U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
REGION IV

Report No. 99900039/79-02 Program No. 51300

Company: Rhine-Schelde-Verolme Zware Apparatenbouw b.v.
Heijplaatstraat 4, P. O. Box 221
Rotterdam, THE NETHERLANDS

Inspection Conducted: November 5-8, 1979

Inspectors: I. Barnes 1-11-80
I. Barnes, Contractor Inspector Date
Components Section II
Vendor Inspection Branch

U. Potapovs 1-11-80
U. Potapovs, Chief Date
Vendor Inspection Branch

Approved by: D M Hunnicutt 1/11/80
D. M. Hunnicutt, Chief Date
Components Section II
Vendor Inspection Branch

Summary

Inspection on November 5-8, 1979 (99900039/79-02)

Areas Inspected: Implementation of 10 CFR 50, Appendix B, criteria and applicable codes and standards, including integrated quality program review, design control, and procurement control. The inspection involved fifty-eight (58) inspector-hours on site by two (2) NRC inspectors.

Results: In the three (3) areas inspected, the following deviations and unresolved items were identified:

Deviations: Integrated Quality Program Review - Certain m[illegible]lers were not in accordance with Criterion V of 10 CFR 50, Appen[illegible] Chapter 6 of the QA Manual relative to use as a controlling [illegible]nt for manufacturing processes (See Notice of Deviation, Item A).

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Design Control - Absence of documented evidence relative to performance of design reviews and failure to submit detailed component stress analyses for buyer approval are not in accordance with Criterion V of 10 CFR 50, Appendix B, Chapter 4 of the QA Manual, NA-4300 in the ASME Code, and customer specification 21A9477 (See Notice of Deviation, Item B).

Procurement Control - Incorrect definition of test specimen depth from a forging surface is not in accordance with Criterion V of 10 CFR 50, Appendix B, and NB-2223.2 in the ASME Code (Notice of Deviation, Item C).

Unresolved Items: Integrated Quality Program Review - Absence of review of adequacy of permissible axial temperature gradients in local postweld heat treatment with respect to nozzles located in gradient zone (Details, B.3.b).

Procurement Control - Absence of QA program requirements relative to customer furnished items (Details, D.3.b).

DETAILS SECTION

(Prepared by I. Barnes and U. Potapovs)

A. Persons Contacted

*F. C. Smit, Managing Director
*M. Lodder, Manager, Quality Assurance
*A. Van Haasen, Manager, Manufacturing
*J. Poort, Manager, Engineering
G. J. Van der Vlies, Manager, Projects
W. N. van de Poll, Executive Secretary
*C. Klootwyk, QA Shop Engineer
S. A. Hulshoff, QA Systems Engineer
P. J. Bomers, QA Systems Engineer
J. H. Van Eldik, QA Engineer
A. Waasdorp, QA Project Engineer
*N. C. Theis, Authorized Inspection Specialist, Hartford Steam Boiler Inspection & Insurance Company
*T. A. Scott, Authorized Nuclear Inspector, Hartford Steam Boiler Inspection and Insurance Company

*Denotes those persons attending the exit meeting.

B. Integrated Quality Program Review (I. Barnes)

1. Objective

The objective of this area of the inspection was to ascertain by integrated review of procurement, vendor and RSV-A manufacturing operations and records, whether QA program controls were functioning.

2. Method of Accomplishment

The preceding objective was accomplished by:

a. Review of Chapter 5, Revision 11, in the QA Manual, "Procurement Control."

b. Review of Chapter 6, Revision 9, in the QA Manual, "Process Control and Material Identification."

c. Review of Sub-Chapter 8.1, Revision 8, "Welding" and Sub-Chapter 8.4, Revision 2, "Forging, Forming and Bending followed by a Heat Treatment," in Chapter 8 of the QA Manual.

d. Review of Chapter 9, Revision 11, in the QA Manual, "Nondestructive Examination."

e. Integrated review of the following records applicable to Shell Course No. 4 in the Black Fox Unit 2 reactor vessel:

(1) Purchase orders and specifications applicable to procurement of SA 533 Grade B Class 1 plate, SA 508 Class 2 Jet Pump Instrumentation Nozzles, and SA 508 Class 2 ingot stock for manufacture of Recirculation Outlet Nozzles.

(2) Examination of vendor approval status at time of procurement.

(3) Review of vendor survey records for those vendors not holding an appropriate ASME Certificate.

(4) Examination of Certified Material Test Reports for the referenced materials with respect to:

(a) Evidence of RSV-A review and approval.

(b) Compliance with procurement requirements.

(5) Examination of RSV-A manufacturing records relative to forging, heat treatment and testing of Recirculation Outlet Nozzles.

(6) Review of Certified Material Test Report for the Recirculation Outlet Nozzles with respect to the requirements of the ASME Section III Code (through the Summer 1974 Addendum) and General Electric Specification 21A-9477, Revision 7, "Reactor Vessel."

(7) Examination of RSV-A manufacturing records applicable to plate forming, shell course fitup and dimensional inspection of fitup.

(8) Examination of RSV-A master travelers for shell course fabrication relative to:

(a) Definition and control of sequencing of manufacturing operations to provide for compliance with ASME Section III fabrication requirements.

(b) Performance of required ASME Code nondestructive examinations of weld preparations and welds.

(c) Performance of nondestructive examinations in accordance with ASME Code rules relative to time of examination.

(9) Review of production Weld Records for compliance with welding procedure specification (WPS) essential and nonessential variables.

(10) Examination of performance qualification records for those welders identified as performing the production welds, with respect to adequacy of qualification for use of the designated WPS.

(11) Review of postweld heat treatment records relative to the requirements of the designated process specification.

(12) Examination of issued Nonconformance Reports and verification of resolution in accordance with ASME Code and QA program requirements.

f. Review of process specification, PS53.23 Revision 2, "Postweld Heat Treatment of the closure seam by inductive heating," applicable to postweld heat treatment of the final weld seam in the Black Fox Unit 1 reactor vessel.

g. Examination of system used for tracking accumulated postweld heat treatment time with respect to welding qualifications and verification of accuracy on the Black Fox Unit 1 reactor vessel.

3. Findings

a. Deviation from Commitment

See Notice of Deviation, Item A.

b. Unresolved Items

Review of specification PS-53.23, Revision 2, relative to requirements for local postweld heat treatment of the vessel final closure seam, showed that criteria had been established with respect to permissible axial thermal gradients during the heat treatment cycle. Discussion of the subject, however, revealed that consideration had not been given to adequacy of the gradients with respect to those locations containing vessel nozzles. Management agreed to review this subject prior to performance of the Black Fox Unit 1 final closure seam postweld heat treatment.

C. Design Control (U. Potapovs)

1. Objectives

To verify that the vendor has established and effectively implemented a system for the control of his design activities consistent with applicable regulatory and ASME Code requirements.

2. Method of Accomplishment

The inspection objectives were accomplished by review of the following documents and discussions with RSV-A engineering personnel:

a. RSV-A Quality Assurance Manual.

b. Black Fox 1 and 2 Design Document Index Revision 20, July 1979.

c. Reactor Vessel Purchase Specification 21A9477 Revision 7.

d. Reactor Pressure Vessel Surveillance Samples - Purchase Specification 21A9507, Revision 0 (1973).

e. Reactor Pressure Vessel Surveillance Samples - Purchase Specification 22A5599, Revision 0, April 14, 1978.

f. Preliminary Fracture Analysis of the LEIBSTADT Reactor Pressure Vessel, Document No. 30795-SR-080, Revision 2.

g. Document 238-D2- Sizing Calculations for Vessel Support Skirt.

h. Document 238-D4 Sizing calculations - Feedwater Nozzle.

i. Document 238-D16 Sizing Calculations for Head Spray and Vent and Spare Nozzles.

j. Document PM 001 (79-01-25) - Engineering Schedules - Reactor Pressure Vessel.

k. QA procedure Nr 9.04.06(E). The Preparation of Stress Reports.

l. Document No. SR-011 Vol I, Reactor Pressure Vessel Stress Report, Thermal, Structural and Fatigue Analysis of the Feedwater Nozzle. (Leibstadt Vessel).

m. Report SR-003- Computer Programs used for thermal, structural and fatigue analysis.

n. Docket No. SR-005 Thermal, Structural and Fatigue analysis of Shell & Head in Area of Shroud Support and Vessel Bottom Head and Support Skirt.

o. Document No. KE 4082A, Revision 0, Pre-Order Review Sheet.

3. Findings

a. Deviation from Commitment - No documented evidence that Design Verification has been performed for stress analyses used in material sizing calculations - See Notice of Deviation, Item B.

Record review indicated that the sizing calculations used for the Black Fox Vessels had been performed by Chicago Bridge & Iron Nuclear Company (CBIN), apparently as generic analysis for a 238 - in. BWR vessel using earlier edition/addenda of the ASME Code than applicable to the Black Fox vessels. Although RSV-A has re-issued these calculations under their cover-sheet indicating their approval, there was no documentary evidence to verify the basis for RSV-A's acceptance of these calculations. It is understood that CBIN was not under contract to RSV-A when these calculations were performed and therefore not accountable to RSV-A for the calculation accuracy or validity of the methods used such as specific computer programs. Review of a number of these calculations showed only one instance where any changes had been made to the original CBIN document. This involved the vessel support skirt (stress Report 238-D2) where the material had been changed from SA 516 to SA 533B Class 1 with the notation that the original calculations were still acceptable, since the substituted material has larger permissible design stress intensity value (26.7 KSI VS 23.2KSI). It was noted that neither the original CBIN sizing calculations for the support skirt, nor the RSV-A - approved revision, fully complied with the applicable GE procurement specification requirement (21A 9477 paragraph 7.4.2) to include impact specification requirements for each ferritic component.

b. Deviation from Commitment -

Failure to submit detailed analysis for each component for customer approval as required by the purchase specification -See Notice of Deviation, Item B.

Paragraph 7.4.3 of the reactor vessel purchase specification requires that detailed stress analyses for each component

be submitted to the customer for his approval in accordance with the Engineering Schedule, but not later than 1 year before completion of the vessel fabrication. Special emphasis is placed on calculations needed to verify fracture toughness adequacy. Specifically, if the maximum acceptable flaw sizes are less than the limits established by the procurement specification, verification of flaw detectability by NDE must be submitted to and approved by the customer prior to use of this flaw size in the detailed stress analysis.

Document review indicated that the detailed stress analyses had not been submitted for customer review as of the date of this inspection and that dates for submission of these documents had not been included in the Engineering Schedule, although the Black Fox Unit 1 vessel was estimated (by RSV-A) to be less than a year from completion. RSV-A engineering management indicated that it was their intent to pattern the Black Fox detailed analysis after those which are currently being completed for a similar Swiss BWR (LEIBSTADT), which is leading the Black Fox units. Several of these analyses were reviewed and determined to be consistent with the applicable Code and design specification requirements. It was noted, however, that the limiting flaw size for the upper closure flange was calculated as .3278-in.

The procurement specification requires that in-service detectability of limiting flaws which are less than 0.5.-in. or 0.1T be demonstrated to the satisfaction of the buyer, before these can be used in the final stress calculations. Since no such demonstration had been made for the Black Fox vessels, this issue was raised as another concern relative to the requirement for buyers' approval of the detailed stress calculations one year prior to the vessel completion. It was pointed out by RSV-A, that a flaw size larger than 0.5-in. and therefore not requiring detectability demonstration, could probably be justified for the Black Fox vessels, since the consideration of residual stress contribution was a significant factor in determining the .3278-in. flaw size for the Leibstadt Vessel. The inclusion of residual stress in this calculation is reportedly a Swiss requirement and not necessary to meet the GE procurement specification. In view of the limited progress in this area, this will be carried as a follow-up item for re-examination during the next scheduled inspection.

c. Reactor Vessel Material Surveillance Program -

The requirements for Black Fox Vessel material surveillance specimen selection and preparation were examined. These

were originally included in GE purchase Specification 21A9507, Revision 0 (1973), which was essentially based on the ASTM-185-73 specification. Subsequently, however, RSV-A was requested to comply with a later GE specification (22A5599), Revision 0 - April 14, 1978), which references 10 CFR 50, Appendices G&H as well as Regulatory Guide 1.99 and requires that the surveillance specimens be prepared and shipped to the buyer 6 months prior to the shipment of the vessel. RSV-A has requested several exceptions to this specification and the actual commitments in this area were not established at the time of this inspection. Therefore this will be carried as a follow-up item for re-examination during the next scheduled inspection.

D. Procurement Control (U. Potapovs)

1. Objectives

To verify that the vendor has established and effectively implemented a system for the procurement of components materials and services, which assures conformance with specified requirements and includes appropriate provisions for source evaluation and selection, evaluation of objective evidence of quality furnished by the supplier, source inspection, audit and examination of items upon delivery or completion.

2. Method of Accomplishment

The inspection objectives were accomplished by discussions with RSV-A purchasing/inspection personnel and review of the following documents:

a. Quality Procedure 9.14.02(E), Revision 1 - Vendor Evaluation/ Approval.

b. Approved Nuclear Vendor List for ASME III Products, Revision 22, 10/15/79

c. Engineering Specification ES-021/Add 2.03, Revision 3 - Premachined Stainless Steel Thermal Sleeves.

d. Engineering Specification ES-018/Add 2.01, Revision 4 - Premachined Carbon Steel Forgings.

e. Vendor Evaluation Checklist for Audit of 1977-05-11 (BOSCHGOTTHARDSHUTTE O. BREYER GmbH) and Corrective Action Request (CAR) 77-08.

f. RSV-A Quality Assurance Manual, Chapter 5.

3. Findings

a. Deviation from commitment - Failure to assure vendor conformance with applicable Code requirement for material test coupon location. See Notice of Deviation, Item C.

b. Unresolved Item

The RSV QA manual does not specifically address the requirements for customer - supplied items. During the document review, it was noted that the Black Fox recirculation inlet nozzle safe end extensions, thermal sleeves and thermal sleeve extensions had been removed from the RSV-A scope of supply and that the replacements for these items had been procured by GE and delivered to RSV-A for installation. Since the safe end extensions are to be welded to the reactor vessel and GE does not appear on the RSV-A Approved Nuclear Vendor List, the basis for RSV-A acceptance of these items was questioned. RSV-A is evaluating this problem and will be prepared to address it during the next inspection.

E. Exit Meeting

A post inspection exit meeting was held on November 8, 1979, with the management and Authorized Inspection Agency representatives denoted in paragraph A, above. The scope of the inspection and the findings were discussed with the representatives present. Management acknowledged the statements of the inspectors and had no specific questions regarding the findings as identified to them.