

SAFETY EVALUATION
BY THE
INSERVICE VALVE TESTING PROGRAM

III. Valve Testing Program

A. General

1. Licensee Documents and Piping and Instrumentation Drawings

By letter dated June 18, 1977 and January 15, 1979, Arkansas Power and Light Company submitted proposed changes to the Arkansas Unit 1 Technical Specifications to incorporate the provisions of 10 CFR 50.55(a) as revised on February 12, 1976 (41 FR 6256). The ISI task group has reviewed the valve testing portion of the proposed test program.

Throughout our review, staff questions regarding the adequacy of the program were directed toward the licensee. Formal responses to these questions together with commitments to modifications to the proposed test program were documented by the licensee in a revision to the plan. To conduct our review we were provided boundary diagrams by the licensee.

2. Testing of Valves Which Perform a Pressure Isolation Function

There are several safety systems connected to the reactor coolant pressure boundary that have design pressures that are below the reactor coolant system operating pressure. There are redundant isolation valves forming the interface between these high and low pressure systems to prevent the

low pressure systems from being subjected to pressures which exceed their design limit. In this role, the valves are performing a pressure isolation function.

It is our view that the redundant isolation provided by these valves regarding their pressure isolation function is important. We consider it necessary to provide assurance that the condition of each of these valves is adequate to maintain this redundant isolation and system integrity. For this reason we believe that some methods, such as pressure monitoring, radiography, ultrasonic testing, leak testing, etc. could be used to assure that the condition of each valve is satisfactory to maintain this pressure isolation function.

In the event leak testing is selected as the appropriate method for achieving this objective the staff believes that the following valves should be categorized as A or AC and leak tested in accordance with IWV-3420 of Section XI of the applicable edition of the ASME Code. These valves are:

- | | | |
|----|--------------|-----------------------------|
| a. | CF-1A, 1B | (M-230, RCS/CFT) |
| b. | DH-14A, 14B | (M-230, RCS/L.P. Injection) |
| c. | DH-13A, 13B | (M-230, RCS/L.P. Injection) |
| d. | MU-34A, B, C | (M-230, RCS/H.P. Injection) |
| e. | DH-17 | (M-230, RCS/L.P.) |

- f. DH-18 (M-230, RCS/L.P. Injection)
- g. CV-1228, 1227 (M-231, RCS/H.P. Injection)
- h. CV-1219, 1220 (M-231, RCS/H.P. Injection)
- i. CV-1050 (M-230, RCS/DHR)
- j. CV-1410 (M-232, RCS/CHR)
- k. DH-12, 16 (M-230, RCS/DHR)

We have discussed this matter and identified the valves listed above to the licensee. The licensee has agreed to consider testing each of these valves and to categorize these valves with the appropriate designation depending on the testing method selected. Whatever the licensee selects as the testing method to be used to determine each valve's condition, the licensee will provide to the NRC for evaluation on a valve-by-valve basis the details of the method used that clearly demonstrates the condition of each valve.

3. Stroking Requirements for Section XI

Subsection IWV-3410(a) of the Section XI Code (which discusses full stroke and partial stroke requirements) requires that Code Category A and B valves be exercised once every three months, with exceptions as defined in IWV-3410 (b)(1), (e) and (f). IWV-3520(a) (which discusses full stroke and partial stroke requirements) requires that Code Category C valves be exercised once every three months, with exceptions as defined in IWV-3520(b).

In the above cases of exceptions, the Code permits the valves to be tested at cold shutdown where:

- (a) It is not practical to exercise the valves to the position required to fulfill their function or to the partial position during power operation.
- (b) It is not practical to observe the operation of the valves (with fail-safe actuator) upon loss of actuator power.

The staff stated its position to the licensee that check valves, whose safety function is to open, are expected to be full-stroked. If only limited operation is possible (and it has been demonstrated by the licensee and agreed to by the staff), the check valve shall be partial stroked. Since disk position is not always observable, the NRC staff stated that verification of the plant's safety analysis design flow rate through the check valve would be an adequate demonstration of the full-stroke requirement. Any flow rate less than design will be considered part-stroke exercising unless it can be shown that the check valve's disk position at the lower flow rate would be equivalent to or greater than that of the design flow rate through the valve. The licensee agreed to conduct his flow tests to satisfy the above position.

The licensee has stated that none of the Category A or B power operated valves identified in our Safety Evaluation Report can be part-stroked because of the design logic of the operating circuits. These circuits are such that when an open or close signal is received the valve must complete a full stroke before the relay is released to allow the valve to stroke in the other direction. We find that the licensee relief request from part-stroking is warranted and should be granted because the required function of the valves involves only full open or full closed positions.

4. Cold Shutdown Testing Definition

Inservice valve testing at cold shutdown is acceptable when the following conditions are met. It is understood that the licensee is to commence testing as soon as the cold shutdown condition is achieved but not later than 48 hours after shutdown and continue until complete or plant is ready to return to power. Completion of all valve testing is not a prerequisite to return to power. Any testing not completed at one cold shutdown should be performed during any subsequent cold shutdowns that may occur before refueling to meet the Code specified testing frequency.

For planned cold shutdowns, where the licensee will complete all the valves identified in his IST program for testing in the cold shutdown mode, exception to the above 48 hour start time may be taken. It is noted that the staff differentiates for valve testing purposes between the cold shutdown mode and the refueling mode.

That is, for testing purposes the refueling mode is not considered as a planned cold shutdown.

5. Check Valve Testing Frequency

The Code states that, in the case of cold shutdowns, valve testing need not be performed more often than once every three months for Category A and B valves and once every nine months for Category C valves. It is our position that the code is inconsistent and that Category C valves should be tested on the same schedule as Category A and B valves. Arkansas has agreed to modify any procedures as necessary on cold shutdown to read, "In the case of frequent cold shutdowns, valve testing will not be performed more often than once every three (3) months for Category A, B and C valves."

6. Changes to the Technical Specification

In a November 1976 letter to the Arkansas Power and Light Company, we provided an attachment entitled "NRC Guidelines for Excluding Exercising (Cycling) Tests of Certain Valves During Plant Operation." The attachment stated that when one train of a redundant system such as in the Emergency Core Cooling System (ECCS) is inoperable, nonredundant valves in the remaining train should not be cycled since their failure would cause a loss of total system function. For example, during power operation in some plants, there are stated minimum requirements for systems which make up the ECCS which allow certain limiting conditions for operation to exist at any one time and if the

system is not restored to meet the requirements within the time period specified in a plant's Technical Specifications, the reactor is required to be put in some other mode. Furthermore, prior to initiating repairs all valves and interlocks in the system that provide a duplicate function are required to be tested to demonstrate operability immediately and periodically thereafter during power operation. For such plants this situation would be contrary to the NRC guideline as stated in the document mentioned above.

The licensee has agreed to review the Arkansas 1 Nuclear Plant Technical Specifications and to consider the need to propose Technical Specification changes which would have the effect of precluding such testing.

After making this review, if the licensee determines that the Technical Specifications (T.S.) should be changed because the guidelines are applicable, the licensee will submit, in conjunction with the proposed T.S. change, the inoperable condition for each system that is affected which demonstrates that the valves failure would cause a loss of system function, or if the licensee determines that the T.S. should not be changed because the guidelines are not applicable or cannot be followed, the licensee will submit to the staff the reasons that led to their determination for each potentially affected valve in those applicable sections of the T.S. The licensee will submit the above information by the dates indicated in Table 3.1.2.

7. Safety Related Valves

This review was limited to safety-related valves. Safety related valves are defined as those valves that are needed to mitigate the consequences of an accident and/or to shutdown the reactor and to maintain the reactor in a shutdown condition. Valves in this category would typically include certain code class 1, 2 and 3 valves and could include some non-code class valves.

It should be noted that the licensee may have included non-safety related valves in their Inservice Test Program as a decision on the licensee's part to expand the scope of their Inservice Test Program.

8. Category A Valve Leak Check Requirements for Containment Isolation Valves (CIV)

All CIVs are classified as Category A valves. The Category A valve leak rate test requirements of IWV-3420(a-e) have been superceded by Appendix J requirements for CIVs. The staff has concluded that the applicable leak test procedures and requirements for CIVs are determined by 10 CFR 50 Appendix J. Relief from paragraph IWV-3420(a-e) for CIVs presents no safety problem since the intent of IWV-3240(a-e) is met by the Appendix J requirements.

The licensee shall comply with Sections f and g of IWV-3420 until relief is requested from these paragraphs. It should be

noted that these paragraphs are only applicable where a type C Appendix J leak test is performed.

Based on the considerations discussed above the staff concludes that the alternate testing proposed above will give the reasonable assurance of valve operability intended by the Code and that the relief thus granted will not endanger life or property of the common defense and security of the public.

9. Application of Appendix J Testing to the IST Program

The Appendix J review for this plant is a completely separate review from the IST program review. However, the determinations made by that review are directly applicable to the IST program. Our review has determined that the current IST program as submitted by the licensee correctly reflects our interpretation of Section XI vis-a-vis Appendix J. The licensee has agreed that, should the Appendix J program be amended, they will amend their IST program accordingly.

B. Generic Relief Request

1. Valve Stroke Timing comparison

Relief Request: IWV-3410 (c) (3) will be satisfied by comparison of valve stroke times to a set value arrived at from initial testing and testing following any maintenance pursuant to IWV-3200.

Code Requirement: The limiting value of full stroke time of each power operated valve shall be specified by the owner.

The stroke time of all power-operated valves shall be measured to the nearest second or 10% of the maximum allowable stroke time, whichever is less, whenever such a valve is full stroke tested.

If an increase in stroke time of 25% or more from the previous test for valves with stroke times greater than ten seconds or 50% or more for valves with stroke times less than or equal to ten seconds is observed, test frequency shall be increased to once each month until corrective action is taken, at which time the original test frequency shall be resumed. In any case, any abnormality or erratic action shall be reported.

Licensee Basis for Request: The requirement for comparison against the previous test stroke time is unconservative in that slow degradation of valves will not be flagged by this surveillance. The specified limit (25% or 50%) could be additive, each test resulting in reaching the limiting value of stroke time without previously identifying a problem or increasing the surveillance frequency.

Maintenance of a running file of previous test stroke times and the inclusion of such as revised criteria amount to an undue clerical

burden for dubious benefits, and greatly increases chances of clerical error.

Evaluation: The comparison of valve stroke time to a set valve arrived at from initial testing is a more conservative approach than the code requirement. However, in the interest of maintaining complete data, the granting of this relief request does not relieve the licensee from keeping a running record of valve stroke times for each test.

Conclusion:

Based on the considerations discussed above, the staff concludes that alternate testing proposed above will give reasonable assurance of valve operability intended by the code and that the relief thus granted will not endanger life or property of the common defense and security of the public.

C. Reactor Coolant System

1. Category C Valves

a. Relief Request: CF-1A, CF-1B

The check valves will be part stroke exercised at refueling outages.

Code Requirement: See Section III.A.3.

Licensee Basis for Request: CF-1A and CF-1B cannot be full or part stroke exercised every 3 months while the plant is in power operation. These check valves are not designed to be manually stroked, and can only be exercised by flow. Flowing during normal operation from the CFT's is not possible due to the fact that the differential pressure between the RCS (approximately 2250 psig) and the CFTs (approximately 600 psig) acts to maintain check valves DH-14A and DH-14B closed. These check valves are in series with CF-1A and CF-1B respectively, therefore preventing flow thru CF-1A and CF-1B from the CFT's.

Full-stroking of these valves during cold shutdown could subject the reactor coolant system to conditions exceeding pressure temperature limits and create as much as 28,000 gallons of liquid waste.

Evaluation: The Core Flood Discharge check valves CF-1A and CF-1B are valves that form part of a redundancy with check valves DH-14A and DH-14B respectively, whose function is to isolate the lower design pressure Core Flooding Tanks (CFTs) from the higher operating pressure Reactor Coolant System (RCS) during power plant operation. These check valves automatically open during a large break LOCA when the (RCS) pressure drops below approximately 600 psig and allows water from the CFTs to flood the reactor core.

Conclusion:

The staff finds that the testing frequency required by code to be impractical. We cannot grant this relief, however, because we are unable to determine that conducting a part stroke test only will not endanger public health and safety.

D. Decay Heat Removal System

1. Category B Valves

a. Relief Request: CV-1414 and CV-1415

No regularly scheduled testing is planned.

Code Requirement: See Section III.A.3.

Licensee Basis for Relief: The valves are open during normal plant operation and their emergency function is to be open.

Evaluation: The motor operated Sump Suction valves CV-1414 and CV-1415 are in the recirculation lines from the sump to the Decay Heat Removal System (DHRS) pumps, and are used during the long term recirculation phase of the Low Pressure Injection mode. CV-1414 and CV-1415 are open during normal plant operation and their function is to stay open during LOCA.

The NRC staff considers the subject valves as passive i.e., an open valve whose function is to remain open during an emergency

condition. The staff has determined that the exercising requirement of Code Section XI provides no meaningful information for these passive valves and that relief from the 3 month stroke and stroke timing requirement is acceptable.

Conclusion:

We conclude that the quarterly stroke and stroke time measurement are meaningless for passive valves and the relief should be granted.

2. Category C Valves

a. Relief Request: CA-61 and CA-62

Valves will be part stroked only, every 3 months.

Code Requirement: See Section III.A.3.

Licensee Basis for Request: System and test configuration used limit the flowrate through the valves during testing.

Evaluation: The NaOH Discharge check valves CA-61 and CA-62 are closed during normal plant operation. Their function is to open in an emergency condition when CV-1616 and CV-1617 are opened and NaOH is supplied to the Decay Heat Removal pumps (LPI mode) Reactor Building Spray pumps inlets.

The licensee presently tests the valves every 3 months in what amounts to a part stroke exercise. Condensate water is pumped from a condensate transfer pump through the subject check valves to a test connection upstream of the Reactor Building Spray pumps.

The line sizes and configuration of the existing test loop are such that only part stroking is practical at any time (i.e., 3 month intervals, cold shutdowns, or refueling).

The licensee has also indicated that there is no specific time for the NaOH tank to drain and the draindown could continue over a long period of time (days) with no adverse effects.

The testing presently conducted to check the flowpath to the DHRS/RBS pumps is considered adequate in that flowrate requirement is not as important a factor as determining the integrity of the flowpath. The licensee has demonstrated the adequacy of part stroke exercising and the impracticality of full stroke exercising the check valves. Part stroke exercising is the practical alternative that satisfies the intent of the code.

Conclusion:

Based on the considerations discussed above, the staff concludes that the alternate testing proposed above will give the reasonable assurance of valve operability intended by the Code and that the relief thus granted will not endanger life or property or the common defense and security.

E. Reactor Building Spray and Core Flooding System

1. Category C

- a. Relief Request: BS-4A and BS-4B

The licensee has requested relief to part-stroke exercise BS-4A and BS-4B during each refueling outage.

Code Requirement: See Section III.A.3.

Licensee Basis for Request: These valves are immediately upstream of the RB spray nozzles. Water flow cannot be used for stroking these check valves because the system is open ended into containment. Alternate test procedures require more manpower and equipment than is normally available during cold shutdown.

Evaluation: The licensee had originally (SER Meeting) requested relief to exercise these check valves by conducting air flow tests every 5 years as part of the Reactor Building spray header flow tests. The staff questioned the proposed air tests as to the possibility that seat leakage past a stuck closed valve could lead to the belief that a valve was being part-stroked open. The licensee was asked to review the testing proposed, and provide technical information that would support the proposed air flow tests in light of the staff's concern about seat leakage vs. determination of part stroking. At present, this review has not been made, but the licensee has suggested disassembling the valves on some maintenance schedule.

Conclusion:

The staff finds the testing frequency required by the code to be impractical. We cannot grant this relief, however, because we are unable to determine that never conducting a full stroke test or conducting testing at less than code specified frequency will not endanger public health and safety.

F. M-261 Heating, Ventilating and Air Conditioning - Reactor Building

1. Category A, AC, AE Valves

- a. Relief Request: CV-7401, CV-7402, CV-7403 and CV-704

Code Requirement: See Section III.A.3.

No regularly scheduled stroke testing is planned for these valves.

Licensee Basis for Request: The valves are normally closed and their emergency position is also closed.

Evaluation: The Purge Air valves CV-7401 and CV-7402, CV-7403 and CV-7407 are in the Purge Air System. The valves are closed during normal plant operation, and their emergency function is to stay closed.

The NRC staff considers the subject valves as passive, i.e., a closed valve whose function is to remain closed during the emergency condition. The staff has determined that the exercising requirement of Code Section XI provides no meaningful information for these passive valves, and relieves the licensee from the 3 month stroke and stroke timing requirements.

Conclusion:

We conclude that the quarterly stroke and stroke time measurement are meaningless for passive valves and the relief should be granted.