Nebraska Public Power District

GENERAL OFFICE
P. O. BOX 499, COLUMBUS, NEBRASKA 68601
TELEPHONE (402) 564-8561

June 7, 1981

Director, Nuclear Reactor Regulation
Attention: Mr. Thomas A. Ippolito, Chief
Operating Reactors Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C 20555

Dear Mr. Ippolito:

Subject: Containment Purge and Venting System
Cooper Nuclear Station
NRC Docket No. 50-298, DPR-46

Reference: 1) Letter from J. M. Pilant to T. A. Ippolito dated February 8, 1980, same subject.

2) Letter from J. M. Pilant to T. A. Ippolito dated December 18, 1979, same subject.

Your letter of March 3, 1981, requested additional information relating to the staff's long-term operability review of the subject system. Enclosed is the District's response.

Should you have any questions or require additional information, please contact me.

Sincerely,

Jay M. Pilant
Director of Licensing
& Quality Assurance

JMP/jw:rs10/6
Enclosure

A034
S
1/1

P

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
COOPER NUCLEAR STATION
CONTAINMENT PURGING DURING NORMAL PLANT OPERATION
MECHANICAL OPERABILITY DEMONSTRATION

1. AIR OPERATED VALVES 237AV, 238AV, 245AV, AND 246A

1.1 a. Was the Allis Chalmer's (AC) test report A-C, VER-0209 used as the basis for predicting valve loading results from the DBA-LOCA postulated?

b. What test numbers in the AC report apply to these valves?

c. Was the peak containment pressure resulting from the DBA-LOCA used for the "Initial Upstream Pressure" (as used in the AC report)? If not, provide the rationale used to allow use of a lower "Initial Upstream Pressure." Discuss instrument lag times used, actual valve closure times or Tech. Spec. allowable times as they apply.

Response to 1.1

a) A-C Test Report VER-0209 was used as the basis for predicting the loads on the valves in question.

b) Torque values for valves 245 AV and 246 AV were interpolated from Test No. 32. Torque values for valves 237 AV and 238 AV were interpolated from Test No. 29.

c) The initial upstream pressure values in the A-C Report were the primary containment response pressures for a LOCA using the model presented in the General Electric Pressure Suppression Containment Analytical Model (NEDO 10320 and NEDO 10329). This model is discussed in FSAR Amendment 11, response to question 14.6. The initial valve open upstream pressure (P_1) for the drywell valves was 33 psi and the maximum (valve closed) pressure was 55.5 psi. The corresponding pressures for wetwell valves was 5 psi and 18.5 psi. A nominal lag time of one second was used because per the FSAR LOCA analysis, reactor scram on high drywell pressure and, therefore, containment isolation occurs in less than one second. Technical Specifications limit the valve closure time to less than 15 seconds. The actual valve closing times are on the order of 5 seconds.

1.2 What were identified as the critical parts in these valves (shaft, disc to shaft pins, other)? What were the stresses calculated? Do they include simultaneous seismic loading? What are the design allowable stresses? What code or standards are the valves designed to?

Response to 1.2

The pin connection between the valve shafts and the disc is considered the critical part of the operating mechanism. The valves are designed to Code C504 of the American Water Works Association (AWWA). The valves in question have Class 75B shafts and pin connections, which will transmit

2,200 ft-lb of torque. The shaft has a safety factor of 2:1; the pin connection, a safety factor of 1.5:1. The stress calculations do not include considerations for seismic activity.

1.3 Do the operators have maximum torque rating(s) as established by the manufacturer? How does it compare to the maximum torque developed during the accident postulated? Does combined loading of spring and dynamic torque affect any parts of the operator to the extent that they become the limiting factor?

Response to 1.3

The operator manufacturer (Bettis) specifies a maximum air pressure input to the air cylinder. Maximum torques can be calculated from this air pressure, if desired. The postulated accident is concerned with spring return torques, however. These torques have been plotted, and there is no condition in which the operator is the limiting factor.

1.4 Is there sufficient torque margin available from the operator to overcome the torques developed that tend to oppose valve closure as the valve strokes from its initial open position to the fully seated position. What is the minimum margin available and at what disc angle does this minimum exist?

Response to 1.4

There is sufficient torque margin available in the operator to enable it to perform its desired function. Minimum excess torque and the angle at which the minimum occurs are as follows.

Valve	Valve Angle	Minimum Excess Margin (Torque, Ft-Lb)	Excess Torque Torque %
237 AV	10°	895	175.0
238 AV	30°	2,530	320.0
245 AV	20°	1,067	535.0
246 AV	30°	2,811	550.0

1.5 For those valve assemblies (with air operators) inside containment, has the containment pressure rise (backpressure) been considered as to its affect on torque margins available (to close and seat the valve) from the actuator? During the closure period, air must be vented from the actuator's opening side through the solenoid valve into this backpressure. Discuss the installed actuator bleed configuration and provide basis for not considering this backpressure affect a problem on torque margin. Valve assembly using 4 way solenoid valve should especially be reviewed.

Response to 1.5

The valve assemblies in question are located outside of the drywell.

1.6 Describe the extent to which the valve assembly (valve and operator) is seismically qualified?

Response to 1.6

The air-operated valve assemblies with Bettis W/744A-ISR Operators were seismically qualified by analysis to 1.5 g's horizontal and 1.21 g's vertical using Allis-Chalmers Stress and Seismic Calculation VER-0093. The original drywell valve operators were replaced with Bettis operators No. T420B-SR1. The District is presently reviewing the seismic calculations to ensure conformance with the original calculations. This review will be completed by July 15, 1981.

1.7 Describe the extent to which the pilot solenoid valves are seismically qualified and environmentally qualified for long-term exposure to the normal plant environment. If the purge valves are to be operative post-LOCA describe the extent to which the solenoid valves are environmentally qualified for the LOCA environment. Do the elastomeric parts, solenoids, etc., have a qualified design life where periodic replacement of parts is required?

Response to 1.7

ASCO has informed the District that the solenoid pilot valves are individually qualified generically by ASCO at least to 10 g's. The partial or complete loss of the solenoid valve on the air-operated valve will not affect the closing ability of the air-operated valve or any other safety system. The solenoid valve is environmentally qualified to the LOCA environment outside containment.

1.8 Describe the extent to which the operators are seismically qualified and environmentally qualified for long-term exposure to the normal plant environment? If the purge valves are to be operative post-LOCA, describe the extent to which the operators are environmentally qualified for the LOCA environment. Do the elastomeric parts in the operator have a qualified design life where periodic replacement is required?

Response to 1.8

The operators are included in the seismic calculations for the valves. The environmental qualification of the operator has not been determined; however, the nonmetallic materials in the operator do not affect the ability of the operator to close the valve thus performing the safety function. Once the operator closes the valve, the valve will remain closed for the duration of the accident.

1.9 Do the elastomeric parts in the valve body have a qualified design life? Are they required to be replaced periodically?

Response to 1.9

The manufacturer's Engineering Department states that the elastomeric parts in the subject valve body do have a design life of five years. This could vary depending on the actual service temperature, pressure, and the number of operation cycles. At CNS the actual service temperature, pressure, and operating cycles are well within the design specification. Therefore, the five year design life criteria is considered extremely conservative at CNS.

The subject valves are tested for seat leakage each refueling outage and repaired as required. These valves have been included in the station PM program with a recommended refurbishment cycle of seven years.

1.10 Have the manufacturer's recommended preventive maintenance instructions (lubrication, etc.) been reviewed for the valve, operator and solenoids, and are they being followed?

Response to 1.10

The manufacturer's recommended preventive maintenance instructions have been reviewed and it is noted that the subject valves are self lubricating.

CNS has installed in-line oilers on the air supply line to insure adequate air operator cylinder lubrication. In addition, the solenoid valves which control the air operator are included in the station preventive maintenance program.

1.11 Where air operated valve assemblies use accumulators as the fail-safe feature, describe the accumulator air system configuration and its operation. Provide necessary information to show the adequacy of the accumulator to stroke the valve, i.e., sizing, and operation starting from lower limits of initial air pressure charge.

Discuss active electrical components in the accumulator system, and the basis used to determine their qualification for the environmental conditions experienced.

Response to 1.11

The subject air operated valve assemblies installed at CNS do not utilize air accumulators as a fail-safe feature since all electrical components fail in the deenergized position.

1.12 Provide an assessment of the structural capability of any ducting or piping in the purge system which is upstream or downstream of the valves and is exposed to the flow condition associated with the LOCA and the seismic event. The staff is particularly interested in the affects that loose debris from the pipe or duct system may have on the closure capability of these valves.

Response to 1.12

Since the double isolation purge valves are located immediately outside of the drywell, there is essentially no piping upstream of the valves. As stated in the response to Question 4 in Reference 1, there are no specific provisions installed at CNS to protect equipment downstream of the valves from damage by escaping air and steam. The small amount of containment atmosphere released due to downstream damage would be primarily contained by the Secondary Containment (Reactor Building). As discussed in CNS FSAR Section V-2.4.6, the short Technical Specification closure time limit ensures that the valves will be closed before significant amounts of fission products are released from the reactor core under design basis accident conditions. Additionally, as stated in Reference 2, the motor operated purge values in each purge line have been limited to the 60° open position which will facilitate more rapid isolation.

As regards loose debris from the piping system, there is essentially no piping system upstream. As the butterfly valves approach the seated position, there is a wiping action between the rubber and stainless steel seating surfaces that would tend to clean the seat of small particulate matter coming from the drywell. The flow of air through the valve also enhances this cleaning.

The District will continue to monitor the efforts of the NRC Division of Reactor Safety Research and various contract consultants to analyze insulation debris generation during a pipe break event and postulated migration of insulation debris within the containment. It is felt that this type of loose debris does not pose a significant safety hazard when coupled with the relatively short times which the valves are open at power during any calendar year.

2. MOTOR OPERATED VALVES 230MV, 231MV, 232MV, AND 233MV

2.1 Same as Question 1.1 a, b, and c.

Response to 2.1

See response to 1.1.

2.2 Same as Question 1.2.

Response to 2.2

See response to 1.2.

2.3 What are the maximum torque ratings of the operators. How do they compare to the torques developed during the DBA-LOCA postulated?

Response to 2.3

The maximum operator torque output and the maximum required torque during the DBA-LOCA postulated are as follows:

Valve	Maximum Required Torque (Ft-Lb)	Available Operator Torque (Ft-Lb)
231 MV	1,978	1,300
232 MV	1,954	1,300
233 MV	622	1,300
234 MV	583	1,300

2.4 Same as Question 1.4.

Response to 2.4

As can be seen from 2.3 above, there is not sufficient torque to operate valves 231 and 232. As stated in the response to Question 2 of Reference 3, these valves have been limited to 60° open at CNS when the plant is not in the cold shutdown or refueling mode.

2.5 Has the minimum available voltage to the electric operator under both normal or emergency modes been determined and specified to the operator manufacturer, to assure the adequacy of the operator to stroke the valve at DBA conditions with these lower limit voltages available. Does this reduced voltage operation result in any significant change in stroke timing?

Response to 2.5

The minimum available voltage to the subject motor operators have been determined and evaluated by the motor operator manufacturer. The postulated momentary and sustained low voltages are within the motor manufacturer's nameplate criteria.

Reduced voltage operation does not significantly change the valve stroke timing.

2.6 Same as Question 1.6.

Response to 2.6

The motor-operated valve assemblies were seismically qualified by analysis to 1.5 g's horizontal and 1.21 g's vertical using Allis-Chalmers Stress and Seismic Calculation VER-0043.

2.7 Same as Question 1.8.