Department of Energy
Washington, D.C. 20545

Docket No. 50-537
HQ:S:82:021

APR 19 1982


Mr. Paul S. Check, Director
CRBRP Program Office
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Check:

RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION - INSERVICE INSPECTION

Reference: Letter, P. S. Check to J. R. Longenecker, "CRBRP Request for Additional Information," dated February 19, 1982

This letter formally responds to your request for additional information contained in the reference letter.

Enclosed is a response to question CS 250.2 that will also be incorporated into the PSAR in Amendment 68, scheduled for April 30. The remaining question (CS 250.1) from the reference letter will be provided under separate cover by April 23, 1982.

Sincerely,

John R. Longenecker

John R. Longenecker, Manager
Licensing & Environmental
Coordination
Office of Nuclear Energy

Enclosure

cc: Service List
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QUESTION CS250.2

We require that an inservice inspection program be established and submitted for our review to meet the quality requirements of the CRBR Design Criteria. The program should include periodic volumetric examination of vessel and piping welds in both the Primary Heat Transport (PHT) system and the Intermediate Heat Transport (IHT) System. The periodic volumetric examination is intended to provide assurance of the structural integrity of the components and to reliably identify potential long term degradation mechanisms that may result from plant operation.

We suggest that the selection of individual welds to be examined be based on the current inspection philosophy identified in the Summer 1979 and later Addenda of Division 1 of Section XI of the ASME Code. The Addenda concentrates on the examinations to those areas which have a high degree of safety significance and a greater probability of failure. These are generally high stress welds, terminal end and dissimilar metal welds. In addition, the Addenda requires examination of the same weld each 10 year interval so that data trending may be accomplished.

RESPONSE:

The CRBRP Inservice Inspection plan is defined in PSAR Appendix G and meets the CRBRP General Design Criteria, e.g. Criterion 30 and 33. The basis for the CRBRP plan is ASME Section XI Division 3 which was issued in the Section XI Winter 1981 Addenda and an assessment by the designer of record. Appendix G identifies and provides justification for any exceptions to the ASME Section XI Division 3 Code requirements.

A. General Approach

The results of a comprehensive and detailed assessment of the Primary and Intermediate Heat Transport System piping are provided in WARD-D-0185 (Reference 2 to PSAR Section 1.6), "Integrity of Primary and Intermediate Heat Transport System Piping in Containment." This assessment supports the PSAR Appendix G emphasis placed upon leak detection and visual inspection as the main techniques for Inservice Inspection.

The objective of the CRBRP Inservice Inspection plan is to provide continuing assurance that the plant is safe for operation. In order to initially achieve this objective, during the CRBRP Construction Phase components are constructed to ASME Code Section III rules which include extensive examinations and quality assurance to ensure there are no unacceptable indications in any of the welds, and to establish high structural integrity for operation within the design envelope.

Following construction, the Preservice examinations establish the basis for the inservice examinations that are performed through out the plant life to ensure that the high structural integrity established during the construction phase is maintained.

The following two sections of this response discuss the CRBRP position with regards to volumetric examinations for the Primary and Intermediate Heat Transport Systems.

B. Examination of PHTS Welds

1. General

The CRBRP position is that inservice volumetric examinations of the Primary Heat Transport System welds are not necessary and are not included in the Appendix G inservice requirements. The inservice examination requirements do consist of periodic visual examinations of the Heat Transport System boundary in addition to continuous monitoring for liquid metal to gas and radioactive cover gas to gas leak detection. This program is considered adequate to satisfy the inservice inspection requirements as defined in CRBRP General Design Criterion 30, i.e., the reactor coolant boundary is designed to permit periodic inspection of areas and features important to safety and to access their structure and leak tight integrity. The adequacy of this program to meet CRBRP General Design Criterion 30 is discussed in WARD-D-0185.

2. Examination of Dissimilar Metal Welds

The Primary Heat Transport System has only one dissimilar metal weld. This weld is located in the upper section of the reactor vessel above the coolant level. ASME Section XI Division 3 specifies an inservice volumetric examination of Class 1 dissimilar metal welds. A justification for performing a periodic visual examination as an exception to the ASME Code is provided in Appendix G of the PSAR.

3. Examination of High Stress Welds

As stated above, inservice volumetric examinations of the Primary Heat Transport System welds are not necessary and are not included in the Appendix G inservice requirements.

In CRBRP, high stress welds are those areas where the stress levels are high in comparison to other areas of the piping. The justification for no volumetric examinations is based upon the following points which are documented and discussed in detail in WARD-D-0185. Volumes 1 and 2.

- The highest quality engineering standards and a comprehensive and stringent quality assurance program have been imposed upon the PHTS piping throughout all stages of design, fabrication and installation.

- Extensive analysis and testing as shown that:

  (1) If a flaw develops, it will leak sodium, but it will not enlarge to a critical limit, and

  (2) the leaking sodium will be detected by the sodium to gas leak detection system.

- The sensitivity of the liquid metal to gas leakage detection system is sufficient to detect through wall cracks before enlargement

In summary, the CRBRP has been carefully and conservatively designed using recognized standards and practices. Fabrication and construction are subjected to a stringent and comprehensive quality assurance program. The piping receives a thorough and rigorous non-destructive examination for flaws to assure all of the stringent requirements of the quality assurance program are met. The piping material is very well characterized through an extensive program of investigation. Stress analyses of the piping have been performed and the highest stress locations identified. When the appropriate stresses and material properties were combined with a conservatively large assumed flaw, it was found that the flaw growth over the plant life time would be insignificantly small. Crack growth morphology tests have proven that these flaws require stresses and numbers of cycles orders of magnitude beyond those which would occur in the plant in order to grow significantly. In addition, the tests indicate that crack growth is accompanied by through-wall penetration at short length, thus providing a small leakage path for the coolant. For the CRBRP PHTS environment, a through-wall crack would leak and timely detection by the plant leak detection systems is assured.

C. Volumetric Examination of IHTS Welds

1. General

The inservice examinations necessary for the CRBRP intermediate coolant boundary are defined in Appendix G of the PSAR. These periodic inspections include volumetric examinations, visual examinations, and continuous monitoring for liquid metal to gas leak detection. Volumetric examinations will be performed on IHTS dissimilar metal welds and the heat transfer tubes inside each steam generator module.

The Inservice Inspection Program as defined in Appendix G of the PSAR satisfies CRBRP General Design Criteria 33, i.e., the intermediate coolant boundary shall permit periodic inspection of areas and features important to safety and to access their structural and leaktight integrity.

The following paragraphs provide additional information on the volumetric examinations of the IHTS.

2. Volumetric Examination of Dissimilar Metal Welds

The dissimilar metal welds on the IHTS are all located in the Steam Generator Building. The Project will perform a volumetric examination of 33% of the welds once every ten years, choosing a different sample each interval in order to cover essentially 100% of the welds by the end of the third interval. This examination is performed in addition to periodic visual examinations and continuous monitoring for leak detection.

The specific volumetric examination to be performed on these 2-1/4 Cr-1 Mo material dissimilar metal welds will be dependent upon the results of on-going contributing base development programs. These development programs address transition weld development, life tests and methods for fabrication examinations as well as inservice examinations. Should final stress analysis determine that these are limited life components, more frequent volumetric examinations than presently defined may be required and will be factored into the inservice examination requirements.

3. Volumetric Examination of Steam Generator Module Tubing

Refer to PSAR Appendix G which states that 3% of the heat transfer surface tubes in each steam generator module (9 total) will have an inservice volumetric examination during the first 10 year inspection intervals, 1-1/2% of the heat transfer surface tubes in each of the three steam generator modules in one loop will receive a volumetric examination. All tubes to be examined are selected from previously examined tubes, including any tubes which exhibit a wall thinning rate greater than the design allowable.