



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555-0001

ENCLOSURE 1

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

OF THE FIRST TEN-YEAR INTERVAL INSERVICE INSPECTION

REQUESTS FOR RELIEF FOR

COMMONWEALTH EDISON COMPANY

ZION NUCLEAR POWER STATION, UNITS 1 AND 2

DOCKET NOS. 50-295 AND 50-304

1.0 INTRODUCTION

The Technical Specifications for Zion Nuclear Station, Units 1 and 2, state that the inservice inspection and testing of the American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 components shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable Addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the staff, if (i) the proposed alternatives would provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulties without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first ten-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) on the date twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable edition of Section XI of the ASME Code for the Zion Nuclear Power Station, Units 1 and 2, second 10-year inservice inspection (ISI) Interval is the 1980 Edition, through winter 1981 Addenda. The components (including supports) may meet the requirements set forth in subsequent editions and addenda of the ASME Code incorporated by reference in 10 CFR 50.55a(b) subject to the limitations and modifications listed therein and subject to Commission approval.

Pursuant to 10 CFR 50.55a(g)(5)(iii), if the licensee determines that conformance with an examination requirement of Section XI of the ASME Code is impractical for its facility, information shall be submitted to the Commission

in support of that determination and a request made for relief from the ASME Code requirement. The Commission will evaluate determinations under paragraph 10 CFR 50.55a(g)(5) that Code requirements are impractical. Pursuant to 10 CFR 50.55a(g)(6)(i), the Commission may grant such relief and may impose such alternative requirements that it determines to be authorized by law, will not endanger life, property, or the common defense and security, and are otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed. In a letter dated August 19, 1993, and supplemented on December 3, 1993, Commonwealth Edison Company (CECo or the licensee) submitted Hydrostatic Request for Relief Nos. 11, 12, 13, 14, 15, and Technical Approach and Position 11.

## 2.0 EVALUATION AND CONCLUSIONS

The staff, with technical assistance from its contractor, the Idaho National Engineering Laboratory (INEL), has evaluated the information provided by the licensee in support of its Hydro Request for Relief Nos. 11, 12, 13, 14, 15, and Technical Approach and Position 11. Based on the information submitted, the staff adopts the contractor's conclusions and recommendations presented in the Technical Evaluation Summary. The alternative examination contained in Hydro Request for Relief No. 11 is authorized pursuant to 10 CFR 50.55a(a)(3)(i) because it would provide an acceptable level of quality and safety. In addition, for Hydro Request for Relief Nos. 13, 14, 15, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i), and Hydro Request for Relief No. 12 is denied. Technical Approach and Position 11 concerning isolation of instruments during pressure testing of the system is acceptable.

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IDAHO NATIONAL ENGINEERING LABORATORY  
TECHNICAL EVALUATION SUMMARY OF THE  
SECOND TEN-YEAR INTERVAL INSERVICE INSPECTION  
REQUESTS FOR RELIEF FOR  
COMMONWEALTH EDISON COMPANY  
ZION NUCLEAR POWER STATION, UNITS 1 AND 2  
DOCKET NOS. 50-295 AND 50-304

1.0 INTRODUCTION

The licensee, Commonwealth Edison Company, submitted Relief Requests 11, 12, 13, 14, and 15, and Technical Approach and Position 11, in a letter dated August 19, 1993, for the second 10-year ISI interval, which ends in December 1993 for Unit 1 and September 1994 for Unit 2. The Idaho National Engineering Laboratory (INEL) has evaluated the subject requests for relief in the following sections.

2.0 EVALUATION

The Code of record for the Zion Nuclear Station, Units 1 and 2, second 10-year ISI interval is the American Society of Mechanical Engineers (ASME) Section XI, 1980 Edition through winter 1981 Addenda. The information provided by the licensee in support of the requests for relief has been evaluated and documented below.

A. Hydro Relief Request No. 11, Examination Category D-B, Item D2.10, and Paragraph IWA-5244(a), Pressure Testing of Buried Service Water Pump Discharge Lines

Code Requirement: Table IWD-2500-1, Examination Category D-B, Item D2.10 requires that system pressure tests be performed on all Class 3 piping systems in accordance with Articles IWA-5000 and IWD-5000. Paragraph IWA-5244(a) provides specific guidance for testing of buried portions of these systems as follows:

"In non-redundant systems where the buried components are isolatable by means of valves, the visual examination VT-2 shall consist of a leakage test that determines the rate of pressure loss. Alternatively, the test may determine the change in flow between the ends of the buried components. The acceptable rate of pressure loss or flow shall be established by the Owner."

Licensee's Code Relief Request: The licensee requested relief from the Code-required pressure loss or change-in-flow tests for buried portions of the Service Water Pump Discharge piping at Zion Nuclear Power Station, Units 1 and 2.

Licensee's Stated Basis for Requesting Relief:

"Relief is requested on the basis that the proposed alternatives would provide an acceptable level of quality and safety.

The testing options available per ASME Section XI, pressure loss and change in flow, are not practical to perform.

Previously, a pressure loss test was attempted. Due to extensive boundary valve leakage, the test failed. The majority of these boundary valves are butterfly type which may not exhibit the necessary isolation characteristics to successfully complete a pressure loss test. In summary, the pressure loss testing methods available for the subject piping will not provide conclusive evidence of the pressure retaining capability of this buried piping.

Investigations into change in flow testing for the subject piping indicate that this methodology will also be impractical. Permanent service water flow instrumentation is not available to accomplish a change in flow test. No downstream flow instrumentation on the 48" lines is currently in place. Similarly, temporary flow instrumentation will not be feasible for this test due to system configuration constraints. (Branch piping ties in immediately after the 48" lines become exposed in the auxiliary building.) This configuration will not allow an accurate downstream flow measurement to be taken."

Licensee's Proposed Alternative Examination: The licensee proposed to perform a visual examination of a portion of the piping internal surfaces in lieu of the Code-required pressure loss or change-in-flow test. Both sections of buried piping (Units 1 and 2) contain two horizontal runs of over 100 feet in length connected by a vertical pipe section approximately 40 feet long. The licensee stated:

"The upcoming dual unit outage modifications to the Service Water System will allow individual and/or remote "crawler" entry into the 48" buried piping for visual inspection of the pipe internal surfaces.

At a minimum, Zion Station, will perform the visual examination on a portion of the piping internal wall surfaces in each physical section (four horizontal sections and two vertical sections) that can be performed safely. Zion Station will attempt to obtain a visual sampling of the pipe wall in each of these sections in order to verify it's pressure retaining capability.

Documentation will be developed detailing the visual examination, including a specific set of acceptance criteria. In general, the acceptance criteria would not allow defects which indicate through wall leakage. Allowances will be made in the examination acceptance criteria to take into account service related wear and internal fixed debris normally expected in Service Water Systems."

Evaluation: INEL concurs with the licensee's contention that the 48-inch diameter butterfly-type valves in the Zion Service Water System may not exhibit the isolation capabilities necessary to allow Code-required pressure loss tests to be successfully performed. The licensee's proposed alternative of performing a visual examination from the piping inside diameter could provide more material degradation information than a flow test.

The licensee further described the extent of the proposed visual inspections during a telephone conference held on November 19, 1993. The licensee committed to performing visual (VT-3) examinations of the internal surfaces of the entire lengths of the horizontal sections, and the manually accessible portions of the vertical sections, for buried 48-inch Service Water System piping at Zion Nuclear Station, Units 1 and 2.

The visual examination of the inside surface provides an acceptable level of quality and safety for the subject piping in lieu of the Code-required pressure loss or change-in-flow test. Therefore, in accordance with 10 CFR 50.55a(a)(3)(i), it is recommended that this alternative examination be authorized.

B. Hydro Relief Request No. 12, Examination Category D-B, Item D2.10, and Paragraph IWA-5244(a), Pressure Testing of Buried Reactor Vessel Support Pad Supply and Discharge Lines

Code Requirement: Table IWD-2500-1, Examination Category D-B, Item D2.10 requires that system pressure tests be performed on all Class 3 piping systems in accordance with Articles IWA-5000 and IWD-5000. Paragraph IWA-5244(a) provides specific guidance for testing of buried portions of these systems as follows:

"In nonredundant systems where the buried components are isolatable by means of valves, the visual examination VT-2 shall consist of a leakage test that determines the rate of pressure loss. Alternatively, the test may determine the change in flow between the ends of the buried components. The acceptable rate of pressure loss or flow shall be established by the Owner."

Licensee's Code Relief Request: The licensee has requested relief from the Code-required pressure loss or change-in-flow tests for buried portions of the supply and discharge piping to the reactor vessel support pads.

Licensee's Stated Basis for Requesting Relief:

"Relief is requested on the basis that the proposed alternatives would provide an acceptable level of quality and safety.

Investigations into performance of the testing options available per ASME Section XI indicate that pressure loss testing is not practical due to the location, size, and configuration of the subject piping."

Licensee's Proposed Alternative Examination: The licensee stated:

"A test which determines the change in flow between the ends of the buried piping will be attempted using ultrasonic flow meters. Due to the low flow rates expected and the inherent limitations of the flow measurements on small diameter piping, it is not known whether this test method will provide conclusive results.

As an alternative examination, in the event that flow change testing does not provide conclusive results, Zion Station will perform a visual VT-2 examination on the areas where this piping enters and exits the Reactor Vessel support pads. This examination will be performed when the subject piping is pressurized to the hydrostatic pressure required per IWD-5223."

Evaluation: The subject piping is listed as nonredundant and isolable. The licensee has not provided convincing evidence to support a determination of impracticality with respect to an ASME pressure loss test. Further, the change-in-flow test proposed by the licensee may satisfy the Code requirements for pressure testing, provided the results are conclusive. Therefore, until the licensee has made an effort to perform the Code-required test(s), and/or presents a technically valid basis for relief, this request should be denied.

C. Hydro Relief Request No. 13, Examination Category D-B, Item D2.10, and Paragraph IWD-5223(a), Pressure Tests of Turbine-Driven Auxiliary Feedwater Pump Oil Cooler and Attached Piping

Code Requirement: Table IWD-2500-1, Examination Category D-B, Item D2.10 requires that system pressure tests be performed on all Class 3 piping systems in accordance with Articles IWA-5000 and IWD-5000. Paragraph IWD-5223(a), *System Hydrostatic Test*, requires that test pressures shall be 1.10 times the system pressure ( $P_{sv}$ ) for systems with design temperatures of  $\leq 200^{\circ}\text{F}$ , and 1.25 times  $P_{sv}$  for systems with design temperatures  $> 200^{\circ}\text{F}$ . The Code defines system pressure ( $P_{sv}$ ) as "the lowest pressure setting among the number of safety or relief valves provided for overpressure protection within the boundary of the system to be tested." The Code further states that system design pressure ( $P_d$ ) shall be substituted for  $P_{sv}$  for systems not provided with safety or relief valves.

Licensee's Code Relief Request: The licensee requested relief from the system test pressures required by IWD-5223(a) for portions of the Turbine-Driven Auxiliary Feedwater Pump Oil Cooler and attached piping.

Licensee's Stated Basis for Requesting Relief:

"Relief is requested on the basis that compliance with the Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of safety or quality.

The design of this portion of the Service Water System includes a relief valve set at 125 psig and a pressure control valve set at 75 psig, which was included to protect the subject cooler from overpressurization. Testing of the cooler, attached piping and the relief valve to IWD-5223 rules would require a test pressure of 132.5 psig, which would exceed the cooler design pressure of 120 psig."

Licensee's Proposed Alternative Examination: The licensee stated:

"As an alternative examination, Zion Station will perform a visual, VT-2 examination of the oil coolers and attached piping, up to and including the first available isolation valves. This examination will be performed when the subject piping is pressurized to normal system operating pressure."

It should be noted that the VT-2 examination at normal system operating pressure is required to be performed once during each inspection period, therefore the licensee's alternative examination is not in addition to existing Code requirements.

Evaluation: The licensee supplied additional information in a letter dated December 3, 1993, that clarified, through highlighted process and instrumentation drawings (P&ID's), the extent of piping included in the relief request. A limited segment of auxiliary feedwater suction piping, up to and including the first isolation valves on the inlet and outlet lines of the auxiliary feed pump turbine, will be subjected to operating pressure only. This is due to turbine bearing oil coolers contained within this piping segment that have a maximum design pressure less than that of the associated piping.

The oil coolers are not isolable from the inlet and outlet piping, therefore, the Code-required hydrostatic pressures could potentially cause failure of the component pressure boundary. The licensee would have to replace the oil coolers with similar components designed for higher pressure if the Code-required hydrostatic test pressures are imposed. Because the request encompasses only a limited segment of piping, and the licensee has proposed to perform a VT-2 visual examination at normal system operating pressure, there is reasonable assurance of continued pressure boundary integrity of the piping. Based on the impracticality of complying with Code hydrostatic pressure test

requirements, it is recommended that relief be granted, pursuant to 10 CFR 50.55a(g)(6)(i).

D. Hydro Relief Request No. 14, Examination Category D-B, Item D2.10, and Paragraph IWD-5223(a), Pressure Tests of 6-inch Diameter Piping to Auxiliary Feedwater Pump 1A and 2A Turbines

Code Requirement: Table IWD-2500-1, Examination Category D-B, Item D2.10 requires that system pressure tests be performed on all Class 3 piping systems in accordance with Articles IWA-5000 and IWD-5000. Paragraph IWD-5223(a), *System Hydrostatic Test*, requires that test pressures shall be 1.10 times the system pressure ( $P_{sv}$ ) for systems with design temperatures of  $\leq 200^{\circ}\text{F}$ , and 1.25 times  $P_{sv}$  for systems with design temperatures  $> 200^{\circ}\text{F}$ . The Code defines system pressure ( $P_{sv}$ ) as "the lowest pressure setting among the number of safety or relief valves provided for overpressure protection within the boundary of the system to be tested." The Code further states that system design pressure ( $P_d$ ) shall be substituted for  $P_{sv}$  for systems not provided with safety or relief valves.

Licensee's Code Relief Request: The licensee requested relief from the system test pressures required by IWD-5223(a) for a portion of the Auxiliary Feed Pump 1A and 2A Turbine Piping.

Licensee's Stated Basis for Requesting Relief:

"Relief is requested on the basis that the proposed alternatives would provide an acceptable level of quality and safety.

In order to test this piping per ASME Section XI, the check valves in these piping runs would require disassembly. These check valves are of split body design and plant maintenance experience is that significant risk of valve damage is possible during disassembly/reassembly activities.

In addition, no system connections are available to pressurize around the check valves in order to accomplish this test."

Licensee's Proposed Alternative Examination: The licensee proposed to visually examine (VT-2) this piping during operational testing of the Auxiliary Feedwater Pump Turbine at nominal operating pressure.

It should be noted that the VT-2 examination at normal system operating pressure is required to be performed once during each inspection period, therefore the licensee's alternative examination is not in addition to existing Code requirements.

Evaluation: The licensee provided further information to support the request in a letter dated December 3, 1993. This submittal included a description of the Chapman split-body valves, Nos. 1MS-0006 and 1MS-0007.



The licensee stated that these valves would require disassembly, and replacement with blank flanges, to permit the connected piping to be pressurized for a hydrostatic test.

The split design includes a flange mating surface and disc assembly oriented at approximately 45 degrees to the valve body. These valves are welded to the piping. Therefore, disassembling the valves and installing blank flanges would require the licensee to "spring", or move, the associated piping aside while accessing the mating surfaces. In the letter referenced above, the licensee stated that structural concrete interferences would further complicate the disassembly and reassembly processes.

After reviewing the design of the valves, INEL concludes that it is impractical for the licensee to perform the Code-required hydrostatic test due to the difficulty in disassembly/reassembly of the valves, which could result in damage to the valves and connecting piping. The licensee has proposed to perform a VT-2 visual examination of this limited segment (approximately 15 feet in length) of piping at normal system operating pressure. The VT-2 examination will provide reasonable assurance of the continued pressure boundary integrity for this limited segment of piping. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

E. Hydro Relief Request No. 15, Examination Category D-A, D-B, and D-C, Items D1.10, D2.10, D3.10, and Paragraph IWD-5223(a), Pressure Tests of 1/2-inch Isolation Valve Seal Water Piping

Code Requirement: Table IWD-2500-1, Examination Categories D-A, D-B, and D-C, Items D1.10, D2.10, and D3.10 require that system pressure tests be performed on all Class 3 piping systems in accordance with Articles IWA-5000 and IWD-5000. Paragraph IWD-5223(a), *System Hydrostatic Test*, requires that test pressures shall be 1.10 times the system pressure ( $P_{sv}$ ) for systems with design temperatures of  $\leq 200^{\circ}\text{F}$ , and 1.25 times  $P_{sv}$  for systems with design temperatures  $> 200^{\circ}\text{F}$ . The Code defines system pressure ( $P_{sv}$ ) as "the lowest pressure setting among the number of safety or relief valves provided for overpressure protection within the boundary of the system to be tested." The Code further states that system design pressure ( $P_D$ ) shall be substituted for  $P_{sv}$  for systems not provided with safety or relief valves.

Licensee's Code Relief Request: The licensee requested relief from the system test pressures required by IWD-5223(a) for portions of the 1/2-inch diameter Isolation Valve Seal Water Piping.

Licensee's Stated Basis for Requesting Relief:

"Relief is requested on the basis that the proposed alternatives would provide an acceptable level of quality and safety.

Check valves isolate the affected piping from the remainder of the system piping of the same design. A Pipe Design Table Change occurs (Table "B" or "E" [2485 psig] or "C" [2500 psig] to Table "X-1" [150 psig]) at the manual isolation valves on the inlet side of the check valves. No test connections are provided between the check valves and the isolation valves making it impractical to test the affected piping to IWD-5223 requirements."

Licensee's Proposed Alternative Examination: The licensee will perform VT-2 visual examination of the subject piping in conjunction with the Isolation Valve Seal Water System hydrostatic test to be conducted at the system design pressure of 150 psig.

Evaluation: The licensee provided a list of areas affected by this request, which includes short segments of 1/2-inch diameter seal water piping between check and manually-controlled isolation valves in Zion Nuclear Station, Units 1 and 2. As stated above, no test connections exist to allow these segments of piping to be tested to the Code-required pressures listed in IWD-5223.

INEL concludes that it is impractical for the licensee to perform the subject tests at the Code-required pressures, and that imposing the requirements would force the licensee to redesign the affected piping segments. The licensee's proposed alternative, a VT-2 visual examination of these piping segments at a test pressure of 150 psig, provides reasonable assurance of the continued integrity of the piping pressure boundary. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that the request be granted.

F. Licensee's Technical Approach and Position 11, Paragraphs IWA-5211 and IWA-5224, Requirements for System Pressure Tests Beyond Instrument Root Valves

Code Requirements: IWA-5211 requires that pressure-retaining components within each system boundary be subjected to system pressure tests, at which time VT-2 visual examinations must be performed to detect leakage. Further, IWA-5224 describes the examination boundary subject to test pressurization as the boundary "within which the components have the same minimum required classification and are designed to the same primary pressure rating as governed by the system function and the internal fluid operating conditions, respectively."

Licensee's Stated Position:

"Because system instrumentation is normally valved into the system process piping, the tubing between the root valves and respective instruments has been classified ISI Class 1, 2, or 3, as applicable, at Zion Station.

These lines and instruments are thus subject to System Pressure Testing of IWA-5000. In situations where a System Hydrostatic [Test] per IWA-5211(d) is applicable, the elevated pressures required may exceed the design rating of the included instrumentation.

It is Zion Station's position that in cases where the System Pressure Testing of IWA-5211 is determined to exceed the design rating of the system instruments, the affected instruments will be isolated during such pressure testing by closing the respective instrument root valves."

Evaluation: Instrumentation components that satisfy the conditions for safety classification set forth by 10 CFR 50.55a must be subjected to ASME Code Section XI examination requirements for Class 1, 2, or 3 components, as applicable. The licensee's proposal to isolate such instruments at their root valves when system pressure tests would exceed the instrument design rating should be considered acceptable.

### 3.0 CONCLUSION

The licensee's Hydro Relief Request No. 11 proposes a VT-3 visual examination of the inside diameter of buried sections of piping in lieu of the pressure loss or change-in-flow testing required by the Code. This alternative provides an acceptable level of quality and safety, and recommends that the alternative be authorized per 10 CFR 50.55a(a)(3)(i). In Hydro Relief Request No. 12, concerning buried segments of the reactor vessel support pad supply and discharge lines, the licensee has not provided evidence of unusual difficulty or impracticality, nor proposed an acceptable alternative to the requirements. For these reasons, this request should be denied.

Hydro Relief Requests Nos. 13, 14, and 15 are associated with limited segments of piping for which the licensee has shown impracticality, and, pursuant to 10 CFR 50.55a(g)(6)(i), these requests should be granted. Finally, the licensee's Technical Approach and Position 11, which concerns isolation of instruments during pressure testing of the system where the test pressures exceed the instrument ratings, should be considered acceptable.