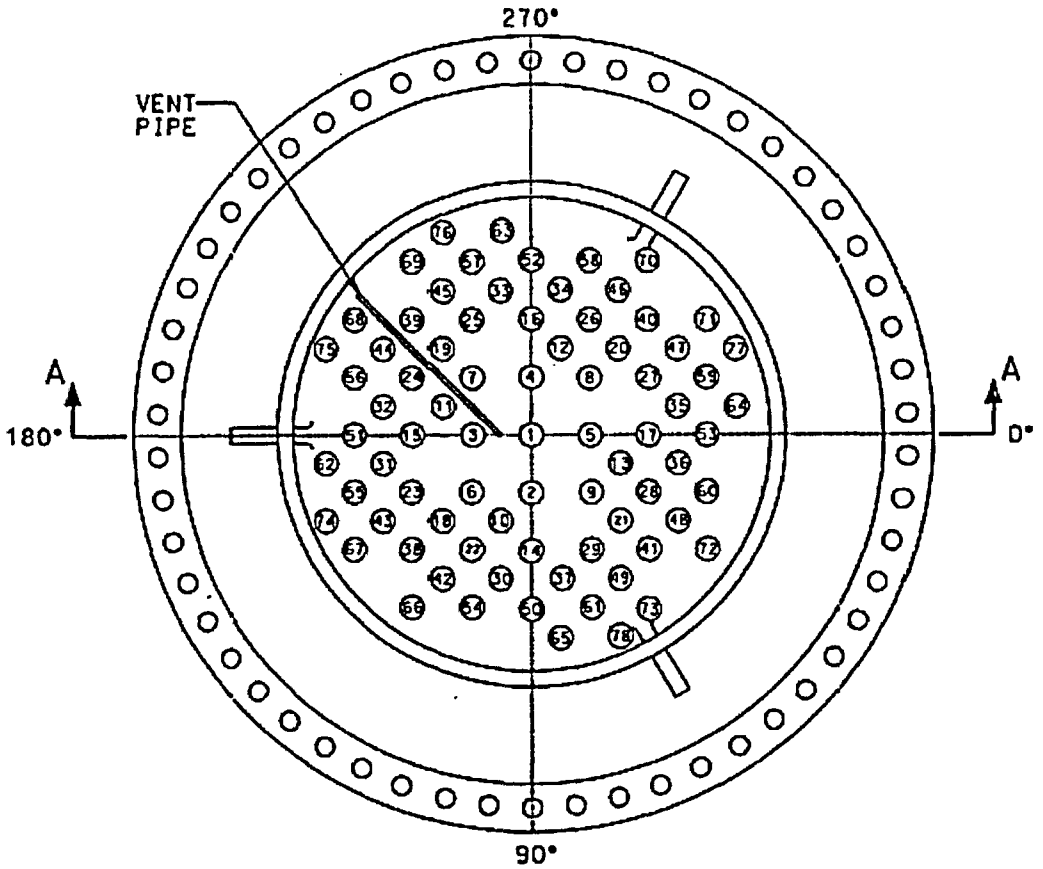
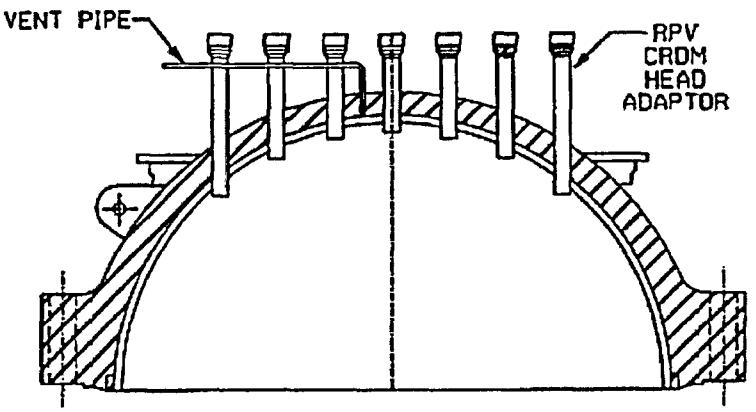


FIGURE 1

REACTOR PRESSURE VESSEL
CLOSURE HEAD PENETRATIONS



SECTION "A-A"

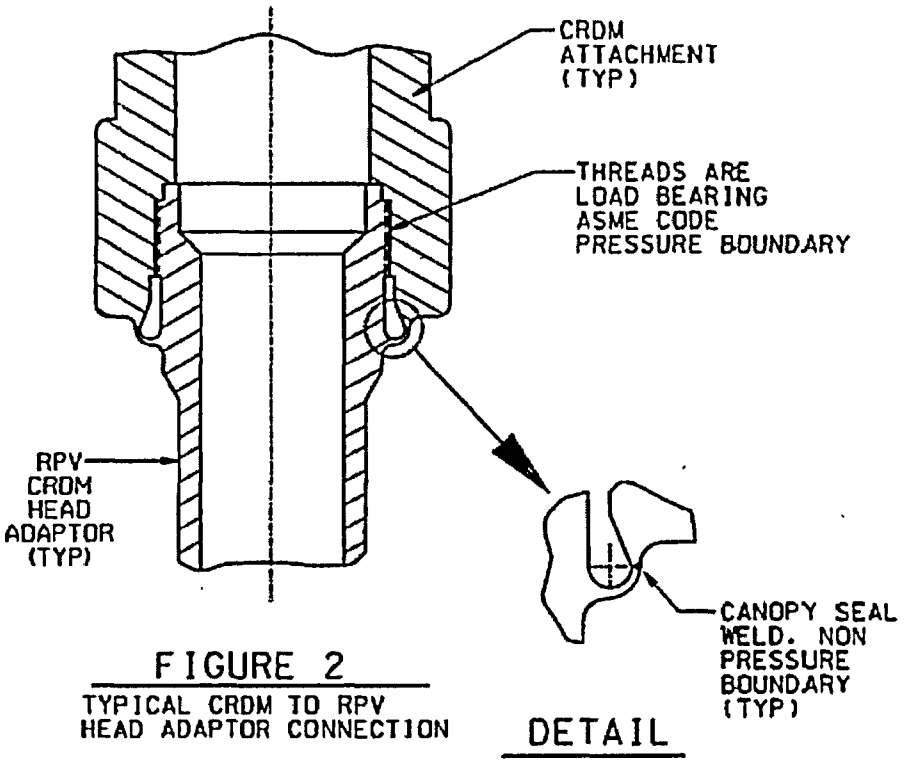


FIGURE 2
TYPICAL CRDM TO RPV
HEAD ADAPTOR CONNECTION

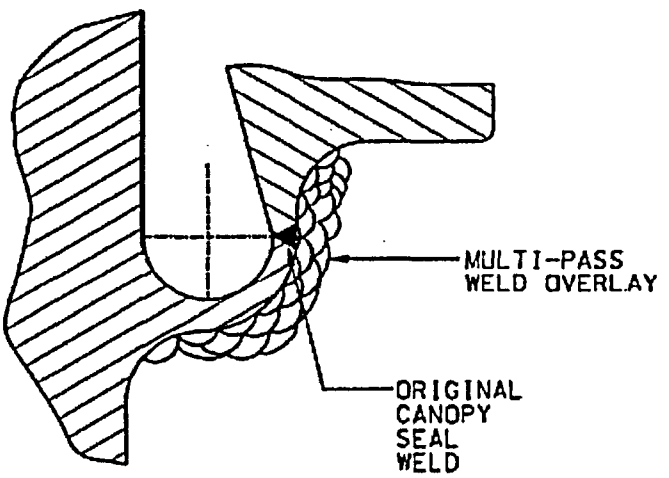


FIGURE 3
TYPICAL CANOPY SEAL
WITH WELD OVERLAY