



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30303

Report Nos.: 50-416/84-38 and 50-417/84-06

Licensee: Mississippi Power and Light Company
Jackson, MS 39205

Docket Nos.: 50-416 and 50-417

License Nos.: NPF-13 and CPPR-119

Facility Name: Grand Gulf

Inspection Conducted: September 18 - 26, 1984

Inspector: B. R. Crowley
B. R. Crowley

10/16/84
Date Signed

Approved by: J. J. Blake
J. J. Blake, Section Chief
Engineering Branch
Division of Reactor Safety

10/16/84
Date Signed

SUMMARY

Scope: This routine, unannounced inspection entailed 38 inspector-hours on site in the areas of service water pipe supports (Unit 1), fracture of steam bypass pipe (Unit 1), nuclear welding (Unit 2), safety-related piping (Unit 2), safety-related structures (Unit 2), reactor vessel (Unit 2), IE Bulletins (Units 1 and 2), and 50.55e items (Unit 2).

Results: No violations or deviations were identified.

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REPORT DETAILS

1. Licensee Employees Contacted

- **J. E. Cross, Grand Gulf Nuclear Station General Manager
- **C. R. Hutchinson, Manager, Plant Maintenance
 - S. M. Feith, Director, Quality Assurance
- *S. F. Tanner, Acting Manager, Nuclear Site QA
- *L. F. Daughtery, Compliance Superintendent
 - F. Adcock, Principle Mechanical Engineer - NPE
 - R. Dubey, Supervisor Piping - NPE
 - S. Lewis, Acting Supervisor Material Science - NPE
 - R. Courtney, Senior Plant Quality Representative
 - B. Oglesby, Maintenance Engineer
 - D. Little, QA Representative
- *J. Bailey, Compliance Coordinator

Other licensee and contractor employees contacted included construction craftsmen, NDE personnel, QC personnel, security force members, and office personnel.

Other Organization

- J. F. Hudson, Project QA Manager, Bechtel
- D. Watt, Lead Field Welding QC Engineer, Bechtel
- M. Shows, Lead Field Welding Engineer, Bechtel
- *P. Collins, QA Engineer, Bechtel
- D. Raines, Mechanical Engineer, Bechtel
- B. White, Mechanical Maintenance Engineer, Bechtel

NRC Resident Inspectors

- **A. G. Wagner, Senior Resident Inspector
- *J. L. Caldwell, Resident Inspector

*Attended exit interview on September 21, 1984

**Attended exit interview on September 21 and September 26, 1984

2. Exit Interview

The inspection scope and findings were summarized on September 21 and 26, 1984, with those persons indicated in paragraph 1 above. The licensee acknowledged the inspection findings listed below and took no exceptions.

(Open) Inspector Followup Item 417/84-06-01, Clarification of RPV Storage and Maintenance Procedure - paragraph 9.

3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Independent Inspection Effort (92706B) (Units 1 and 2)

a. General Inspection of Unit 2

The inspector conducted a general inspection of the Unit 2 reactor and auxiliary buildings to observe construction progress and general activities such as welding, material control, housekeeping, and storage. See paragraphs 6 and 8 for details of welding activities observed.

b. Service Water Pipe Supports (Unit 1)

During a previous inspection related to a crack in Residual Heat Removal (RHR) System piping, a RII inspector performed a random inspection of RHR restraints and hangers. A number of loose hanger bolts and/or nuts were identified. As a result, the licensee agreed to institute a program for inspection of supports, clamps and hangers for loose fasteners (See IFI 84-17-02). During the inspection to satisfy this commitment, the licensee identified the following problems, with the loop B Standby Service Water (SSW) supports:

Dwg. HL-1358D, Support 4A02 - Small crack found in station to structure weld

Dwg. HL-1358D, Support 4C34 - 2 expansion anchors out of 4 pulled out about 1"

Following repair to the supports, the licensee implemented test procedure TSTI P41-84-004-S which simulated a loss of power test for the system. During this test, the discharge valve opens about ten seconds prior to start of the pump. During the test, licensee engineers observed the piping for evidence of water hammer. Visible and audible effects of pump starting under these conditions were noticeably greater than during normal pump starting and stopping. However, the licensee did not consider that significant water hammer had occurred.

After the test, the system was again walked down and visually inspected. No structural damage was evident. However, the following damage to support struts was found:

Dwg. H2-1358D, Supports 4R12 and 4C26 - Bushings slipped out of struts

As a results of the strut failures, the licensee:

- Replaced the failed struts (2½ kips) with the next higher size strut (7 kips)
- Modified the control circuit to not open the valve until the pump starts
- Re-tested the system
- Performed another walkdown of the system after testing
- Showed by analysis that the system remained functional
- Initiated an investigation and detailed dynamic analysis of the system (expected to be completed in 4-5 weeks)

The inspector reviewed the following documentation relative to this problem:

- P QI PN 640-84: Visual inspection after rework of supports 4A02 and 4C34
- MWO F46171: Work order for repair to support 4R12 - Work order signed off through return to operations (RTO)
- MWO F46173: Work order for repair to support 4C26 - Work order signed off through RTO
- MWO F46237: Work order to modify control system - Work order signed off through RTO
- TSTI P41-84-004-S: Documented retest and walkdown of system after test

The inspector questioned the licensee relative to any inspections performed on the pipe. The licensee stated that engineering had evaluated the need for examination of pipe and welds and concluded that hanger and pipe movement was not sufficient to cause any damage to the pipe.

c. Fracture of Main Steam Bypass Piping (Unit 1)

On September 16, 1984, while testing at approximately 18% power using the steam bypass system, a steam leak occurred in the 18" "A" loop bypass line downstream of the bypass stop/control valve. The Unit was shutdown and the licensee found that a capped 2½" drain line nozzle had

blown out of a P3 section of pipe on the upstream side of the Pressure Breakdown Assembly. The P3 section was approximately 1' long and was furnished as part of the Pressure Breakdown Assembly. The licensee replaced the Pressure Breakdown Assembly, including the P3 section of pipe with an identical assembly from Unit 2, and continued testing. On September 23, 1984, at approximately 19% power after approximately 20 hours of use of the bypass line, another steam leak occurred in the same bypass line. The plant was shut down and the leak was found to be from a 7" long crack transverse to and through a P1 to P1 pipe weld about 22" upstream of the previous failure. The weld was between a new piece of pipe (approximately 16" in length), added during the previous repair, and the existing P1 pipe. The inspector visited the site on September 18-21 and 25-26 to examine the pipe failures and review the licensee's plans for corrective action. The following summarizes the observations/examinations and reviews by the inspector:

- (1) The inspector reviewed the configuration and materials with the licensee. The bypass line between the bypass stop/control valve and condenser consisted of a short section of 18" diameter schedule 40 A106, Gr.B pipe and a Pressure Breakdown Assembly. The pressure breakdown assembly is an orifice type assembly where water is injected and the pressure is reduced from 545 psig to 52 psig. The assembly is made from P5 material with a 1' section of P3 material between the assembly and the P1 pipe. The P3 material is the same diameter and thickness as the P1 pipe and is equivalent to A335, Gr. 1 material. The P1 piping material was supplied by Bechtel. The Pressure Breakdown Assembly, including the P3 material, was furnished by Utility Power Corporation and manufactured in Germany using German materials. Material test reports were not available at the site for the pressure breakdown assembly.

The original fracture (blowout of the drain nozzle) extended upstream across the P3 to P1 girth weld and into the P1 pipe and down stream across the P3 to P5 weld into the P5 material. When the assembly was replaced, a 16" long section of P1 pipe was removed immediately upstream of the P3 material and replaced. The second fracture occurred at the P1 to P1 girth weld between the new section of P1 pipe and the old P1 pipe. The crack ran parallel to the axis of the pipe and extended 4" upstream and 3" downstream from the weld.

- (2) The inspector observed the fractured surface of the pipe and drain nozzle for the first failure. The fractured surface gave the appearance of a fatigue type failure. The licensee reported during the inspection that their offsite metallurgical analysis had confirmed a fatigue failure originating on the OD at the intersection of the drain nozzle and nozzle to pipe weld.

When the inspector arrived onsite on September 25, material containing the second crack had been shipped off site for metallurgical analysis. During the inspection, the licensee reported to the inspector that initial metallurgical review of this crack also indicated a fatigue type failure. The failure appeared to have originated near the root of the P1 to P1 weld at a porosity pore (acceptable to welding standards).

- (3) In addition to observation of the fractured surfaces for the first failure, the inspector observed the surfaces of the following welds:

Drain Nozzle to Pipe (Old) - I.D. and O.D.

P1 to P1 Pipe Weld (New) - I.D. and O.D.

P1 to P3 Pipe Weld (New) - I.D. and O.D.

P3 Long Seam (Old) - I.D. and O.D.

Although the I.D. surfaces were not suitable (due to scale from the cut out) for a detailed inspection, all weld surfaces appeared to be satisfactory. All welds were in the as welded condition. The P1 to P1 weld appeared to have been mismatched at fitup by approximately 1/8". However, this did not appear to have any relation to the pipe failure.

- (4) The applicable welding code for the replacement pipe was ANSI B31.1-1973. The inspector reviewed the following procedures and records relative to replacement after the initial failure:

- Bechtel General Welding Standard GWS-1 and WPSs P3,P1-AT-Lh, R5; P1-AT-Lh, R7; and P5-AT-Ag, R6 used to weld the welds listed below
- Welding records including "Field Weld Checklist," "Filler Metal Withdrawal Authorization," Welder Qualification records, PWHT records, weld material test reports, and NDE records for the following welds:

Dwg M-003.0-N1N370001A-1.1-1-M
Weld 502 (P5 downstream side of Pressure Breakdown Assembly)
24" dia.

Dwg. M-1320C
Weld 502 (P1 to P1 Pipe weld)
18" dia.
No PWHT

Dwg. M-1320C
 Weld 501 (P1 to P3 Pipe Weld)
 18" dia.

All welds were MT inspected at 1/3, 2/3 and final thickness levels. Since the system is BOP and not Q, only certificates of compliance were available for some heats of welding material used.

Weld material control in the Field for BOP is essentially the same system as that used for Q work.

- Material procurement, receiving and certification documentation for new sections of 18" schedule 40 pipe that cracked during the second failure. Since this was BOP material, only a certificate of compliance was on file.
 - During investigation of this problem, the licensee found that the P1 to P3 welds on all three loops were not PWHT during construction. The welds were PWHT on loops B and C after the original repair (replacement of the P3 and pressure Breakdown Assembly) on loop A. The inspector reviewed the PWHT records for the P1 to P3 welds on loops B and C (Welds 42 and 44 on dwg. M-1320C).
- (5) After the first failure, the licensee UT and MT inspected the drain nozzle to P3 welds, and P1 to P3 18" pipe welds for loops B and C and the replacement loop A assembly. The inspector reviewed the NDE reports for these inspections.
- (6) Based on metallurgical study of the two failures, the licensee had preliminarily concluded that the failures were fatigue failures caused by pulsating/resonate vibration setup in the thin wall pipe (approximately 1/2") resulting from the throttling effect of the bypass stop/control valve on the steam flow. Bechtel had performed flow calculations which verified that the frequency of vibrations setup by the flow would be near the critical value for the 1/2" thick pipe.

As a fix, the licensee was in the process of replacing the 18" schedule 40 pipe (P1 and P3) from the valve to the pressure breakdown assembly with schedule 100 pipe. This change would eliminate the drain nozzle and would be made for all three loops. For the replacement, all welds will be PWHT and RT inspected. Loop A piping will be instrumented prior to return to power to try to determine the nature of any vibrational forces.

The licensee stated that the manufacturer of the Pressure Breakdown Assembly (Utility Power Corporation) reported that a similar failure had occurred on a plant in Germany. A fix consistent with that used by Grand Gulf (replacement with a heavier wall pipe) was used and the plant has operated since 1979 without a similar incident.

In this area of inspection, no violations or deviations were identified.

6. Nuclear Welding (55050) (Unit 2)

The inspector examined the licensee's program for ASME Code welding as indicated below to determine whether applicable code and regulatory requirements were being met. The applicable code is the ASME Boiler and Pressure Vessel Code, Section III, 1974 Edition including Addenda through the summer of 1974.

a. Welder Performance Qualification

The inspector reviewed the qualification records and status records for the below listed welders relative to the field welds listed in paragraph b. below.

P822
P823

b. Production Welding

The inspector observed the below listed welds at the indicated stage of completion:

<u>ISO</u>	<u>Weld</u>	<u>Size</u>	<u>Status</u>
M-2333B	18	10" x .365"	Welding Cap
M-2333B	7	10" x .365"	Welding Fill Passes

The welding was observed to determine whether:

- Work was conducted in accordance with a document which coordinates and sequences operations, references procedures, establishes hold points, and provides for production and inspection approval.
- Weld identification and location were as specified.
- Procedures, drawings, and other instructions were at the work station and readily available.

- WPS assignment was in accordance with applicable code requirements.
- Welding technique and sequence were specified and adhered to.
- Welding filler materials were the specified type and traceable to certifications.
- Weld joint geometry was in accordance with applicable procedure and was inspected.
- Alignment of parts was as specified.
- Preheat and interpass temperatures were in accordance with procedures.
- Electrodes were used in positions and with electrical characteristics specified.
- Shielding gas was in accordance with the welding procedure.
- Welding equipment was in good condition.
- Interpass cleaning was in accordance with applicable procedures.
- Temporary attachments were removed in accordance with applicable procedures.
- Gas purging, if specified, was in accordance with applicable procedures.
- Process control system had provisions for repairs.
- Welders were qualified.
- No peening performed on root and surface layers.

c. Welding Material Control

Receiving inspection and material certification documentation were reviewed for the following welding materials being used for the welding observed (see paragraph b. above)

- 3/32" E7018
Ht. 411S61181
Lot 2G214201
- 1/8" E7018
Ht. 10334
Lot 25309 AA01

- 1/8" ER70S-2
Ht. 5772
- 1/8" ER70S-2
Ht. 401k151

In this area of inspection, no violations or deviations were identified.

7. Safety-Related Piping - Observation of Work and Work Activities (49063B)
(Unit 2)

The inspector observed the work activities below relative to safety related piping to determine whether work was being conducted in accordance with applicable procedure and code requirements. See paragraph 6 above for the applicable code.

Work activities listed below were observed to determine whether requirements were being met in the following areas, as applicable:

- Conformance with inspection (QC) and work performance procedures
- Conformance with record keeping requirements
- Conformance with construction/installation specifications
- Issuance and use of materials as specified
- Performance of prescribed inspections
- Performance of prescribed NDE activities
- Calibration and use of proper measuring and test equipment
- Utilization of qualified inspection (QC) and NDE personnel

Specific activities observed were:

- Installation activities for pipe spool Q2P45-G817-71-19 on drawing M-2355C
- Machining weld prep and inspection of weld prep on pipe spool Q2E12 - G009-8F-20 at field weld 15 on dwg. M-2348C
- Marking and identification of pipe spools Q2E12-G009-8F-20 and 8H-20 at field weld 15 on dwg M-2348C
- PT of weld prep on pipe spool Q2E12-G009-8H-20 at field weld 15 on dwg M-2348C
- PT of surface defect on pipe spool Q2E12-G009-9G-20 on dwg. M-2348C

- Review of in-process "Large Pipe Installation Cards" for pipe spools Q2E12-G009-8H-20, 8F-20, 9F-20, and 9G-20 on drawing M-2348C
- Review of QC and NDE inspectors' qualification/certification records for the above work
- Review for certification documentation for PT materials used for the above PT inspections

In this area of inspection, no violations or deviations were identified.

8. Safety-Related Structures (Welding) - Observation of Work and Work Activities (55063B)(Unit 2)

The inspector observed welding of safety-related structures as indicated below to determine whether applicable code and procedure requirements were being met. The applicable codes for this welding are the AWS structural welding code D1.1, 1974 Edition and Bechtel Specification C-133.0, revision 17.

- a. In-process welding and completed welding on auxiliary building, E1.185, area 22 structural steel beams D4042 and D4043 on Dwg. FSK-EC-A413 and FSK-EC-A302, Detail 35 were observed and compared with applicable requirements in the areas of:
 - Weld identification/location
 - Joint preparation and alignment
 - Use of applicable weld procedure
 - Welder qualified to perform weld
 - Use of specified filler material
 - Repair procedures
 - NDE performed at proper stage of fabrication
 - Periodic checks of welding variables
- b. The Unit 2 rod room was inspected in the areas of:
 - Storage of materials - identification, segregation and cleanliness
 - Temperature control
 - Issue control
 - Handling of returns

- c. Work areas were observed for the presence of uncontrolled filler material.
- d. The inspector examined the level of QA/QC involvement in the above welding activities.

In this area of inspection, no violations or deviations were identified.

9. Reactor Vessel Installation - Review of Quality Assurance Implementing Procedure (50051b) (Unit 2)

The inspector reviewed procedures relative to the reactor vessel as described below to determine if applicable requirements were being met. The applicable requirements are specified in GE specification 22A4304AA, revision 1, "Installation Instruction, Reactor System."

The procedures listed below were reviewed in the areas of:

- Installation activities covering handling, placement, leveling, final adjustment and data recording
- Personnel requirements for installation
- Record keeping for installation
- Records reflect installed condition
- Inspection procedures to cover installation
- Post-installation activities such as vessel protection and preservation

The following procedures were reviewed to ensure that procedures had been written, approved and issued to control the above activities:

- GE 22A2517, "Site Receiving and Storage of Reactor Vessels" including FDDR No. JB2-058
- Bechtel WP&IR Q2B13-D003-M1, "Unit II RPV Set and Alignment"
- Reliance Truck Co. (RTC) Procedure 206, revision 2, "Procedure for Hoisting the Reactor Vessel from Below the Reactor Gantry Crane to Its Final Position in the Reactor Building"
- RTC 205, revision 0, "Hoist Prelift Checkout and Operational Procedure H-2 Bridge Crane"
- RTC 204, revision 1, "Removing the Reactor Pressure Vessel from Storage and Transporting it to the Reactor Vessel Building"
- RTC 207, revision 1, "Procedure for 924 Ton Load Test of Reactor Gantry Crane at Reactor Building"

- Bechtel "Instorage Maintenance System Bulk Listing"
- Bechtel WP/P-15, revision 4, "Maintenance of Materials and Equipment While in Storage"
- Bechtel WP&IR Q2B13-Y00000-Y01, "Rigging and Installation of Unit 2 RPV"

During review of the above procedures, observations of preservation activities, and review of records, the inspector noted GE FDDR JB2-058 changed procedure GE 22A2517 to require that the vessel interior be preserved by circulating heated dehumidified air in and out of the vessel to maintain the relative humidity below the dew point. The FDDR further required that the relative humidity and temperature be monitored by means of a strip/disc recorder. The Bechtel maintenance procedure required that the strip chart be changed weekly. However, the procedures do not clearly indicate who is to review the data and what it is to be compared with. The licensee agreed to revise Bechtel maintenance procedures to clarify these points. Pending review of the revised procedure, this matter is identified as Inspector Followup Item 417/84-06-01, Clarification of RPV Storage and Maintenance Procedures.

In this area of inspection no violations or deviations were identified.

10. Reactor Vessel Installation - Observation of Work and Work Activities (50053B) (Unit 2)

The inspector observed activities relative to the reactor vessel as described below to determine whether applicable requirements were being met. See paragraph 9 above for the applicable specification.

The reactor vessel installation has essentially been completed. WP&IR Q2B13-D003-M1 which controls installation of the vessel has been completed through step 190. A check of final location remains to be completed. System piping has not yet been welded to the vessel nozzles. See paragraph 11 below for review of installation records.

The inspector visually observed the internal and external of the vessel to ensure that the vessel was being protected and preserved in accordance with applicable requirements.

In this area of inspection, no violations or deviations were identified.

11. Reactor Vessel Installation - Review of Quality Records (50055B) (Unit 2)

The inspector reviewed the quality records indicated below relative to the reactor vessel to determine whether applicable requirements were being met. See paragraph 9 above for the applicable specification.

- a. The licensee considers the installed vessel to be "stored in place". The inspector reviewed the following records relative to storage of the vessel:

- Bechtel "Maintenance Action Cards for the first Quarter of 1984"
- Humidity/Temperature Charts for August 21, 1984 - September 4, 1984

The records were reviewed to determine whether:

- Inspections were made at the required frequency
- Protection requirements were maintained
- Adequate access control was provided
- Required cleanliness was maintained

- b. The following handling and installation records were reviewed:

- Official copy of Bechtel WP&IR Q2B13-G003-M1 signed off through step 190
- Official signed off copies of RTC procedures 204, 205, 206, 207 and 208
- Official signed off copy of Bechtel WP&IR Q2B13-Y00000 - Y01

The records were reviewed in the areas of:

- Accomplishment of QA activities relative to handling, installation and inspection of the reactor vessel during installation
- Work and inspection records confirm that the installation of the reactor vessel was in accordance with work procedures

In this area of inspection, no violations or deviations were identified.

12. I.E. Bulletins (92703) (Units 1 and 2)

(Closed) 416, 417/83-BU-05, ASME Nuclear Code Pumps and Spare Parts Manufactured by the Hayward Tyler Pump Company. The inspector reviewed the licensee's "Document Review Summary Sheet" and other internal correspondence which indicated that no Hayward Tyler pumps or spare parts had been supplied for the Grand Gulf site. Instructions were issued for future procurement to ensure that materials purchased from Hayward Tyler pump for future applications be manufactured after 1981.

(Closed) 416, 417/83-BU-06, Nonconforming Materials Supplied by Tube-Line Corporation Facilities at Long Island City, New York; Houston, Texas, and Carol Stream, Illinois. The inspector reviewed the licensee's internal correspondence and responses to NRC, AECM-83/0731 dated November 15, 1983, and AECM-84/0052 dated January 30, 1984. The licensee's investigation revealed that neither Grand Gulf Unit received ASME code materials from Tube-Line for safety-related applications. Carbon steel fittings were purchased and appropriately marked for non-safety-related applications.

13. Licensee Identified Items (10 CFR 50.55e) (92700) (Unit 2)

(Closed) 417/CDR 82-18, Sample Probe-Recirculation Loop Piping. On April 6, 1982, Mississippi Power and Light Company notified RII of a potential 50.55e item concerning a broken sample probe in the Unit 1 loop A recirculation discharge riser spool. The design for the Unit 2 probe was modified. The inspector reviewed Bechtel WP&IR Q2B33-G-23100-YOA and GE Field Deviation Disposition Request JB2-093 which documented completion of corrective action for Unit 2.