U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-263/84-21(DRS)

Docket No. 50-263 License No. DPR-22

Licensee: Northern States Power Company
414 Nicollet Mall
Minneapolis, MN 55401

Facility Name: Monticello Nuclear Generating Plant

Inspection At: Monticello Site, Monticello, MN

Inspection Conducted: September 17-19, October 29-30, 1984

Inspector(s): K. D. Ward Date 11/15/84

Approved By: D. H. Danielson, Chief
Materials and Processes Section Date 11/15/84

Inspection Summary

Inspection on September 17-19, October 29-30, 1984 (Report No. 50-263/84-32)
Areas Inspected: Announced special safety inspection of recirculation and RHR system piping replacement, 10 CFR Part 21, Inservice Inspection (ISI) activities and Licensee Event Report (LERs). This inspection involved a total of 37 inspector-hours by one NRC inspector including 12 inspector-hours during off-shifts.
Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

Northern States Power Company (NSP)

*G. Crosby, Lead QA Engineer
J. Schanen, Material and Special Processes Specialist
R. Nelson, Level III

Magnaflux Quality Service

P. Durkin, Project Manager

General Electric Company (GE)

R. Price, QC Supervisor

The inspector also contacted and interviewed other licensee and contractor employees.

*Denotes the individual present at the final exit interview on October 30, 1984.

2. Licensee Action on 10 CFR 21 Items

(Open) 10 CFR 21 Report (SS.H-17-84/01): Report of defective components. Corrective action report (CAR) M-27 was issued to Bechtel on July 5, 1984 requesting Bechtel to identify the cause of the defects, address the possibility of occurrence in other pipe materials or sizes and identify actions to be taken to prevent future delivery of defective pipe. Further corrective actions by NSP, if any, will be determined based on the results of Bechtel's evaluation.

The length of time which will be required for corrective action by Bechtel or others in the supply chain is unknown at this time.

3. Inservice Inspection (ISI)

Reference Report No. 50-263/84-06; 50-263/84-13 NSP contracted Lambert, MacGill, Thomas, Inc. (LMT) to perform the ISI in accordance with ASME Section XI, 1977 Edition, Summer 1978 Addenda, and General Electric (GE) to perform the visual examination on the reactor vessel. Westinghouse and NSP jointly performed a visual examination of the internal and external surfaces and the nozzles on the four feedwater spargers.

Ultrasonic examinations (UT) were performed on the following systems:

Jet Pump Instrumentation Nozzle and Canisters

Results: On the "A" loop, weld W-1 on the canister was cracked. Weld W-2 was acceptable and weld W-3 was not ultrasonically examined. Liquid penetrant examinations (PT) were also performed on welds W-1, W-2, and W-3 and were acceptable. On the "B" loop weld JPAD-1 on the jet pump

instrumentation nozzle N8A was acceptable. The "A" and "B" loops were replaced from the nozzle/safe end welds through the canister welds.

Residual Heat Removal, "A" and "B" Loops

Results: On "A" loop weld #RHCF-20 was cracked also weld #RHCJ-21. On "B" loop weld #RHBF-20 and weld #RHBJ-21 were cracked. "A" and "B" loop piping were removed and replaced.

Feedwater Sparger

Results: Sparger #N4C, one crack from center of reactor vessel looking at vessel-nozzle #5 from T-box connection, left side. Sparger #N4D, three cracks from center of reactor vessel looking at vessel nozzles #6, 7, 8 from T-box connection, left side. Sparger #N4B, one crack, counting to the right from the tee nozzle #5. The feedwater spargers were removed for further inspection and the cracked nozzles were removed by GE for analysis. The following nozzles were PT'd, found cracked and removed:

"D" Sparger - 8th nozzle to left of T-box.
"B" Sparger - 5th nozzle to left of T-box.
"C" Sparger - 7th and 10th nozzle to right of T-box.

The above nozzles were shipped to GE San Jose, California for analysis. The conclusions of the analysis was that the most probable cause of the sparger nozzle fracture was high cycle fatigue, with initiation at the geometric discontinuity at the weld root in a region of high weld residual stresses.

General Electric provided four new Monticello spargers. The new spargers were (1) designed to eliminate a weld on each of the top-mounted nozzles, (2) fabricated using 316NG steel for the adapters and elbows and consumable inserts for welding, and (3) solution-heat-treated after final welding of the top-mounted nozzles. The program included design and fabrication of a template to facilitate installation of the new spargers.

No items of noncompliance or deviations were identified.

4. Recirculation System Piping Replacement

Reference Report No. 50-263/84-06; 50-263/84-13.

(Closed) Licensee Event Report (263/81-22-01).
(Closed) Licensee Event Report (263/82-13-01).
(Closed) Licensee Event Report (263/84-11-11).

During the course of routine in-service inspection on September 28, 1982, crack-like indications were identified in the end cap of one of the recirculation system riser manifolds. Subsequent investigation confirmed the existence of four linear indications extending from the weld root into the adjacent heat-affected zone (HAZ), although no through-wall cracking was noted. The NRC was notified and advised that remedial measures were under investigation.

Upon further investigation, indications were found at five additional locations. Three indications were noted in the 12" riser to nozzle safe end welds and two were located in a riser pipe elbow. While preparing the recirculation safe-ends for repair, through-wall cracks were found in each of the three safe-ends. One elbow crack was found by leakage during hydro-static testing. The cracks were determined to be due to intergranular stress corrosion cracking (IGSCC). (Cracks were equally distributed between both recirculation loops.)

As a result of these findings, Northern States Power (NSP) performed repairs (DC 82M087) and then entered into contracts with General Electric Company (GE) and Bechtel Power Corporation (Bechtel) for the replacement of ten inlet safe-ends and transition pieces, ten recirculation riser pipes using bent pipe instead of elbows, semi-circular manifolds using 22" x 12" reducers and 12" elbows on each manifold end, pump suction and discharge piping including a new flow element and suction safe-ends at the reactor vessel.

On July 27, 1984, the Philadelphia Electric Company (PECo) first reported that indications of cracks had been tentatively identified in recirculation riser (12" pipe size) safe ends during penetrant examinations related to their pipe replacement activities at the Peach Bottom 2 plant. On August 14, 1984, PECo confirmed that these cracks were located in the heat affected zone near the weld attaching the thermal sleeve to the inside of the safe end. Indications of cracks were found in 8 of the 10 safe ends, and cracks have been confirmed in 3 safe ends. The safe ends at Monticello were cut out and replaced with ring forgings of ASME SA182 F316L material.

New pipe whip restraints were added on the horizontal run of the 12" ring header. The inspector also observed welding on the new pipe whip restraints. Existing snubbers and hangers were modified as required. New pipe stops were added and the new RHR piping was installed between the recirculation connections and RHR valves 6-1, 6-2 and 9. The 3-3" MO valves and associated piping were installed during this outage, but were administratively controlled by NSP until a license amendment was processed and approved by the NRC.

The NRC inspector visually examined the piping system after their replacement and determined that all applicable Codes and procedures were used to fabricate the system.

The NRC inspector reviewed the following NSP Surveillance of GE #M-1584, M-1582, M-1579, M-1575 and M-1556.

The NRC inspector reviewed radiographic inspection reports and interpreted radiographs of the following welds and found them to be acceptable. The welds were welded by GE and radiographed by Magnaflux Quality Services Level II in accordance with General Electric Radiographic Examination Procedure #GEM-N-004, Revision 1. The radiographs were interpreted by Magnaflux's Level III, GE's Level III, NSP's Level III and the ANI.

Weld Number	System	Weld Number	System
RCA-FR-2	Recirculation	RCB-FR-2	Recirculation
RCA-JR-3	Recirculation	RCB-JR-3	Recirculation
RCA-JR-5	Recirculation	RCB-JR-5	Recirculation
RCA-JR-8	Recirculation	RCB-JR-6	Recirculation
RCA-JR-9	Recirculation	RCB-JR-7	Recirculation
RCA-JR-11	Recirculation	RCB-JR-10	Recirculation
RCA-JR-12	Recirculation	RCB-JR-14	Recirculation
RCA-JR-16	Recirculation	RCB-JR-15	Recirculation
RCA-JR-17	Recirculation	RCB-JR-18	Recirculation
RCA-JR-20	Recirculation	RCB-JR-22	Recirculation
RCA-JR-24	Recirculation	RCB-JR-23	Recirculation
RCA-JR-25	Recirculation	RMB-JR-3	Recirculation
RMA-JR-3	Recirculation	RMB-JR-5	Recirculation
RMA-JR-5	Recirculation	RRA-JR-2	Recirculation
RRA-JR-3	Recirculation	RRF-JR-3	Recirculation
RRA-JR-4	Recirculation	RMA-JR-4	Recirculation
RRB-FR-2	Recirculation	RRG-FR-2	Recirculation
RRB-JR-3	Recirculation	RRG-JR-3	Recirculation
RRB-JR-4	Recirculation	RRG-JR-4	Recirculation
RRC-FR-2	Recirculation	RRH-FR-2	Recirculation
RRC-JR-3	Recirculation	RRH-JR-3	Recirculation
RRC-JR-4	Recirculation	RRH-JR-4	Recirculation
RRD-JR-3	Recirculation	RRJ-FR-2	Recirculation
RRD-JR-4	Recirculation	RRJ-WB-2	Recirculation
RRE-FR-2	Recirculation	RRJ-JR-3	Recirculation
RRE-JR-3	Recirculation	RRJ-JR-4	Recirculation
RRE-JR-4	Recirculation	RRK-FR-2	Recirculation
RRF-FR-2	Recirculation	RRK-JR-4	Recirculation
RHE-J-3	RHR	RHE-JR-28	RHR
RHE-J-4	RHR	RHE-J-28	RHR
RHE-J-5	RHR	RHE-J-32	RHR
RHE-J5-5	RHR	RHE-JR-32	RHR
RHE-J-8	RHR	RHE-J-33	RHR
RHE-J-9	RHR	RHE-J-34	RHR
RHE-J-10	RHR	RHE-J-35	RHR
RHE-JR-10A	RHR	RHA-FR-4	RHR
RHE-J-12	RHR	RHA-JR-1	RHR
RHE-J-21	RHR	RHA-JR-9	RHR
RHE-J-22	RHR	RHA-JR-11	RHR
RHE-J-24	RHR	RHA-JR-11	RHR
RHE-JR-25	RHR	RHA-JR-12	RHR
RHE-J-25	RHR	RHA-JR-14	RHR
RHE-J-26	RHR	RHE-FR-6	RHR
RHB-FR-23	RHR	RHC-FR-6	RHR
RHB-FR-24	RHR	RHC-FR-23	RHR
RHB-JR-1	RHR	RHC-JR-1	RHR
RHB-JR-7	RHR	RHC-JR-7	RHR
RHB-JR-10	RHR	RHC-JR-10	RHR
RHB-JR-12	RHR	RHC-JR-12	RHR
RHB-JR-13	RHR	RHC-JR-13	RHR
RHB-JR-14A	RHR	RHC-JR-16	RHR
RHB-JR-16	RHR	RHC-JR-17	RHR

RHB-JR-17	RHR	RHC-JR-18	RHR
RHB-JR-18	RHR	RHC-JR-19	RHR
RHB-JR-19	RHR	RHC-JR-21	RHR
RHB-JR-21	RHR	RHC-FR-24	RHR

After the weld joints were tack welded, remotely controlled and operated automatic welding equipment was used to improve weld consistency and minimize welder radiation exposures. All field welds were completed and each weld was stress relieved using the Induction Heating Stress Improvement (IHSI) method.

Consistent with the requirements of ASME Section XI, installation was performed in accordance with the requirements of ASME Section III, Article NB-4000, as specified in installation specifications developed by GE and Bechtel.

Nisko Iwai American Corporation (NIAC) performed the IHSI and the inspector reviewed the following procedures:

- NIAC, IHSI Plan, #061K204
- NIAC, List of Essential Variables, #061K207
- NIAC, General Arrangement of IHSI Equipment #061K214
- NIAC, Test Procedure for IHSI Systems #061K232
- NIAC, IHSI Procedures, #061K239
- NIAC, Personnel Qualifications #061K247

Preservice examination of 100% of the pressure retaining welds were performed in accordance with Section XI, IWB 2000, 1977 Edision through Summer 1978 Addenda upon completion of Section III work but prior to system hydro as provided by IWB 2200. This was peformed prior to and after IHSI of all field welds including safe end weld to reactor vessel nozzles.

Replacements performed in accordance with ASME Section XI, Article IWA-7000 was subjected to a System Hydrostatic Test in accordance with article IWB-5000.

The hydrotest of the system will be performed in accordance with ASME Section XI and observed by the NRC resident inspector.

No items of noncompliance or deviations were identified.

5. Exit Interview

The inspector met with Mr. G. Crosby (denoted in Persons Contacted Paragraph 1) at the conclusion of the inspection. The inspector summarized the scope and findings of the inspections noted in this report.