



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ON ASME CODE CASE N-524

CRYSTAL RIVER NUCLEAR PLANT UNIT NO. 3

FLORIDA POWER CORPORATION

DOCKET NO: 50-302

1.0 INTRODUCTION

The Technical Specifications (TS) for the Crystal River Nuclear Plant, Unit 3 (CR3), 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 NRC, 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 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of the ASME Code Section XI incorporated by reference in 10 CFR 50.55a(b) on the date 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable ASME Code Section XI edition for CR3, during the second 10-year inservice inspection (ISI) interval is the 1983 Edition though the Summer 1983 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), if a licensee determines that conformance with an examination requirement of the ASME Section XI is not practical 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. After evaluation of the determination, pursuant to

10 CFR 50.55a(g)(6)(i), the Commission may grant relief and may impose alternative requirements that are determined 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.

Pursuant to 10 CFR 50.55a(a)(3), by letter dated November 25, 1996, Florida Power Corporation (FPC or the licensee), requested approval for implementing the alternative rules of ASME Section XI Code Case N-524, "Alternative Examination Requirements for Longitudinal Welds in Class 1 and 2 Piping Section XI, Division 1," dated August 9, 1993, to be applied to the ISI program for CR3.

The staff has reviewed and evaluated the licensee's request and supporting information to use Code Case N-524.

2.0 DISCUSSION

CODE CASE N-524 ALTERNATIVE EXAMINATION REQUIREMENTS FOR LONGITUDINAL WELDS IN CLASS 1 AND 2 PIPING - SECTION XI, DIVISION 1

Component Identification

Longitudinal Welds in Class 1 and 2 Piping:

Examination Category B-J, in Table IWB-2500-1, Item Nos B9.12 and B9.22

Examination Category C-F, in Table IWC-2500-1, Item Nos C5.12, C5.22 and C5.32 of ASME Code, Section XI, 1983 Edition through Summer 1983 Addenda.

Code Requirement and Relief Request: (As stated by the licensee)

"ASME Section XI 1983 Edition, Table IWB-2500-1, Examination Category B-J requires examination (surface and volumetric for piping ≥ 4 inches in diameter and surface only for piping < 4 inches in diameter) of at least one pipe diameter length but not more than 12 inches of each longitudinal weld in piping intersecting circumferential piping welds required to be examined by Examination Categories B-F and B-J.

"ASME Section XI 1983 Edition, Table IWC-2500-1, Examination Category C-F, Item C5.22 requires surface and volumetric examination for piping $> 1/2$ inch nominal wall thickness. Category C-F, Item C5.12 requires surface examination only for piping $\leq 1/2$ inch nominal wall thickness and Item C5.32 requires surface examination of pipe branch connections > 4 inches in diameter branch pipe size. The extent of examination includes at least the length of longitudinal welds equal to $2.5t$, at the intersection of the circumferential weld, where 't' is a measure of the pressure boundary thickness.

"Relief is requested from performing the Code-required examination for longitudinal welds in Class 1 and 2 piping. FPC is proposing to adopt the extent of examination for longitudinal welds in Categories B-J and C-F defined by Code Case N-524."

Licensee's Basis for Relief (As stated)

"Florida Power Corporation is requesting relief from the above stated requirements based on ASME Section XI Code Case N-524 which has been issued by the American Society of Mechanical Engineers and has been included in the 1995 Addenda of Section XI. Code Case N-524 defines alternative examination requirements that may be applied to surface and volumetric examination of longitudinal welds in Class 1 and Class 2 piping.

"Code Case N-524 directs examination efforts at the high risk area at weld intersections. By eliminating the low risk areas of longitudinal welds from examination, the time requirements and radiation exposure of personnel are significantly reduced. The expected dose savings is estimated to be 1.6 to 2.0 man-rem per weld with a projected outage savings of 12.8 to 16.0 man-rem based on examination of eight longitudinal welds. Compliance with the existing ASME Section XI requirements, in lieu of Code Case N-524, would result in unnecessary exposure without a compensating increase in the level of quality or safety.

"Longitudinal welds are produced during pipe fabrication, as opposed to circumferential welds which are field produced. The ASME Code contains requirements for characteristics and performance of materials and components, and for examination of longitudinal piping welds during fabrication. Additionally, the ASME Code specifies the minimum chemical and physical properties of the material to ensure structural integrity of the longitudinal welds at the time of pipe fabrication.

"The preservice, and inservice examinations conducted during the first ISI interval provide assurance of longitudinal weld structural integrity for the service life of the plant to date.

"Experience within the United States reveals that ASME Code longitudinal welds have not experienced degradation warranting inservice examination beyond that required to meet the circumferential weld examination requirements. To date, no significant loading conditions or material degradation mechanisms have become evident that specifically relate to longitudinal seam welds in nuclear power plant piping. If degradation of a longitudinal weld was to occur, it is expected to be located at an intersection with a circumferential weld, which is inspected in accordance with Code Case N-524. Therefore, the health and safety of the public will continue to be maintained while implementing the alternative examination requirements of Code Case N-524."

Licensee's Alternate Examination (As stated)

"The following alternative examination requirements will be performed as defined in ASME Section XI Code Case N-524:

- a) When only a surface examination is required, examination of longitudinal piping welds is not required beyond those portions of the welds within the examination boundaries of intersecting circumferential welds.

- b) When both surface and volumetric examinations are required, examination of longitudinal piping welds is not required beyond those portions of the welds within the examination boundaries of intersecting circumferential welds provided the following requirements are met:
- 1) Where longitudinal welds are specified and locations are known, examination requirements shall be met for both transverse and parallel flaws at the intersection of the welds and for that length of longitudinal weld within the circumferential weld examination volume;
 - 2) Where longitudinal welds are specified but locations are unknown, or the existence of longitudinal welds is uncertain, the examination requirements shall be met for both transverse and parallel flaws within the entire examination volume of intersecting circumferential welds."

3.0 EVALUATION

The ASME Section XI Code (1983 Edition) requires one pipe diameter in length, but no more than 12 inches, be examined for Class 1 longitudinal piping welds. Class 2 longitudinal piping welds are required to be examined for a length of $2.5t$, where t is the thickness of the weld. These weld lengths are measured from the intersection of the circumferential weld and longitudinal weld. The licensee's proposed alternative, Code Case N-524, limits the volumetric and surface examination requirements of the longitudinal weld to the volume or area contained within the examination requirements of the intersecting circumferential weld.

Longitudinal welds are produced during the manufacturing process of the piping, not in the field as is the case for circumferential welds. ASME (the Code) provides requirements on characteristics and performance of materials and products, and specifies the examination requirements during the manufacturing of the subject longitudinal piping welds.

In addition, there are material, chemical, and tensile strength requirements in the Code. The manufacturing process that is specified by the Code provides assurance of the structural integrity of the longitudinal welds at the time the piping is manufactured.

The preservice examination and initial inservice examinations have provided the code-required assurance of the structural integrity of the longitudinal welds. The staff concurs with the licensee's assessment of the industry experience in the United States relating to degradation of pipes with shop welded longitudinal seams, that they do not warrant continued examination beyond the boundaries required to meet the circumferential weld examination requirements. No significant loading conditions or known material degradation mechanisms have become evident to date which specifically relate to longitudinal seam welds in nuclear plant piping.

If any degradation associated with a longitudinal weld were to occur, it is expected that it would be located at the intersection with a circumferential weld. This intersection is inspected in accordance with the provisions of

Code Case N-524. Furthermore, the 1983 ASME Code, Section XI, Appendix III "Ultrasonic Examination of Piping Systems" which is applicable to the subject plant, requires scanning for reflectors parallel and transverse to the weld seam in case of ferritic piping, contrary to the requirement in some older Code editions to only scan for reflectors oriented parallel to the weld seam. The transverse scan of a circumferential weld, will further detect reflectors oriented parallel to a longitudinal weld at the root of intersection of a longitudinal seam.

4.0 CONCLUSION

Based on the above discussions, the staff concludes that the licensee's proposed use of Code Case N-524 as an alternative to the Code requirements, provides an acceptable level of quality and safety while eliminating personnel radiation exposure associated with the examination of longitudinal welds. Therefore, the licensee's proposed alternative to use Code Case N-524 is authorized pursuant to 10 CFR 50.55a(a)(3)(i). The licensee is authorized to use Code Case N-524 until such time as the code case is included in a future revision of Regulatory Guide 1.147. At that time the licensee should follow all provisions and any limitations that may be described in the Regulatory Guide 1.147 concerning the use of Code Case N-524.

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