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Donald C. Cook Nuclear Plant Unit 2
Docket No. 50-316
License No. DPR-74
NRC INSPECTION REPORT NO. 50-316/90008 (DRP);
RESPONSE TO NOTICE OF VIOLATION

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Attn: A. B. Davis

April 9, 1990

Dear Mr. Davis:

This letter is in response to Mr. E. D. Greenman's letter dated March 9, 1990, which forwarded a summary of the Enforcement Conference conducted on February 27, 1990, at the Region III offices. The Notice of Violation attached to Mr. Greenman's letter identified one Severity Level IV violation associated with main steam isolation valve (MSIV) stroke time testing at the Cook Nuclear Plant Unit 2. This violation resulted from a special safety inspection conducted at Cook Nuclear Plant from January 8 through February 2, 1990, by members of your staff. Our response to the Notice of Violation is provided in the attachment to this letter.

Mr. Greenman's letter also expressed concern with our test practices associated with applying the retest provisions of the ASME Code during MSIV stroke time testing. This concern is addressed in the discussion of preventive actions we are taking in response to the cited violation (see attachment item 2). In addition, concern was raised with regard to our root cause investigation conducted following MSIV stroke time testing failures observed in June 1989. This issue is addressed in the "Response to Violation" section of the attachment to this letter.

This document has been prepared following Corporate procedures that incorporate a reasonable set of controls to ensure its accuracy and completeness prior to signature by the undersigned.

Sincerely,

M. P. Alexich
Vice President

ldp
Attachment

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cc: D. H. Williams, Jr.
A. A. Blind - Bridgman
R. C. Callen
G. Charnoff
NRC Resident Inspector - Bridgman
NFEM Section Chief

ATTACHMENT TO AEP:NRC:1125B

RESPONSE TO VIOLATION

NRC Violation

"Unit 2 Technical Specification 3.7.1.5 requires that each steam generator stop valve shall be OPERABLE in MODES 1, 2 and 3. A test verification of full valve closure within 5 seconds is specified to demonstrate a stop valve OPERABLE. With a stop valve inoperable, the unit must be reduced to at least MODE 2 within 6 hours, and the stop valve maintained closed thereafter, or the unit must be in HOT SHUTDOWN within an additional 12 hours.

Contrary to the above, Unit 2 was continuously operated in MODEs 1, 2, and 3 from June 20, 1989 through August 15, 1989, and again from August 17, 1989 through January 8, 1990, with Stop Valve 2-MRV-210 inoperable because it was not capable of full closure within 5 seconds.

This is a Severity Level IV violation (Supplement I)."

Response to Violation

The main steam isolation valves (MSIVs) used at the Cook Nuclear Plant are parallel slide stop valves (see Figure 1). Main steam pressure equilibrium across the operating piston maintains a normally open position at power. During testing, the MSIV safety function is simulated by venting steam from the top of the piston through an open dump valve to close the MSIV. The steam venting creates a large pressure differential across the piston that forces disc travel into the main steam flow path, thus blocking main steam flow.

On the evening of January 8, 1990, with Unit 2 in Mode 3 (hot standby), surveillance testing was conducted on the main steam isolation valves (MSIVs). Two MSIVs exhibited closing times in excess of the Technical Specification (T/S) limit of five seconds. Following these failures, each MSIV was declared inoperable and immediately retested. In both cases the retest demonstrated that the valves closed within the T/S time limit and the MSIVs were declared operable.

During additional testing conducted on January 9, 1990, a substantial amount of water was observed to flash from the dump valve vent stacks upon venting steam from the top of the MSIV cylinder to stroke the MSIV closed. Once again, MSIV closure times exceeded the T/S limit. The January 9 testing demonstrated that sufficient condensation could accumulate on the vent side of the piston within a 24-hour period to render the MSIV inoperable. In view of the fact that a similar situation to that discussed above occurred in June 1989, it was believed that this condition existed during power operation since that time.

The June 1989 event occurred during MSIV closure time testing in Unit 2. All four Unit 2 valves were tested, with one closure time in excess of the five second Technical Specification (T/S) requirement (2-MRV-210), and another closure time in excess of ASME Section XI (2-MRV-230). Upon retest, the valves functioned satisfactorily. Prior to these tests, Unit 2 had experienced only one T/S failure (June 24, 1983) in 105 tests over a period of 11 years and no adverse trend in Section XI valve stroke times. Therefore, no adverse trend in equipment performance or mechanical degradation had been established at the time of the June 1989 occurrence.

The results of the June 1989 tests were documented in Problem Report 89-887, and the root cause of stroke time test failure was attributed to accumulation of condensation creating a water slug that impeded steam dump flow resulting in a slower stop valve stroke time. It was recognized that numerous factors could be contributing to the amount and rate of condensation buildup. These factors include heat loss due to conduction and convection, insufficient insulation, drain tube blockage, equalizing orifice blockage, ambient temperature, steam temperature and pressure, dump valve condition, and test circumstances (e.g., increasing or decreasing power). Based on the lack of an adverse trend in valve performance at the time of the June 1989 testing and the recent opening of the secondary side for Unit 2 steam generator replacement and 2-MMO-210 replacement (3-way isolation valve shown in Figure 1), it was suspected that drain tube/equalizing line blockage by foreign material was the primary contributing factor for condensate buildup.

Based on Nuclear Engineering Department review of Problem Report 89-887, Job Order B000077 was initiated for MSIV internal inspection, and preparations were made to implement drain tube modifications and contact a manufacturer's representative to assist in disassembly and inspection.

In conclusion, root cause analysis of the June 11, 1989, test failure was effective in identifying water condensation as the source of slow closure times, and actions were underway to determine the relative effect of the numerous contributing factors on the amount and rate of condensation buildup.

Subsequent to the January 9, 1990 testing, Unit 2 was held in Mode 3 to further evaluate the cause of the observed condensate buildup and resulting MSIV closing time failures. An investigation of the source of the observed condensate accumulation identified three contributing factors.

First, the insulation on the MSIVs, vent piping and associated valves was less than current design specifications. The insufficient insulation resulted in increased condensation rates in the MSIVs. Secondly, the quantity of condensate that can collect is related to the mass of saturated steam permitted to enter the upper equalizing steam volume. Dump valve seat leakage allows steam to escape from this volume. The escaping steam is replaced by additional saturated steam which increases the differential pressure across the piston and prevents drainage. The combined effects of the foregoing factors results in increased condensation rates which leads to development of a greater pressure differential across the operating piston than that assumed in the original design of the MSIVs for normal operation. The MSIV actuator design is therefore a contributor to the observed condition. The rate at which condensate can flow from the upper equalizing volume through the drain tube is limited by the diameter of the drain tube port holes. Condensate will accumulate in the upper equalizing volume if the drain tube port holes are too small to drain the condensate faster than it forms. In addition, if the MSIV steam nipple diameter is too small, a differential pressure will exist across the piston further restricting condensate drainage.

1. Corrective Actions Taken and Results Achieved

A cooldown to bring Unit 2 to Mode 5 (cold shutdown) was initiated on January 11, 1990. Upon reaching Mode 5, all four MSIVs were disassembled and a visual examination of each valve was performed. The examinations showed that the MSIV drain tubes had not experienced any physical degradation that could have restricted condensate drainage. Based on the visual examinations, the results of the investigation discussed above and a technical evaluation of all other available sources of information on the observed condition, several actions were initiated to correct the problem of unacceptable accumulation of condensate in the MSIV upper volume. The diameter of the drain tube port holes on all Unit 2 MSIVs was increased from 0.125 inch to 0.197 inch in order to improve condensate flow through the operating piston. The diameter of the equalizing steam nipple was also increased, from 0.125 inch to 0.394 inch. The increase in steam nipple size provides a less restrictive path for steam to pass through the piston to maintain equilibrium and prevents steam from passing through the drain tube thus inhibiting drainage. In addition to these physical modifications to the MSIVs, the insulation on the MSIVs, vent piping and associated valves was increased in order to reduce

the temperature differential in these areas and hence inhibit the formation of condensate. Acoustic monitoring of the dump valves was also initiated in order to quickly identify unacceptable dump valve leakage.

After completing all modifications and reassembling the MSIVs, Special Procedure 2-THP.SP.MM-079 was used to verify operability. This procedure included a series of test cycles for all MSIVs at different intervals with the appropriate instrumentation required to measure and record all applicable performance variables, specifically the rate of pressure drop in the vent line. The acceptance criteria used within 2-THP.SP.MM-079 was twofold. First, the full closure stroke time must be within five seconds in accordance with T/S 3.7.1.5. Second, the rate of pressure drop in the vent line must not change as the test interval is extended to 24 hours. This second criteria was used to verify no additional condensate had accumulated within the upper steam volume that could lengthen stroke time and delay stem travel upon flashing to steam during the venting process (i.e., to confirm that the observed problem had been corrected).

All stroke tests performed in accordance with 2-THP.SP.MM-079, except the first test on 2-MRV-210, provided acceptable results and verified the generic condensate issue had been resolved. The initial test performed on 2-MRV-210 failed. The corresponding rate of pressure drop in the vent line verified significant quantities of condensate still present. Investigation revealed that Train B Dump Valve 2-MRV-212 was not seating properly permitting a significant amount of steam to be exhausted out the vent stack. Under these circumstances, additional steam was brought into the upper volume with condensate collecting at a rate faster than could be drained. 2-MRV-212 was repaired and subsequent closure tests completed on 2-MRV-210 verified that this condition had been resolved. All MSIVs were returned to an operable status on January 24, 1990, and Unit 2 returned to power operation.

An evaluation of the historical data for Unit 1 MSIV closure time tests was also performed. This evaluation showed that, with one exception, closure time tests performed on each of the Unit 1 MSIVs since 1987 were successful (i.e., confirmed compliance with the T/S limit) on the first attempt, with no retest

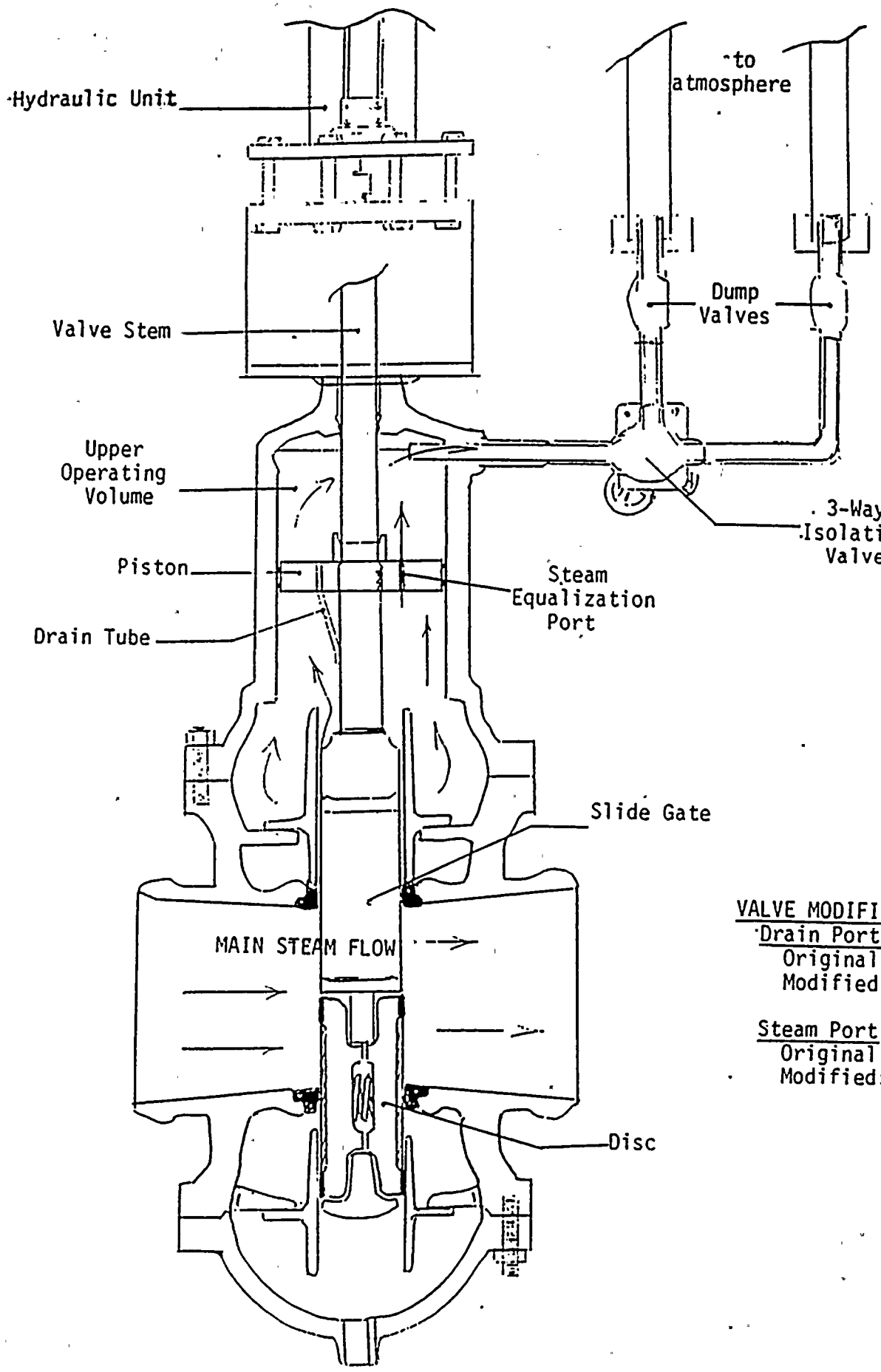
required to demonstrate T/S compliance. The noted exception occurred in the test performed on 1-MRV-240 on September 24, 1987. The initial test yielded a closing time of 5.4 seconds. Upon retest, the closing time was 2.5 seconds. All Unit 1 MSIVs were within the T/S required closure time without retest when tested on March 17, 1990, during the ice condenser surveillance outage. The evaluation therefore concluded that all Unit 1 MSIVs were operable and fully supportive of continued unit operation. As an added measure however, increased insulation has been installed on the Unit 1 MSIVs, vent lines and associated valves (as was done for Unit 2) and dump valve acoustic monitoring has been initiated (again, as was initiated for Unit 2). The necessity of physical modifications to the Unit 1 MSIVs of the type performed in Unit 2 and schedule for performance of any needed modifications are being evaluated at present.

2. Corrective Action Taken to Avoid Further Violation

The procedure for the steam generator stop valve operability test (12-OHP 4030.STP.019F) has been revised. Revision 1, change sheet No. 2 to the procedure requires that an MSIV be declared inoperable immediately upon failing the stroke time test. No retest is allowed until the Cook Nuclear Plant Technical Engineering Department has fully evaluated the cause of the failure, determined required corrective action and the corrective actions have been implemented. Similarly, the procedure governing inservice inspection (ISI) valve data recording and corrective action for power operated valves (12-THP 5070.ISI.014) is being revised to prohibit retest after initial MSIV stroke time testing failure until after the ISI Section has evaluated the cause of test failure and required corrective actions have been implemented. In addition, if the acoustic monitoring discussed in 1. above indicates unacceptable dump valve leakage, immediate action will be initiated for dump valve repair. This will reduce the potential of prolonged dump valve leakage becoming a contributor to condensate accumulation in the MSIVs.

3. Date When Full Compliance Will Be Achieved

Full compliance was achieved on January 24, 1990, when all Unit 2 MSIVs were restored to within T/S operability requirements.



VALVE MODIFICATIONS

Drain Port
Original: 0.125"
Modified: 0.197" (5mm)

Steam Port
Original: 0.125"
Modified: 0.394" (10mm)

FIGURE 1: MAIN STEAM ISOLATION VALVE

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