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Docket Nos. 50-277
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Subject: Peach Bottom Atomic Power Station Unit 2 & 3
Response to Notice of Violation (Combined Inspection
Report No. 50-277/93-25 & 50-278/93-25)

Dear Sir:

In response to your letter dated January 19, 1994, which transmitted the Notice of Violation concerning the referenced inspection report, we submit the attached response. The subject inspection concerns a routine residents' safety inspection that was conducted October 31, through December 25, 1993.

If you have any questions or desire additional information, please do not hesitate to contact us.

Sincerely,

GDE/RKS:bah
Attachment

cc: T. T. Martin, Administrator Region I, USNRC
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CCN 94-14024

Response to Notice of Violation

Restatement of Violation

10CFR Part 50, Appendix B, Criterion III, states, in part, that procedures and instructions be established to maintain design controls during maintenance activities on safety related equipment.

Contrary to the above, in September and October 1993, procedures and instructions were not established to maintain design controls during maintenance activities on the 3A low pressure coolant injection (LPCI) outboard injection valve. Specifically, the maintenance activities resulted in interference between the valve wedge and stationary in-body components, during closing operations. This caused the valve stem to bend and caused the valve to fail to operate properly.

This is a Severity Level IV Violation (Supplement I).

Background

In 1980, maintenance was performed on the Unit 3 Low Pressure Coolant Injection motor operated valve MO-3-10-025A. The SMB-4T actuator was damaged and was replaced with a SMB-4 actuator. The 63 spline stem nut was removed from the SMB-4T actuator and was reinstalled in the SMB-4 actuator. The valve was also disassembled and work was performed on the wedge to increase clearance between the in-body guide and the inner reactor side of the wedge. Afterwards, the valve was reassembled and was stroked satisfactorily. At the time of these activities, there was not a formalized system to capture maintenance data for future reference.

In 1987, the MO-3-10-025A SMB-4 actuator was removed, rebuilt and reinstalled. The original 63 spline stem nut from the previous SMB-4T actuator was also reinstalled. After the rebuild, the valve successfully stroked and satisfactorily passed surveillance testing.

During the Unit 3 refuel outage in the fall of 1993, in body valve work was performed on the MO-3-10-025A as the result of a failed local leak rate test (LLRT). The original stem's as found run out of .019 inches was approaching the maximum acceptance criterion of .020 inches and was replaced with a new stem. The original 63 spline stem nut was again reinstalled. In addition to the stem replacement, a hole was drilled in the wedge for bonnet pressure relief and the wedge was rotated 180 degrees to put the better side of the wedge toward internal valve work. A valve operation testing and evaluation system (VOTES) test was performed September 27, 1993 as the post maintenance test.

During the VOTES test, high cyclic loading was observed at the drive sleeve and there was evidence of stem nut thread damage. The stem nut was removed and exhibited minor damage to the thread start region in the lower portion of the nut. A 64 spline stem nut was bored and threaded based on measurements from the original 63 spline stem nut as a replacement. It was not known during the replacement that the original stem nut was an incorrect size 63 spline stem nut. The 64 spline stem nut was appropriate for the SMB-4 actuator. Following ins.allation of the replacement stem nut, a post maintenance VOTES test was performed. The opening stroke time established during the test was approximately 15 seconds. The test crew believed that they had manually contacted the backseat while setting the open limit switch. It was later identified that what was thought to be the backseat was the bend of the stem.

On October 5, 1993, the MO-3-10-025A failed a surveillance test that consisted of stroking the valve open and closed under static conditions. The valve stroked open but failed to stroke fully closed. Diagnostic evaluation indicated that stem to stem nut interface was degraded. After the stem nut was removed, it was identified that considerable damage had occurred to the bottom threads of the stem nut. It was now evident that when the valve was thought to have backseated that the stem had actually run out of threads and had bound itself into the stem nut. Pieces of the damaged stem nut became entrained in the stem nut and caused the binding that resulted in the failed surveillance test.

The damage to the newly installed stem nut led to a closer examination of the original stem nut replaced on September 28, 1993. This examination revealed that the previously replaced 63 spline stem nut was from the original SMB-4T actuator and had been inappropriately retained for use in the SMB-4 actuator in 1980. It was believed that this mismatch resulted in the stem nut not to be centered in the drive sleeve and caused the stem to wobble on September 27, 1993. In addition, test personnel realized the replacement 64 spline stem nut had been counterbored to match the original 63 spline stem nut and was counterbored to the same depth as the original stem nut. The stem nut for the SMB-4 actuator, however, resides approximately 1.5 inches lower than the corresponding SMB-4T actuator stem nut. The removed 64 spline stem nut was reworked and then reinstalled in the valve with an additional counterbore cut into the bottom. The stem nut was removed from the operator several times during valve testing to be inspected and cleaned. The stem was repeatedly cleaned and lubricated along with the stem nut until consistent and smooth operation of the valve was achieved. Stroke time was established to be approximately 22 seconds. VOTES testing was satisfactorily completed October 10, 1993.

On November 25, 1993, the valve failed the same surveillance test it had on October 6. Unit 3 was in operation and a seven day limiting condition of operation (LCO ) was entered. The stem nut was removed and appeared to be in the same condition as when it had been reinstalled in October. Based on previous experience however, stem and stem nut interference was suspected. When the stem nut was removed to be cleaned, several bronze chips were found. It was believed that the failure to adequately clean the stem nut was the primary cause of the November ST failure. The stem and the stem nut were completely cleaned and lubricated and the stem nut was reinstalled. The valve was cycled fully open and closed approximately 10 times, operating very smoothly with only a slight increase in load near the full open position.

On November 29, 1993, VOTES testing was initiated. Nothing unusual was noted during stroking evolutions and VOTES sensor calibrations. During the next testing evolution however, high running loads were experienced almost immediately and the valve torqued out in approximately 15 seconds from the full close position. Testing was halted and the stem and stem nut were reinspected. There was no obvious evidence to indicate why valve performance had changed so dramatically. Although there were no known problems with the actuator, the Limitorque housing was disassembled and the drive sleeve was removed and inspected to ensure that the experienced problems were not the result of operator damage. No problems were identified with the Limitorque actuator.

On December 1, 1993, additional inspections of the stem were performed by Component Engineering, Corporate Engineering, personnel from Limerick Generating Station and a contracted design specialist. The recommendation from this group was to replace the stem. Plans were established to shutdown Unit 3 to allow the in-body repair of MO-3-10-025A. Unit 3 was shutdown the next day and on December 3, 1993, the valve was disassembled. Inspection revealed that the stem was bent at the "T" head connection which engages a slot in the wedge to provide a connection to the stem. Gouges on the stem and valve bonnet were also identified where the two had contacted. A replacement stem, stem nut and bonnet were prepared for installation. During seating checks of the wedge, with the stem installed, a roll of the wedge was noted. Additionally, the "T" head was tight in the wedge connect slot. Reassembly was halted, and the following day this was discussed with component engineering personnel. The main focus of the Engineering efforts concentrated on opening the "T" head clearance. The roll of the wedge was not made known to the Component Engineering personnel. Upon completing modifications to the "T" head of the stem and the top of the wedge, valve reassembly continued.

On December 5, 1993, the valve was completely reassembled and VOTES testing was initiated. An attempt was made to stroke the valve fully open and closed. The valve failed on both these attempts, tripping on torque. Valve disassembly was reinitiated and completed on December 7, 1993. The stem/wedge/bonnet were all removed as a single unit due to the damage previously experienced. The stem was found to be badly galled in the bonnet. From December 8 through December 10, valve seat and wedge maintenance was performed and stem repair efforts continued offsite. The wedge was reworked to include a 45 degree bevel on the outer edge to increase clearance between the valve body on the pump side. The wedge was also returned to the original orientation found prior to the September 27 reversal and a hole was drilled in the reactor side of the wedge to prevent pressure locking. The Limitorque operator was also rebuilt. An additional taper cut was made on the "T" head of the stem to allow more freedom of movement within the wedge.

On December 13, 1993, additional inspections of alignment and stem/stem nut interface were performed and the valve was reassembled. The as left VOTES test, as left LLRT and pressure boundary test were performed satisfactorily and the valve was returned to an operable status.

Reason for the Violation

Reversing the original configuration of the wedge was a primary contributor to the failure of the valve stem. Normally, reversing the wedge configuration would have no effect on the operation or seating characteristics of the valve. In this case however, maintenance activities performed on the valve in 1980 changed the wedge configuration. A formalized system to capture historical data from valve maintenance activities was not in existence at that time. Since a historical file was not in place, work performed on the valve wedge in 1980 was not known prior to the wedge reversal that occurred in September, 1993. If a review of the historical data could have been performed, maintenance activities would not have included reversing the wedge.

The mismatched stem nuts contributed to a delay in identifying the in-body interference problem. Degradation found in the stem to stem nut threaded region seemed to substantiate the early test failure prognosis. This was compounded when the 63 spline stem nut was identified as the incorrect stem nut and it was realized that the 64 spline stem nut had been counterbored to match it. It was only after inspection of the in-body valve components was it realized that the stem to stem nut interference was not the primary cause of the failure.

M-510-604, " Walworth Mark 10 and 14 Pressure Seal Gate Valve Maintenance", provided controls for the disassembly, inspection and repair of the MO-3-10-025A valve. The procedure required an inspection of valve internal parts for wear and degradation, but did not require detailed measurements of valve components during valve disassembly or rework activities to be obtained. Dimensional checks of the wedge and stem therefore, were not performed. This resulted in the difference in thickness along the lower end of the wedge of the non-seat side of the valve not being identified.

Maintenance procedures and maintenance valve technician training processes adequately instruct technicians on the proper sequence in which a valve and actuator are to be reassembled after work activities. The procedures and training, however, did not provide detailed instructions on how to ensure that a valve stem wedge assembly is properly aligned in the complete valve/actuator mechanism during the reassembly process. In addition, current valve actuator procedures did not provide adequate direction in the areas of stem nut design, fabrication, and installation.

The normal stroke time for the MO-3-10-025A is approximately 22 seconds. During diagnostic tests performed on the valve however, the valve open stroke time was measured to be approximately 15 seconds. This change in stroke time should have been evaluated and used as an indication that the valve had been set up for a short stroke condition. A less than adequate questioning attitude prevented an earlier determination that the stem had been bent. Prior to the diagnostic testing being performed, test personnel engaged the limit switch gearing without ensuring exactly where the open limit had been previously engaged. The valve was stroked open, the limit switch contacts opened and the valve coasted until the stem thread transition area contacted the stem nut, damaging the stem and the stem nut.

Corrective Steps That Have Been Taken and the Results Achieved

The MO-3-10-025A was returned to an operable status on December 13, 1993, following stem and wedge repairs and successful diagnostic testing. Installed diagnostic test equipment has shown no indication of any further anomalies and the valve has successfully passed surveillance testing.

A review was conducted to evaluate the replacement of SMB-4T size Limitorque actuators with SMB-4 size actuators. Diagnostic test data taken following the replacement activity have been reviewed by Component Engineering. Anomalies similar to those identified during testing of the MO-3-10-025A have not been observed.

Corrective Steps That Will Be Taken to Avoid Further Violations

Appropriate valve maintenance procedures and guidelines will be revised to obtain detailed in body measurements during valve disassembly. This will apply to valves being disassembled as a repeat maintenance task, as a result of a LLRT failure on a valve with a history of repetitive failures, or as identified by the performance enhancement program. These procedures will be revised by August 31, 1994.

Maintenance actuator procedures will be revised by July 15, 1994, to include direction that ensures actuator stem nuts are properly selected and fabricated. Training will also be conducted for personnel on proper stem nut inspection techniques, maintenance, selection and installation. In addition, training will be conducted on the proper methods for ensuring alignment of the complete valve assembly during reassembly activities for personnel who perform valve in body maintenance. These training sessions will be initiated by August 1, 1994.

Training for maintenance planners will be provided to require that previous valve maintenance is reviewed with greater detail and that important history information available is included in the planning package. This will be completed by August 2, 1994.

Maintenance procedure M-511.130, "Diagnostic Testing of Motor Operated Valves using the VOTES Method" will be revised by July 1, 1994, to address the use of stroke times and lengths as acceptance criteria and identification of actuator anomalies. In addition, enhanced training will be conducted for qualified VOTES technicians and appropriate maintenance technical staff on the methods and cautions involved in the setting of limit switches, review and identification of anomalies during diagnostic testing and the use of stroke time and length as diagnostic test acceptance criteria. This training will be completed by August 1, 1994.

Date When Full Compliance Will Be Achieved

Full compliance will be achieved August 31, 1994, when procedure enhancements are completed that assure design requirements are maintained during performance of in body valve maintenance.