

April 15, 2004

Mr. Michael Kansler
President
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT - RELIEF REQUEST
RR-31 FROM THE REQUIREMENTS OF AMERICAN SOCIETY OF
MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE (ASME
CODE), SECTION XI, APPENDIX VIII, SUPPLEMENT 10 (TAC NO. MC0292)

Dear Mr. Kansler:

By letter dated August 5, 2003, you requested relief from the requirements of ASME Code, Section XI, Appendix VIII, Supplement 10 to implement the qualification requirements for procedures, equipment, and personnel involved with ultrasonic examination (UT) of dissimilar metal welds at the James A. FitzPatrick (JAF) Nuclear Power Plant. The proposed relief would be applicable to the third 10-year inservice inspection interval (ISI) interval. The JAF's third 10-year ISI program plan meets the requirements of ASME Code, Section XI, 1995 Edition with 1996 Addenda.

The Nuclear Regulatory Commission staff has reviewed your request as documented in the enclosed Safety Evaluation. Based on its review, the staff concludes that the proposed alternatives to ASME Code, Section XI, Appendix VIII, Supplement 10 as described in Relief Request RR-31 provide an acceptable level of quality and safety. Therefore, the proposed alternatives are authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI interval at JAF. 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. The relief granted is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee if compliance with the actual inservice inspection requirements were imposed on the facility.

Sincerely,

/RA/

Richard J. Laufer, Chief, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-333

Enclosure: As stated

cc w/encl: See next page

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
ON REQUEST FOR RELIEF FROM THE REQUIREMENTS OF
AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND
PRESSURE VESSEL CODE (ASME CODE), SECTION XI,
APPENDIX VIII, SUPPLEMENT 10
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
DOCKET NO. 50-333

1.0 INTRODUCTION

By letter dated August 5, 2003, Entergy Nuclear Operations, Inc. (Entergy or the licensee) submitted Relief Request RR-31. The licensee sought relief from the requirements of ASME Code, Section XI, Appendix VIII, Supplement 10 to implement the qualification requirements for procedures, equipment, and personnel involved with the ultrasonic examination (UT) of dissimilar metal welds at its James A. FitzPatrick (JAF) Nuclear Power Plant. The proposed relief will be applicable to the third 10-year ISI interval. The JAF's third 10-year ISI program plan meets the requirements of ASME Code, Section XI, 1995 Edition with 1996 Addenda.

Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g) specifies that inservice inspection (ISI) of nuclear power plant components shall be performed in accordance with the requirements of the ASME Code, Section XI, 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 difficulty without a compensating increase in the level of quality and safety. 10 CFR 50.55a(g)(5)(iii) states that if the licensee has determined that conformance with certain Code requirements is impractical for its facility, the licensee shall notify the Commission and submit, as specified in 10 CFR 50.4, information to support the determinations.

Enclosure

2.0 REGULATORY EVALUATION

2.1 Licensee's Evaluation

SYSTEM/COMPONENT (S) FOR WHICH RELIEF IS REQUESTED (as stated):

Pressure Retaining Piping Welds subject to examination using procedures, personnel, and equipment qualified to ASME Section XI, Appendix VIII, Supplement 10 criteria.

Code Requirements (as stated):

The following paragraphs or statements are from ASME [Code] Section XI, Appendix VIII, Supplement 10 and identify the specific requirements that are included in this request for relief.

Item 1 - Paragraph 1.1(b) states in part - Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent.

Item 2 - Paragraph 1.1(d) states - All flaws in the specimen set shall be cracks.

Item 3 - Paragraph 1.1(d)(1) states - At least 50% of the cracks shall be in austenitic material. At least 50% of the cracks in austenitic material shall be contained wholly in weld or buttering material. At least 10% of the cracks shall be in ferritic material. The remainder of the cracks may be in either austenitic or ferritic material.

Item 4 - Paragraph 1.2(b) states in part - The number of unflawed grading units shall be at least twice the number of flawed grading units.

Item 5 - Paragraph 1.2(c)(1) and 1.3(c) state in part - At least 1/3 of the flaws, rounded to the next higher whole number, shall have depths between 10% and 30% of the nominal pipe wall thickness. Paragraph 1.4(b) distribution table requires 20% of the flaws to have depths between 10% and 30%.

Item 6 - Paragraph 2.0 first sentence states - The specimen inside surface and identification shall be concealed from the candidate.

Item 7 - Paragraph 2.2(b) states in part - The regions containing a flaw to be sized shall be identified to the candidate.

Item 8 - Paragraph 2.2(c) states in part - For a separate length-sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate.

Item 9 - Paragraph 2.3(a) states - For the depth sizing test, 80% of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate.

Item 10 - Paragraph 2.3(b) states - For the remaining flaws, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.

Item 11 - Table VIII-S2-1 provides the false call criteria when the number of unflawed grading units is at least twice the number of flawed grading units.

RELIEF REQUESTED (as stated):

Relief is requested to use the following alternative requirements for implementation of Appendix VIII, Supplement 10 requirements. They will be implemented through the PDI [Performance Demonstration Initiative] Program.

A copy of the proposed revision to Supplement 10 is attached. [This attachment was included in the licensee submittal but is not included in this safety evaluation (SER).] It identifies the proposed alternatives and allows them to be viewed in context. It also identifies additional clarifications and enhancements for information. It has been submitted to the ASME Code for consideration and as of September 2002 has been approved by the NDE [Nondestructive Examination] Subcommittee.

Basis for Relief (as stated):

Item 1 - The proposed alternative to Paragraph 1.1(b) is:

The specimen set shall include the minimum and maximum pipe diameters and thicknesses for which the examination procedure is applicable. Pipe diameters within a range of ½ in. (13 mm) of the nominal diameter shall be considered equivalent. Pipe diameters larger than 24 in. (610 mm) shall be considered to be flat. When a range of thicknesses is to be examined, a thickness tolerance of ±25% is acceptable.

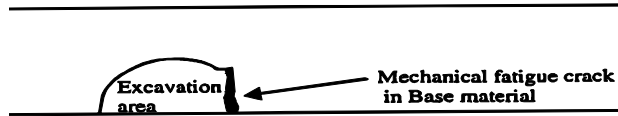
Technical Basis - The change in the minimum pipe diameter tolerance from 0.9 times the diameter to the nominal diameter minus 0.5 inch provides tolerances more in line with industry practice. Though the alternative is less stringent for small pipe diameters they typically have a thinner wall thickness than larger diameter piping. A thinner wall thickness results in shorter sound path distances that reduce the detrimental effects of the curvature. This change maintains consistency between Supplement 10 and the recent revision to Supplement 2.

Item 2 - The proposed alternative to Paragraph 1.1(d) is:

At least 60% of the flaws shall be cracks, the remainder shall be alternative flaws. Specimens with IGSCC [intergranular stress-corrosion cracking] shall be used when available. Alternative flaws, if used, shall provide crack-like reflective characteristics and shall be limited to the case where implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws. Alternative flaw mechanisms shall have a tip width of less than or equal to 0.002 in. (.05 mm). Note, to avoid confusion the proposed alternative modifies instances of the term "cracks" or "cracking" to the term "flaws" because of the use of alternative flaw mechanisms.

Technical Basis - As illustrated below, implanting a crack requires excavation of the base material on at least one side of the flaw. While this may be satisfactory for ferritic materials, it does not produce a useable axial flaw in austenitic materials because the sound beam, which normally passes only through base material, must now travel

through weld material on at least one side, producing an unrealistic flaw response. In addition, it is important to preserve the dendritic structure present in field welds that would otherwise be destroyed by the implantation process. To resolve these issues, the proposed alternative allows the use of up to 40% fabricated flaws as an alternative flaw mechanism under controlled conditions. The fabricated flaws are isostatically compressed which produces ultrasonic reflective characteristics similar to tight cracks.



Item 3 - The proposed alternative to Paragraph 1.1(d)(1) is:

At least 80% of the flaws shall be contained wholly in weld or buttering material. At least one and a maximum of 10% of the flaws shall be in ferritic base material. At least one and a maximum of 10% of the flaws shall be in austenitic base material.

Technical Basis - Under the current Code, as few as 25% of the flaws are contained in austenitic weld or buttering material. Recent experience has indicated that flaws contained within the weld are the likely scenarios. The metallurgical structure of austenitic weld material is ultrasonically more challenging than either ferritic or austenitic base material. The proposed alternative is therefore more challenging than the current Code.

Item 4 - The proposed alternative to Paragraph 1.2(b) is:

Detection sets shall be selected from Table VIII-S10-1. The number of unflawed grading units shall be at least one and a half times the number of flawed grading units.

Technical Basis - Table VIII-S10-1 provides a statistically based ratio between the number of unflawed grading units and the number of flawed grading units. The proposed alternative reduces the ratio to 1.5 times. This reduces the number of test samples to a more reasonable number from the human factors perspective. However, the statistical basis used for screening personnel and procedures is still maintained at the same level with competent personnel being successful and less skilled personnel being unsuccessful. The acceptance criteria for the statistical basis are in Table VIII-S10-1.

Item 5 - The proposed alternative to the flaw distribution requirements of Paragraph 1.2(c)(1) (detection) and 1.3(c) (length) is to use the Paragraph 1.4(b) (depth) distribution table (see below) for all qualifications.

Flaw Depth	Minimum
<u>(% Wall Thickness)</u>	<u>Number of Flaws</u>
10 - 30%	20%
31 - 60%	20%
61 - 100%	20%

Technical Basis - The proposed alternative uses the depth sizing distribution for both detection and depth sizing because it provides for a better distribution of flaw sizes within the test set. This distribution allows candidates to perform detection, length, and depth-sizing demonstrations simultaneously utilizing the same test set. The requirement that at least 75% of the flaws shall be in the range of 10 to 60% of wall thickness provides an overall distribution tolerance. The distribution uncertainty decreases the possibilities for testmanship that would be inherent to a uniform distribution. It must be noted that it is possible to achieve the same distribution utilizing the present requirements, but it is preferable to make the criteria consistent.

Item 6 - The proposed alternative to Paragraph 2.0 first sentence is:

For qualifications from the outside surface, the specimen inside surface and identification shall be concealed from the candidate. When qualifications are performed from the inside surface, the flaw location and specimen identification shall be obscured to maintain a "blind test."

This proposed alternative is applicable to PWRs [pressurized-water reactors] and therefore, not applicable to JAF.

Items 7 and 8 - The proposed alternatives to Paragraph 2.2(b) and 2.2(c) is:

... containing a flaw to be sized may be identified to the candidate.

Technical Basis - The current Code requires that the regions of each specimen containing a flaw to be length sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region (Note, that length and depth sizing use the term "regions" while detection uses the term "grading units" - the two terms define different concepts and are not intended to be equal or interchangeable). To ensure security of the samples, the proposed alternative modifies the first "shall" to a "may" to allow the test administrator the option of not identifying specifically where a flaw is located. This is consistent with the recent revision to Supplement 2.

Items 9 and 10 - The proposed alternative to Paragraph 2.3(a) and 2.3(b) is:

... regions of each specimen containing a flaw to be sized may be identified to the candidate.

Technical Basis - The current Code requires that a large number of flaws be sized at a specific location. The proposed alternative changes the "shall" to a "may" which modifies this from a specific area to a more generalized region to ensure security of samples. This is consistent with the recent revision to Supplement 2. It also incorporates terminology from length sizing for additional clarity.

Item 11 - The proposed alternative modifies the acceptance criteria of Table VIII-S2-1 as follows:

TABLE VIII-S10-1
PERFORMANCE DEMONSTRATION DETECTION TEST
ACCEPTANCE CRITERIA

Detection Test Acceptance Criteria		False Call Test Acceptance Criteria	
Number of Flawed Grading Units	Minimum Detection Criteria	Number of Unflawed Grading Units	Maximum Number of False Units
5	5	10	0
6	6	12	1
7	6	14	1
8	7	16	2
9	7	18	2
10	8	20—15	3—2
11	9	22—17	3—3
12	9	24—18	3—3
13	10	26—20	4—3
14	10	28—21	5—3
15	11	30—23	5—3
16	12	32—24	6—4
17	12	34—26	6—4
18	13	36—27	7—4
19	13	38—29	7—4
20	14	40—30	8—5

Technical Basis - The proposed alternative is identified as new Table S10-1 above. It was modified to reflect the reduced number of unflawed grading units and allowable false calls. As a part of ongoing Code activities, Pacific Northwest National Laboratory [PNNL] has reviewed the statistical significance of these revisions and offered the revised Table S10-1.

ALTERNATIVE EXAMINATION (as stated):

In lieu of the requirements of ASME [Code] Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 10, the proposed alternative shall be used. The proposed alternative is described in the enclosure. [the enclosure is not included in this SER.]

JUSTIFICATION FOR GRANTING RELIEF (as stated):

Pursuant to 10 CFR 50.55a(a)(3)(i) approval is requested to use the proposed alternatives described above in lieu of the ASME [Code] Section XI, Appendix VIII, Supplement 10 requirements. Compliance with the proposed alternative will provide an adequate level of quality and safety for examination of affected welds.

A similar request for relief was granted for Entergy's Pilgrim Nuclear Power Station on May 7, 2003 (Reference TAC No. MB7949).

IMPLEMENTATION SCHEDULE (as stated):

The alternative program will be applicable for the 3rd ISI interval.

2.2 Staff Evaluation

The licensee proposed to use the program developed by PDI that modifies selected aspects of the existing Code requirements. The licensee has described those modifications in its basis for relief above and in its enclosure to Request for Relief RR-31. The staff's evaluation of the differences between the Code and the PDI program are discussed below.

Paragraph 1.1(b) - The Code requirement of "0.9 to 1.5 times the nominal diameter are equivalent" was established for a single nominal diameter. When applying the Code-required tolerance to a range of diameters, the tolerance rapidly expands on the high side. Under the current Code requirements, a 5-inch outside diameter (OD) pipe would be equivalent to a range of 4.5-inches to 7.5-inches diameter pipe. Under the proposed PDI guidelines, the equivalent range would be reduced to 4.5-inch to 5.5-inch diameter pipe. With current Code requirements, a 16-inch nominal diameter pipe would be equivalent to a range of 14.4-inches to 24-inches diameter pipe. The proposed alternative would significantly reduce the equivalent range to between 15.5-inches and 16.5-inches. The difference between Code and the proposed alternative for diameters less than 5-inches is not significant because of shorter metal path and beam spread associated with smaller diameter piping. The proposed alternative is considered more conservative than current Code requirements. The proposed alternative paragraph provides an acceptable level of quality and safety.

Paragraph 1.1(d) - The Code requires all flaws to be cracks. Manufacturing test specimens containing cracks free of spurious reflections and telltale indicators is extremely difficult in austenitic material. To overcome these difficulties, PDI developed a process for fabricating flaws that produce UT acoustic responses similar to the responses associated with real cracks. PDI presented its process for discussion at public meetings held June 12 through 14, 2001, and January 31 through February 2, 2002, at the EPRI NDE Center, Charlotte, NC. The NRC staff attended these meetings and determined that the process parameters used for manufacturing fabricated flaws resulted in acceptable acoustic responses. PDI is selectively installing these fabricated flaws in specimen locations that are unsuitable for real cracks. The proposed alternative paragraph provides an acceptable level of quality and safety.

Paragraph 1.1(d)(1) - The Code requires that at least 50% of the flaws be contained in austenitic material, 50% of the flaws in the austenitic material shall be contained fully in weld or buttering material. This means that at least 25% of the total flaws must be located in the weld or buttering material. Field experience shows that flaws identified during ISI of dissimilar metal welds are more likely to be located in the weld or buttering material. The grain structure of austenitic weld and buttering material represents a much more stringent ultrasonic scenario than that of a ferritic material or austenitic base material. Flaws made in austenitic base material that are free of spurious reflectors and telltale indicators are difficult to create. The proposed alternative of 80% of the flaws in the weld metal or buttering material provides a challenging testing scenario reflective of field experience and minimizes testmanship

associated with telltale reflectors common to placing flaws in austenitic base material. The proposed alternative paragraph provides an acceptable level of quality and safety.

Paragraph 1.2(b) and Paragraph 3.1 - The Code requires that detection sets meet the requirements of Table VIII-S10-1 which specifies the minimum number of flaws in a test set to be 5 with 100% detection. The current Code also requires the number of unflawed grading units to be two times the number of flawed grading units. The proposed alternative would follow the detection criteria of the table beginning with a minimum number of flaws in a test set being 10, and reducing the number of false calls to one and a half times the number of flawed grading units. The proposed alternative satisfies the pass/fail objective established for Appendix VIII performance demonstration acceptance criteria. The proposed alternative paragraphs provide an acceptable level of quality and safety.

Paragraph 1.2(c)(1), Paragraph 1.3(c) - For detection and length sizing, the Code requires at least 1/3 of the flaws be located between 10 and 30% through the wall thickness and 1/3 located greater than 30% through the wall thickness. The remaining flaws would be located randomly throughout the wall thickness. The proposed alternative sets the distribution criteria for detection and length sizing to be the same as the depth sizing distribution, which stipulates that at least 20% of the flaws be located in each of the increments of 10-30%, 31-60% and 61-100%. The remaining 40% would be located randomly throughout the pipe thickness. With the exception of the 10-30% increment, the proposed alternative is a subset of the current Code requirements. The 10-30% increment would be in the subset if it contained at least 30% of the flaws. The change simplifies assembling test sets for detection and sizing qualifications and is more indicative of conditions in the field. The proposed alternative paragraphs provide an acceptable level of quality and safety.

Paragraph 2.0 - The Code requires the specimen inside surface be concealed from the candidate. This requirement is applicable for test specimens used for qualification performed from the outside surface. With the expansion of Supplement 10 to include qualifications performed from the inside surface, the inside surface must be accessible while maintaining the specimen integrity. The proposed alternative requires that flaws and specimen identifications be obscured from candidates, thus maintaining blind test conditions. The NRC staff considers this to be consistent with the intent of the Code requirements. The proposed alternative paragraph provides an acceptable level of quality and safety.

Paragraph 2.2(b) and 2.2(c) - The Code requires that the location of flaws added to the test set for length sizing shall be identified to the candidate. The proposed alternative is to make identifying the location of additional flaws an option. This option provides an additional element of difficulty to the testing process because the candidate would be expected to demonstrate the skill of detecting and sizing flaws over an area larger than a specific location. The alternative is more conservative than Code requirements. The proposed alternative paragraph provides an acceptable level of quality and safety.

Paragraph 2.3(a) - The Code requirement is that 80% of the flaws be sized in a specific location that is identified to the candidate. The proposed alternative permits detection and depth sizing to be conducted separately or concurrently. In order to maintain a blind test, the location of flaws cannot be shared with the candidate. For depth sizing that is conducted separately, allowing the test administrator the option of not identifying flaw locations makes the testing

process more challenging. The alternative is more conservative than the Code requirements. The proposed alternative paragraph provides an acceptable level of quality and safety.

Paragraph 2.3(b) - The Code requires that the location of flaws added to the test set for depth sizing shall be identified to the candidate. The proposed alternative is to make identifying the location of additional flaws an option. This option provides an additional element of difficulty to the testing process because the candidate would be expected to demonstrate the skill of finding and sizing flaws in an area larger than a specific location. The alternative is more conservative than the Code requirements. The proposed alternative paragraph provides an acceptable level of quality and safety.

Based upon the results of the staff's evaluations of the differences between the Code and the PDI program discussed above, the staff finds that the applicant has provided acceptable alternatives to the requirements of ASME Code, Section XI, Appendix VIII, Supplement 10.

3.0 CONCLUSIONS

The NRC staff concludes that the proposed alternatives to ASME Code, Section XI, Appendix VIII, Supplement 10 as described in Relief Request RR-31 provide an acceptable level of quality and safety. Therefore, the proposed alternatives are authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI interval at JAF. 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.

Principal Contributor: G. Georgiev

Date: April 15, 2004

Mr. Michael Kansler
President
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440 Hamilton Avenue
White Plains, NY 10601

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RR-31 FROM THE REQUIREMENTS OF AMERICAN SOCIETY OF
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The Nuclear Regulatory Commission staff has reviewed your request as documented in the enclosed Safety Evaluation. Based on its review, the staff concludes that the proposed alternatives to ASME Code, Section XI, Appendix VIII, Supplement 10 as described in Relief Request RR-31 provide an acceptable level of quality and safety. Therefore, the proposed alternatives are authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI interval at JAF. 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. The relief granted is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee if compliance with the actual inservice inspection requirements were imposed on the facility.

Sincerely,

Richard J. Laufer, Chief, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Enclosure: As stated
cc w/encl: See next page
Docket No. 50-333

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**See previous concurrence

*Safety evaluation provided - no significant changes made

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FitzPatrick Nuclear Power Plant

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