



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

November 19, 2014

Mr. Louis P. Cortopassi
Site Vice President and Chief Nuclear Officer
Omaha Public Power District
Fort Calhoun Station
9610 Power Lane, Mail Stop FC-2-4
Omaha, NE 68008

SUBJECT: FORT CALHOUN STATION, UNIT NO. 1 – RELIEF REQUEST RR-14,
PROPOSED ALTERNATIVE, TEMPORARY ACCEPTANCE OF A PINHOLE
LEAK IN RAW WATER SYSTEM PIPING ELBOW (TAC NO. MF4643)

Dear Mr. Cortopassi:

By letter dated August 15, 2014, as supplemented by letter dated August 19, 2014, Omaha Public Power District (OPPD, the licensee) requested relief from the requirements of the American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* (ASME Code), Section XI, IWD-3120(b), at Fort Calhoun Station, Unit No. 1 (FCS). Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii), the licensee submitted Relief Request RR-14, which proposed to use an alternative methodology to ASME Code Case N-513-3 to disposition a pinhole leak in lieu of immediately performing a repair on a leaking elbow of the raw water system piping, on the basis that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii). Therefore, the NRC authorizes the use of Relief Request RR-14 at FCS until September 5, 2014, or the predicted flaw size from periodic inspection exceeds the acceptance criteria, whichever occurs first.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

L. Cortopassi

- 2 -

The NRC staff provided verbal authorization for Relief Request RR-14 during a teleconference with your staff on August 15, 2014. Your staff repaired the pinhole leak on August 15, 2014, in accordance with Work Order 00528986. If you have any questions, please contact Fred Lyon at 301-415-2296 or via e-mail at Fred.Lyon@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael T. Markley". The signature is written in a cursive style with a large initial "M".

Michael T. Markley, Chief
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-285

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv



UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST RR-14 FOR TEMPORARY ACCEPTANCE OF

A PINHOLE LEAK IN A RAW WATER SYSTEM PIPING ELBOW

OMAHA PUBLIC POWER DISTRICT

FORT CALHOUN STATION, UNIT NO. 1

DOCKET NO. 50-285

1.0 INTRODUCTION

By letter dated August 15, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14230A157), and supplement dated August 19, 2014 (ADAMS Accession No. ML14231B310), Omaha Public Power District (OPPD, the licensee) requested relief from the requirements of the American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* (ASME Code), Section XI, IWD-3120(b), at Fort Calhoun Station, Unit No. 1 (FCS). The proposed alternative is documented in Relief Request RR-14 for the temporary acceptance of a pinhole in an elbow of the raw water (RW) system piping.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii), the licensee requested the temporary use of modified ASME Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping, Section XI, Division 1," to disposition the pinhole on the basis that complying with the specified ASME Code requirement to repair the degraded elbow would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

On August 15, 2014, the U.S. Nuclear Regulatory Commission (NRC) staff verbally authorized the use of Relief Request RR-14 at FCS (ADAMS Accession No. ML14230A080) until September 5, 2014, or when the leakage flaw size exceeds the allowable flaw size, whichever occurs first. This safety evaluation documents the NRC staff's technical basis for the verbal authorization.

2.0 REGULATORY EVALUATION

In the Relief Request, the licensee requests authorization of an alternative to the requirements of article IWD-3120(d) of Section XI of the ASME Code pursuant to 10 CFR 50.55a(a)(3)(ii).

Enclosure

Article IWD-3120(b) of the ASME Code, Section XI, requires that unacceptable flaws in ASME Code Class 3 components be corrected by repair or replacement activity or be accepted by supplemental examination and flaw evaluation, to the extent necessary to meet the acceptance standards in ASME Code, Section XI, Article IWD-3000, which refers to the requirements of IWC-3000.

Adherence to Section XI of the ASME Code is mandated by 10 CFR 50.55a(g)(4), which states, in part, that ASME Code Class 1, 2, and 3 components (including supports) will meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI.

The regulations in 10 CFR 50.55a(a)(3) state, in part, that alternatives to the requirements of paragraph (g) of 10 CFR 50.55a may be used, when authorized by the NRC, if the licensee demonstrates that: (i) the proposed alternative provides an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request the use of an alternative and the NRC to authorize the proposed alternative.

3.0 TECHNICAL EVALUATION

3.1 Relief Request RR-14

3.2 ASME Code Component Affected

The affected component is an ASME Code, Class 3, 90 degree Elbow in the 20-inch East Raw Water Header, piping class 152, with a wall thickness of 3/8 inches. The design Code is [USAS] B31.7 Class 1. The design pressure is 150 pounds per square inch and design temperature is 500 degrees Fahrenheit.

3.3 Applicable Code Edition and Addenda

FCS is currently in the fourth 10-year inservice inspection (ISI) interval, which ends on June 6, 2016. The Code of record for the fourth 10-year ISI interval is the ASME Code, 1998 Edition through 2000 Addenda.

3.4 Applicable Code Requirement

ASME Code, Section XI, IWD-3120(b) requires that components exceeding the acceptance standards of IWD-3400 be subject to supplemental examination, or to a repair/replacement activity.

3.5 Reason for Request

On August 14, 2014, the licensee identified a leak in an elbow on the east raw water (RW) piping in Room 19 of the auxiliary building. The leak required the plant entry into Technical Specification (TS) 2.4(2)d. The licensee reported that the pinhole leak was approximately 600 milliliters (ml) per hour on the inside of the elbow towards the middle of the pipe. The licensee performed an UT of the area around the pinhole and found no additional areas of significant pipe wall thinning. On August 15, 2014, the licensee reported that the leak rate had increased to 1100 ml/hour.

The licensee stated that performing an ASME Code repair or replacement activity to correct the pinhole in the RW elbow would require the plant to shut down (i.e., entry into a 24-hour hot shutdown TS requirement) and create a hardship based on the potential risks associated with unit cycling and emergent equipment issues incurred during shutdown and startup evolutions.

The licensee further stated that no compensating increase in the level of quality and safety would be gained by immediate repair of the flaw because the RW system continues to be capable of performing its required safety functions and is not susceptible to sudden or catastrophic failure.

Article IWD-3500 of the ASME Code, Section XI, establishes flaw size acceptance standards and IWD-3600 provides analytical evaluation criteria for flaws identified during performance of in-service inspections and tests. The licensee noted that the ASME Code does not include analytical evaluation criteria for acceptance of 100 percent through-wall flaws in pressure retaining base material of ferritic pipe or fittings. NRC Regulatory Guide 1.147, Revision 17, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," August 2014 (ADAMS Accession No. ML13339A689), conditionally approves ASME Code Case N-513-3 which provides analytical evaluation rules for temporary acceptance of 100 percent through-wall flaws in piping. The licensee noted that Code Case N-513-3 does not apply to through-wall flaws located in elbows.

3.6 Proposed Alternative and Basis for Use

In lieu of repair or replacing the degraded elbow, the licensee proposed to use Code Case N-513-3 to disposition the pinhole in the subject elbow. However, the licensee proposes to deviate from paragraph 1(c) of Code Case N-513-3 that prohibits its application to pipe elbows. Instead, the licensee proposed to use the methodology in a pending revision to Code Case N-513-3 (i.e., N-513-4) to evaluate and disposition the flaw in the subject elbow. Code Case N-513-4 includes rules for the evaluation of piping components such as elbows, branch tees, and reducers. Flaws in an elbow may be evaluated per N-513-4 as if in a straight pipe provided that the stresses used in the evaluation are adjusted to account for geometric differences. For elbows, hoop stress is adjusted by considering flaw location and primary stress due to elbow ovalization from axial loads. For axial stresses, the stress scaling follows the same approach given in ASME Code, Section III, ND-3600 using stress indices and stress intensification factors for the adjustment.

Using the methodology in Code Case N-513-4, the licensee calculated allowable flaw sizes of 10 inches in the circumferential direction and 4 inches in the axial direction. The licensee also determined that the 100 percent through-wall flaw is stable and the pipe will not fail catastrophically under design loading conditions.

As part of the proposed alternative, the licensee will perform the following actions:

- The licensee will perform a daily visual walk down and measure leakage from the RW elbow, with the insulation removed, to confirm that the analysis supported by UT examinations remains valid (i.e., no new significant leakage).
- The licensee will examine a sample size of at least five of the most susceptible and accessible locations, or, if fewer than five, all susceptible and accessible locations within 30 days of detecting the flaw in accordance with the requirements (including scope expansion) of Code Case N-513-3.
- The licensee will repair the RW elbow no later than when either the predicted flaw size from periodic inspection exceeds the acceptance criteria, or by September 5, 2014.

3.7 Duration of Proposed Alternative

The licensee stated that the relief request will be used until ASME Code repair activities are performed on the RW elbow which will be completed by September 5, 2014.

4.0 NRC Staff Evaluation

The NRC staff reviewed the licensee's flaw evaluation, monitoring of the flaw, extent of condition, and hardship to determine the structural integrity of the subject elbow for the duration between August 14, 2014, when the leak was identified and September 5, 2014, when the elbow is repaired.

The NRC staff has not approved Code Case N-513-4 in Regulatory Guide 1.147. Therefore, the NRC staff evaluated the proposed alternative based on Code Case N-513-3 and the flaw calculation methodology of the ASME Code, Section XI, Appendix C.

Flaw Evaluation

The licensee modeled the pinhole as a planar flaw and performed a linear-elastic fracture mechanics calculation to demonstrate the structural integrity of the degraded elbow. Using the stress intensity factor of the flaw and the pipe material, the licensee has demonstrated that the pipe material has sufficient toughness to resist the flaw to propagate suddenly and in an unstable manner. Based on its independent calculations, the NRC staff verified that the allowable flaw size of 10 inches in the circumferential direction and 4 inches in the axial direction are acceptable and that the flaw will not propagate uncontrollably.

The licensee measured wall thickness of the degraded elbow extensively. Based on an independent calculation, the NRC staff verified that the elbow, except at the pinhole area, satisfies the minimum required wall thickness in accordance with the ASME Code, Section III, ND-3640.

The NRC staff concludes that the licensee has demonstrated by analysis that the pinhole will not challenge the structural integrity of the elbow during the effective period of the relief request. In addition, the licensee will monitor the degraded area of the elbow periodically as discussed below to provide additional assurance of the structural integrity of the elbow.

Monitoring of the Flaw

The licensee has not requested deviation from and, therefore, will follow the monitoring requirements of Code Case N-513-3. The licensee stated that it will monitor the pinhole in a daily walk-down, consistent with Paragraph 2(f) of N-513-3, to confirm the analysis conditions used in the evaluation. Should the pinhole size grow, Paragraph 2(g) of N-513-3 requires a repair or replacement be performed.

Paragraph 2(e) of N-513-3 requires that periodic inspections of no more than 30 day intervals be performed to determine if flaws are growing. However, as the leak was discovered on August 12, 2014 and the elbow will be repaired at the latest on September 5, 2014, the duration of the leakage is less than 30 days. Therefore, paragraph 2(e) of N-513-3 is not applicable.

The NRC staff concludes that the flaw evaluation and the daily monitoring of the flaw will provide reasonable assurance of the structural integrity of the degraded elbow.

Extent of Condition

The licensee will examine a sample size of at least five of the most susceptible and accessible locations, or, if fewer than five, all susceptible and accessible locations within 30 days of detecting the flaw in accordance with the requirements (including scope expansion) of Code Case N-513-3. The NRC staff concludes that the licensee has satisfied the extent of condition inspection in accordance with Code Case N-513-3.

Flooding Analysis

The licensee has performed a flooding analysis in the vicinity of the leak and has identified the equipment that may be affected by the flooding or spray from the leakage. The licensee stated that some equipment may be at risk from either spray or flood if the leakage increases. However, at the time of the discovery none of the equipment was affected.

The NRC staff concludes that a current leak rate would not be a flooding concern. Should the leak rate increase, paragraph 2(g) of N-513-3 requires the licensee to perform a Code repair or replacement.

Hardship Justification

The NRC staff concludes that shutting down the unit to repair the subject elbow would cycle the unit and increases the potential of an unnecessary transient, resulting in undue hardship. The NRC staff further concludes that the leakage is small and the elbow continuously maintains its structural integrity based on the above evaluation. Therefore, the NRC staff determines that no compensating increase in the level of quality and safety would be gained by performing an ASME Code repair at the time of discovery of the leakage.

5.0 CONCLUSION

Based on the above, the NRC staff determines that the proposed alternative provides a reasonable assurance of structural integrity of the subject raw water piping. The NRC staff concludes that complying with IWD-3120(b) of the ASME Code, Section XI, would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii). Therefore, the NRC authorizes the use of Relief Request RR-14 at FCS until September 5, 2014, or the predicted flaw size from periodic inspection exceeds the acceptance criteria, whichever occurs first.

All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested and authorized by NRC staff remain applicable, including a third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: J. Tsao, NRR/DE/EPNB

Date: November 19, 2014

The NRC staff provided verbal authorization for Relief Request RR-14 during a teleconference with your staff on August 15, 2014. Your staff repaired the pinhole leak on August 15, 2014, in accordance with Work Order 00528986. If you have any questions, please contact Fred Lyon at 301-415-2296 or via e-mail at Fred.Lyon@nrc.gov.

Sincerely,

/RA/

Michael T. Markley, Chief
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-285

Enclosure:
Safety Evaluation

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